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Exploring Digital Portfolios and their Effects on Test Scores

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EXPLORING DIGITAL PORTFOLIOS AND THEIR EFFECT ON TEST SCORES

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DEDICATION

To my family, for always believing in me, especially my Mama and Papa, who always ensured I had every opportunity to pursue my dreams and passions. An extra-special thank you to my wife, Veronica, for putting up with this madness. For my sister, Roslynn who always had high expectations of me. And to my children: Etienne, Emil, and Enzo, who, no matter the sacrifice I endured, have made this academic adventure worth doing.

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VITA

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ABSTRACT

Many educators in the field are looking for ways to grade their students. Many of our youth can learn new concepts and attain academic growth but have difficulties in the traditional lecture-based classroom. Digital portfolio incorporation in our secondary classrooms may be a solution to engaging learners through various interactions using online learning tools, interaction with peers, and their teachers. This exploratory study investigated the current value of digital portfolios in improving academic performance in today's classroom. Much of the trend was popular ten years ago. The research explored how current educators in the secondary school setting feel about the incorporation of digital portfolios, and if the learning tool effectively prepares their students' subject understanding prior to an assessment. Data were collected using a research survey that obtained the responses of teachers who volunteered to be a part of this study. Three main questions were directed to educators by this study. Do e-portfolios affect student academic performance? Does the tool improve student subject-matter efficacy? Third, do technical skills have an impact on academic performance and curriculum pacing while using e-portfolios? The collected data had mixed results, with many responses to the survey questions produced data that were inconclusive regarding the effectiveness of digital portfolios. Although the study did not provide enough evidence of digital portfolios as a tool that greatly improves test scores in classes, it is sufficient to say that there is a positive direction from the scores analyzed in the one-month data-collection.

Keywords: technology, digital portfolios, online portfolios, constructivism, metacognition, self-regulation

Chapter 1: Introduction

> I think it's fair to say that personal computers have become the most empowering tool we've ever created. They're tools of communication, they're tools of creativity, and they can be shaped by their user.
>
> —Bill Gates, 2004

Computers have come a long way since social media and Internet technologies led to the development of tools for user collaboration. These days, the web allows people to work together in both educational and workplace settings. With the availability of online tools such as Google Applications for Education (GAFE), people can now collaborate and showcase works that were once limited to the printed portfolio. Traditional portfolios have a limited audience as only one person can view another's work at any given instance. It takes more time for a group of people to judge one's work and give feedback. However, technology has made it possible to collaborate more efficiently. In the digital environment, students can share documents with teachers and peers who can in turn edit and provide constructive criticism of their written work.

Test Scores and Student Performance

The high school at which the study took place is highly concerned about annual growth in math and reading. Teachers are pressured to cover as much of their curriculum as possible prior to high-stakes testing, and to meet the Common Core State Standards (CCSS). Students, in turn, place their focus on memorizing the proper answers for upcoming unit exams and essays. It seems that testing is what is valued, not the overall growth of individual students. How can educators provide a different way of assessing students to truly measure their understanding about a subject, or explicitly measure academic growth? Surely test scores are not a sufficient indicator of individual performance.

As recent as this semester, some students have shared with me that no matter how much preparation they receive or how much they participate in class activities, they cannot improve their test-taking skills. Many who do complete their notebooks, do their homework, and create wonderful projects for the class cannot seem to pass their exams. These students are motivated, want to please their parents and teachers, and desire to attain high grades on their report cards, but since most of the assessments are done in the standardized testing format, these students are barred from achieving high marks.

A potential solution to this problem is the incorporation of the digital portfolio, a collection of student work that showcases artifacts of their knowledge. The portfolio provides a way for students to reflect on their own understanding of the subject while offering teachers and peers opportunities to provide comments and critiques. This tool might assist teachers in identifying individual student growth in subject learning, but also explicitly showcasing student efficacy. Peers can provide help to each other by providing valuable input in real-time, while they are working on improving portfolio content during class sessions. For example, one can share documents of written essays while others can log into the same document to see how the document is being edited. This ability to share online documents permits others to leave valuable feedback to the writer without having to waste time by printing drafts of paper and having to wait for the peer or teacher to return the proposed draft in order to read comments and suggestions. The ability to provide feedback is almost instantaneous with features such as those offered by Google Docs. The digital portfolio or e-portfolio can be another way of grading students that extends beyond test scores, serving as a more holistic approach to assess a learner.

Background of Study

Many types of students are found in the regular classroom, ranging from gifted students to those who are learning English. English language learners (ELLs) in particular struggle with summative assessments, particularly in higher order-thinking questions that contain text-based evidence or document-based prompts. Some ELL students are unable to convey what they have learned or covered in a grading period, but this has been changing in recent years. In some schools, innovative classrooms are currently adopting the use of e-portfolios to showcase student work and understanding. Through this vehicle, parents, teachers, and other stakeholders become aware of students' level of understanding of the subject matter.

In the 21st century, students must possess the ability to collaborate, set goals, problem solve, and work with technology in order to obtain resources for learning and research, such as GAFE (Partnership for 21st Century Skills, 2015). E-portfolios can help students through a metacognitive process whereby they can reflect on what they have learned, and take ownership of their learning by explicitly documenting their understanding. The e-portfolio activity can help students retain information regarding vocabulary, concepts, and the main ideas of a subject's course unit.

Moreover, collaborating in a digital environment while creating student work necessitates the development of key workplace skills. With the implementation of an e-portfolio, students' work can also be showcased with potential employers and college admissions officers. With the increasing ferocity of competition in the current college admissions process and job market, it is imperative that students learn how to utilize the e-portfolio as both a learning and promotional tool.

Significance of Study

The past three years have seen the incorporation of online applications used by learners in classrooms. Many public secondary schools that are incorporating linked-learning pathways, which incorporate normal curriculum with career-based standards, require individuals to have 21st century skills. These skills include collaboration, problem solving, and the ability to use technology resourcefully (Partnership for 21st Century Skills, 2015). The idea of technology integration is critical in schools, hence the need for teacher instruction to compete with and change at the same rate as post-industrial rival nations. Unfortunately, reforms in districts are slow. Many schools and districts do not integrate technology due to cost, but the e-portfolio idea can be free to implement. Millennials are known for their usage of technology in their personal time but have not yet been able to utilize it fully for classroom use.

Public schools are looking at various ways of improving and enhancing student learning in the 21st Century. The aim of this study was to consider the ways that digital technology could enhance learning, and explored how digital portfolios could enhance student efficacy. This study also explored how digital technologies are transforming the ways individuals interact, access information, produce, and share content (Donnelly, 2010). If students can improve subject matter competency through the use of digital portfolios, then more teachers will be open to incorporating them in their daily teaching routine. Instead of the teacher providing direct instruction to students, digital portfolios will allow educators to be facilitators of learning, as opposed to students' only source of information (A. Williams, 2013).

Advantages of Digital Portfolios

Portfolios are typically used to showcase students' best works and to demonstrate the progression of their skills. Artifacts included in the portfolio may include drafts of papers,

sketches of different designs, or completed pieces of artwork that exemplify a particular level of a skillset. Translating the physical portfolio to the digital one is a simple but powerful step. According to Barak (2012), students who worked on e-portfolios received four benefits in the learning process. First, the method allowed learners to include multimedia artifacts along with technical data and drawings. The inclusion of videos, audio recordings, graphics, and external web links enhances the learner's thought process explicitly and enriches their understanding. Second, students construct their understanding of a subject by gradually building their content over a period of time. As time passes, students engage in collaboration with peers or with the assistance of their teachers to hone their writing skills or increase their depth of knowledge. The artifacts are then continually revised to the point where stakeholders can see an improvement. The third advantage is that e-portfolios allow students to reflect on their learning. Finally, students learn technical skills related to online learning, in addition to their engagement with the content building.

Love and Cooper (2007) credit the scalability and flexibility of digital portfolios in showcasing student work, knowledge, or skills. With cloud technology and storing data online, there is no limit to the number of files or file size. Portfolio content is also non-linear through the incorporation of dynamic hyperlinks to either external websites or files found on the web (Love & Cooper, 2007). Digital portfolios are also flexible in that they allow various contents to be used by different audiences over time. For instance, a student's collected written works can be edited by peers and teachers to create an improved version. A single portfolio might be used for showing a student's personal intellectual growth to teachers as they transition to the next grade level. It can also be used when applying for admission to a university, in job applications,

competitions, scholarships, applying for certifications, and launching a business or service (A Guide to Understanding Student Portfolios, 2013).

Digital portfolios can also aid teachers and parents in understanding the interests of students. As work is collected, the e-portfolio can be accessed by various educators in various grade levels. Written work and oral comprehension easily can be made available for educators to review for assessment purposes (Meeus et al., 2006).

Du and Wagner (2005) argue that the use of weblogs or digital portfolios facilitate cognitive constructivism. Those who use these tools require students to actively construct meaning and to organize their thoughts. The use of digital portfolios can also be used to track intellectual growth over time, where a learner's thoughts can be seen to grow in complexity over a certain period. Students can also showcase their interests in different subjects. By blogging or updating their portfolios, they can share what they have learned, and which areas need improvement through self-reflection.

Comparing Traditional Portfolios to Digital Portfolios

A study by Baturay and Daloğlu (2010) compared traditional and digital portfolios. The study examined whether digital portfolios had a significant effect on learning outcomes for English as a second language. Two student groups, one which employed the traditional portfolio, and the other the digital portfolio, underwent a pre and post-test in English grammar. The study found than both groups scored significantly higher in the reading and writing post-test. However, writing and reading skills were higher for the digital portfolio group due to students getting to know their strengths and weaknesses in the process of writing out their responses and receiving feedback from teachers.

Portfolios as Assessment Tools

E-portfolios can be used as a form of a formative or summative assessment tool for grading. Research conducted by Luescher and Sinn (2003) found that traditional paper-based portfolios can be used as flexible instructional and assessment tools that can be adapted to the needs of various learning environments. Their study emphasized a four-phase system that ensured the rollout of an e-portfolio for undergraduate students:

- Checkpoint 1: Initial Phase – collecting and organizing work
    - Fundamental skills, technical skills, practical skills, ethical skills
- Checkpoint 2: Portfolio Assessment – planning and evaluation
    - Finding strengths and weaknesses
    - Evaluating departmental program performance
    - Developing future goals for growth
    - Reviewing accreditation standards
- Checkpoint 3: Portfolio refinement – design, and production
- Checkpoint 4: Graduation – presentation of the professional portfolio

Zawacki-Richter et al. (2011) emphasize that as an evaluation tool, portfolios cater to self-evaluation purposes that provide users and viewers of a portfolio with an overview of the goals, achievements, and the success of the projects featured within. In other words, portfolios can be used as evidence that achievements, competencies, and growth of skills are featured in a person's explicit learning. Klenowski et al. (2006) found that many fields incorporate portfolios, but education especially so. Portfolios were used to strengthen the validity of data during summative evaluations (Klenowski et al., 2006). In higher education, students use portfolios for college applications and admissions.

Purpose of Study

Some high school students have difficulty in learning essential concepts, particularly citing evidence in response to text-based evidence questions. For these students, learning is measured only through summative assessment scores. Formative assessments such as the usage of e-portfolios can be a way to show what students have learned. By creating digital artifacts that display students' knowledge and understanding of essential concepts, their learning can be demonstrated and shared with teachers, parents, and peers alike.

Bransford et al. (2000) argued that the metacognitive approach to teaching helps students to take control of their own learning by defining their learning goals and monitoring their progress. They emphasize that people need to take control of their own learning by engaging in self-evaluation and reflection. By doing so, learners can then identify what they do know, recognize what information they still lack, and develop ways to obtain missing information. Bruner (1986) believes that through reflection and dialogue, learners can develop their own ideas based on previous knowledge and experiences. This study was guided by the idea that e-portfolios can play a significant role in student learning as a tool that supports a reflective, metacognitive approach to learning (Donnelly, 2010).

Statement of Problem

The purpose of this research was to improve the understanding of the student experience in creating and using the e-portfolio as a learning tool. It aimed to determine the extent to which e-portfolios would make a difference in student learning experiences in their courses, and more specifically, investigate whether the use of e-portfolios would have a positive influence on student scores. This study could also validate other studies in terms of how e-portfolios affect student grading and individual student perceptions. Another key reason for conducting this study

was to determine if there was a difference between the learning of high academic performers and underachievers when teachers use e-portfolios.

If educators refuse to adopt trends in technology and in changing their means of assessing their students, they fall or are in the danger of falling into monotony and disconnection from their students. It is important to link student learning to real-world situations, and as such, just like they should prepare for the challenges they will face upon graduation, students must be prepared to showcase their abilities to potential employers and higher institutions of learning. As action researchers, we should strive to look for alternative methods of assessment that will scaffold learning through the use of collaboration and 21st-century learning skills. Through digital-portfolios, students will be able to learn in a collaborative environment with the help of their peers and teachers in order to enhance their written and comprehensive skills in writing and comprehension of any given subject matter. Students will be able to explicitly track the progress of their learning, and have a place to share their best work with others. As teachers, we must also strive to look at student progress and improvement beyond quantitative test scores. We need to look at student progress in learning with a humanist approach. Some are simply awful test takers and numerous individuals manifest their learning through other means.

Another issue relates to how teachers feel about using the digital portfolio and the issue of the reflective process. Many say either that student reflection does not produce any results, or that it does. Others say that having students reflect on their own work is another activity considered by many to be unnecessary work.

Significance of the Study

Students do not have the option to choose their preferred form of assessment. This leaves some students disenfranchised, unprepared for higher education, and unable to become

marketable employees in the future. To be competitive in the workforce, students are also expected to know online technology tools that may be a necessity in the future workplace. Schools have been looking for a strategy to raise reading and math scores, especially for those who are unmotivated or not prepared to handle academic rigor. By conducting an exploratory research study on digital portfolios, the study could uncover the validity of using digital portfolios as a legitimate assessment tool in all educational environments.

Yastıbaş (2013) theorized that digital portfolios, as a continuous, evidence-based medium, can be used to improve students' self-assessment skills. Yastıbaş believed that students could learn how to monitor not only their learning of a language, but more importantly, the progress of their own learning. Yastibas theorizes that improved self-assessment skills make students more self-confident, motivated, and engaged in their learning. Yastıbaş believes that by incorporating a tool such as a digital portfolio, students can plan and compile their own content for learning and will be able to reflect on what they have learned as a medium that is continuous and evidence-based assessment.

Guiding Research Questions

Would students in classrooms that employ digital portfolios improve their ability to do well in their subjects in terms of test scores if e-portfolios are used in the classroom? To investigate these questions, two classes received instruction using e-portfolios through a series of online lessons where students built their own knowledge of the course content.

Grades are no longer proof enough of learning, and multiple school stakeholders want documentation that demonstrates the entire process of learning (Heaney, 1990; Terheggen et al., 2000; Villano, 2005; Wickersham & Chambers, 2006). As digital portfolios become tools that meet these demands, the guiding questions below were considered for this study:

- RQ1: Do e-portfolios affect student academic performance?
- RQ2: Does the tool improve student subject-matter efficacy?
- RQ3: Do technical skills have an impact on academic performance and curriculum pacing while using e-portfolios?

Methodology

A sequential exploratory survey research study was used to determine whether digital portfolios help improve student performance and achievement. This methodology was chosen as it was the one best suited for investigating the phenomenon of how digital portfolios can construct knowledge for learners, as well as their experiences related to the creation and use of digital portfolios. This exploratory study included a survey study of two classes, one employing the creation of digital portfolios and the other (the control group) not. A comparison of unit test scores followed the intervention. This was a non-random study since teacher participants would be using their own classes to give one class the digital portfolio activity, and not the other. The research relied on the data collected from a survey given to teacher participants.

A pre/post-test assessment was administered as a unit of study in a social studies course in the secondary level. The results of the pre/post-test were used to determine which students would be considered high or low achievers with regard to the subject matter.

Site Selection

Initially, the study took place in a local high school in Southern California, selected out of convenience to the researcher's locale, and due to its having the technology needed in order to carry out a digital portfolio study in the classroom. The site had sufficient computer carts and high-speed Internet connection for students to work on digital portfolios. In addition, the school was composed of a diverse population in regard to race, gender, socioeconomic status, and

academic ability. Students who attend the school appeared to have various levels of technical abilities but are exposed to online applications that require the creation of a digital portfolio. Once we had a few teacher participants willing to participate in the study, acquaintances and other colleagues from other neighboring schools within the school district could also choose to partake.

Participant Selection

Teachers who participated in the study had a skill in using GAFE and some background knowledge of creating a digital portfolio. All teachers were asked to review and sign consent forms required for IRB approval through Pepperdine University and the local school district (see Appendix A).

Data Collection

The data collected will be used to increase current knowledge of teacher experience in creating and using the digital portfolio as an effective tool of learning. Data collected included a survey for teachers regarding the impact of this form on student learning.

- Data collection stage one: This stage involved provisions for a safe and comfortable setting for interviews.
- Data collection stage two: In this stage, the researcher sent out an e-mail reminder to teacher participants when nearing the 4 week mark, at which a test should be given and graded to compare test scores of their students.
- Data collection stage three: The researcher sent a link to an online survey to the teacher participants.

- Data collection stage four: The researcher coded the data collected from the survey, analyzed, and discussed the findings with the participants by a telephone call or e-mail.

Scope and Limitations of the Study

The limitations of the study were associated with the deficiencies of conducting survey-research, and with snowball sampling in particular. One primary issue was gaining access to a hidden target population, in this case teachers who use digital portfolios as part of their teaching practice. Limitations included the availability of teachers to volunteer for the study, and the lack of the researcher's ability to choose which academic subjects were going to be available. Potential participants were from the researcher's place of work, followed by those they could invite from other schools or neighboring districts. The depth and richness of data collection was dependent on the agreeability and teaching and class management skills of potential participants.

Another limitation was that all participants were volunteers, and could not be seduced with incentives, or coerced (Andres, 2012). The researcher had to convince potential participants that the study would contribute to the overall knowledge of utilizing digital portfolios in student learning, and how this might impact student testing performance.

The third limitation of the study was that no lesson plan prescription or format would be prescribed to teachers, since participants might come from different subject matters. Volunteer participants are entitled to follow their course curriculum and utilize digital portfolios the way they deem fit in their units of study. The only potential requisite was that they do a summative assessment and see if student performance as a whole class improves or not.

The fourth and final limitation was time. Participants were given four weeks for conducting a digital portfolio project, followed by an assessment. The study might provide more

depth and understanding for a longer period such as a semester, but research data collection had to be completed in order for research analysis to be conducted in the following months and in time for the researcher's final dissertation defense. The goal of this survey research was not to generalize the findings but to provide a more in-depth look at digital portfolio incorporation with teaching and student performance.

Conceptual Foundation

Knowledge Creation

Knowledge creation is accomplished through a "synergistic relationship between tacit and explicit knowledge" (Choo, 1998, p. x). As differentiated by Jaleel and Verghis (2015), explicit knowledge is what can be translated to formal words, it is the objective knowledge, the knowing about, (Jaleel & Verghis, 2015). Tacit knowledge is difficult to articulate in words, and is the "knowing how" (Jaleel & Verghis, 2015). When students are constructing their understanding of a subject in a digital portfolio, they are able to uncover their understanding through the need to write their own meaning and interpretation. The learner and their peers can then help form the meaning of something that is difficult to express.

Inquiry Learning

Students have ownership when they are free to decide what information they collect, use, analyze, and interpret. Sharing topics and results with others augments feelings of value and enhances commitment to learning (Blumenfeld et al., 2006). Inquiry learning is necessary when creating a digital portfolio. As students generate content, the information stored will have to be analyzed and interpreted based on teacher-produced prompts. Collaborative conversations through peer comments in the portfolio's documents should provide the portfolio owner with constructive feedback that can improve the current work presented.

Definition of Terms

Given that many of the terms employed in this study are ubiquitous in the educational field and often encountered in digital portfolio studies; they are compiled for the reader's convenience:

- *Assessment*: The process of accumulating, analyzing, and systematizing information about a learner's results and applications with a view to identifying a change in individual capacity (Stasiunaitiene & Kaminskiene, 2009).
- *Collaborative Tools*: Online tools or web environments that are used to engage users in a collaborative setting for academic and real-world situations (Pan, 2010). Multiple individuals through the use of these tools are able to work on the same or similar projects together. Blogs and Wikis are two of the most popular platforms used in the education field due to having collaborative features and being easy to use.
- *Comprehension*: A learner's capacity to understand meaning communicated by instructors (Caldwell, 2008).
- *E-portfolio / Digital Portfolio*: Also known as a digital portfolio, an E-portfolio is "a platform that is capable of storing visual and auditory content including text, images, video, and sound" (Alawdat, 2013, p. 340). These make up a collection of artifacts that the student has created and organized according to the standard in which the teacher prescribes them to the class (A. Williams, 2013). Reese and Levy (2009) describe an e-portfolio as a collection of learning and experiential artifacts and accomplishments that represent changes in individual, group, or institutional learning performance. Barrett (2006) adds that an e-portfolio is not only a collection of work

that a person has collected, organized, and edited, but also reflected upon, in order to present what has been learned over time.

- *Evaluation*: A process that measures the degree of mastery learners have achieved based on a learning standard (Stasiunaitiene & Kaminskiene, 2009).
- *Frame of Reference*: A collection of individual experiences, concepts, associations, feelings, values, conditions, and responses used to govern transformative learning (Mezirow, 1997).
- *Google Applications for Education (GAFE)*: Digital tools used in learning as developed by search engine giant Google. These applications are similar to Microsoft's Office Suite, as GAFE offers a text document writing environment for creating reports, spreadsheets, and slide presentations, as well as a sharable hard-drive. The unique property of these tools is that they can be shared with other people for collaborative use, in addition to allowing more than one user to work on the same document in real time.
- *Learning Achievements*: Benchmarks or levels of learning where the skills, knowledge, abilities, and attitudes that a learner demonstrates in a course. (Stasiunaitiene & Kaminskiene, 2009). With digital portfolios, students can demonstrate the level of complexity of content as it improves over time. Learners can demonstrate subject efficacy by the depth of knowledge in their articles and written work in a digital portfolio.
- *Metacognition*: Goal setting, planning, implementing strategies, monitoring, reflection on learning, and learning by gaining experience in how to learn (Flavell, 1979).

- *Motivation*: Doing something that is inherently interesting or enjoyable or because it will lead to a valued outcome (Ryan & Deci, 2000). According to D. William (2002), people want to learn certain things because they value the outcome or want to reach a personal goal. Motivation can also be seen as a consequence of achievement; when one achieves in a task that is challenging and his/her capability is also high, then a sense of *flow*, or the sense of being completely absorbed in an activity, is achieved (Csikszentmihalyi, 1990).
- *Portfolio*: A collection of materials and documents that document a specific range of performance over a period of time (Powell, 2013).
- *Self-Efficacy*: A theory by Albert Bandura which is used as a reliable predictor of behavioral changes related to change (Bandura, 1982).
- *Self-Regulated Learning*: Bandura (1986) states that being aware of your own learning requires three components: self-observation, self-judgment, and self-reaction, all of which are important in self-regulating one's learning process. Hirata (2010) proposed four components of self-regulated learning: cognitive/metacognitive, affective, behavioral, and environmental (Yastıbaş & Yastıbaş, 2015). Self-regulation is defined as "self-generated thoughts, feelings, and actions that are planned and cyclically adapted to the attainment of goals" (Yastıbaş & Yastıbaş, 2015, p. 6). Pintrich (1995) calls these the academic self-directed processes that learners are required to have in order to control and monitor their own cognition and evaluate their effects. Zimmerman and Risenberg (1997) extend the definition to include not only monitoring one's own cognition and behavior, but adding the extended awareness of the environment and social setting when it comes to learning.

- *Student Engagement*: A factor that can indicate a student's performance and achievement is dependent on communication and collaboration with their own work, teachers, and others in the learning environment (Tosh et al., 2005).
- *Transformative Learning*: Mental thoughts are transferred into practical output, and vice-versa (Powell, 2013). Learners have mental images of what they are thinking and translate these ideas into tangible objects, such as a written article, a drawing, or a digital portfolio. At the same time, the quality of work reflects back toward the person who has created the artifact, reflecting their achievement and efficacy.
- *21st Century Learning*: According to Pan (2010), this is the knowledge base that students need to learn in order to be competitive in the global arena.
- *21st Century Skills:* Students require critical thinking and problem-solving skills in order to remain competitive in the job market of the future. Individuals must be able to learn to communicate in various ways, including both *soft* and *hard* skills; collaboration skills in a social, web-based, or technical setting; and social and cross-cultural communication skills. Students must also be able to self-direct. Other skills that are regarded as necessary for competitiveness include creativity and innovation, flexibility, adaptability, initiative, leadership, responsibility, and literacy in the realm of civics, health, media, and information technology (Pan, 2010).
- *Weblog*: Also known as a blog, it is a personalized webpage kept by the author in chronological diary format by using an online software (Du & Wagner, 2005). These weblogs have online features such as hyperlinks to images, sounds, or other people's weblogs. These connected blogs are then part of an online social network of bloggers. A key feature of a weblog is the ability for others to leave a comment underneath an

author's post. This enables others to communicate to the author regarding their thoughts via written responses, thus facilitating dialog between the author and their readers. While weblogs are in diary format, this medium can also be converted into digital portfolios in order to showcase student work or simply to share ideas about certain topics.

Chapter Summary

This chapter focused on the purpose of the study, the research questions, the importance of conducting the study, and the methodology. Teachers face the task of increasing engagement, motivation, and increasing student self-regulation of learning in their classrooms. With GAFE tools becoming more readily available in classrooms, this study aimed to evaluate the use of digital portfolios in teaching and assessment of student academic performance, and the extent to which teachers who use this tool have noticed any improvements in student academic performance as a result. It also asked whether digital portfolios improve student subject matter efficacy, and whether technical skills have an impact on academic performance.

Organization of the Study

Chapter 1 examines the introduction, research problem statement, purpose, research questions, and definition of terms. Also, the chapter includes the theoretical framework for this study, as well as the significance of the study, which included reasons for undertaking the study.

Chapter 2 is primarily a literature review on theories surrounding the idea behind digital portfolios: constructivism, metacognition, student-centered classrooms, engagement in digital environments, language learning, e-portfolios as assessment tools, self-regulation strategies; literature on e-portfolios based on high school environments; effects of digital portfolios on

student efficacy; digital portfolios as disruptors in the traditional learning environment; and implementation of digital portfolios.

Chapter 3 discusses the methodology used in the research. This chapter also identifies the methodology of data collection that was used, including the research design and tools for data analysis. The data collection procedures are also identified in this section as well as the steps to ensure validity and reliability.

Chapter 4 presents a detailed data analysis of the results based on the method of data collection identified for the study. Results from the respondents are quantitatively presented along with a discussion on every data set of the research survey.

Chapter 5 involves the discussion of results for each research question as well as the summary of the entire study, including the conclusions which were drawn based on the analysis of the data collected. Recommendations for future research on the same area of study are also identified. Recommendations for future research are also made.

Chapter 2: Literature Review

Background

At the beginning of the fall semester, educators often find wide-eyed, interested students who are rightfully excited about being in school and engaged in their classes. As the time progresses, some individuals begin to lose motivation in the more challenging courses. Some students at the school where the researcher works mentioned that, as much as they are interested in a course, the testing and low grades that they receive brings uneasiness and less desire to do the work. Others stated that they can understand the concepts discussed but when it comes to summative testing, they lack the skill to effectively communicate their understanding to the teacher. So how do educators modify their pedagogical practices in order to assess students differently? How can they see academic growth in an individual in a way that goes beyond test scores? How can they explicitly see student thought processes and how do they coach them toward the right direction?

This dissertation investigated a learning strategy that could increase student engagement and subject matter efficacy: specifically, the use of reflection and e-portfolios. Using digital portfolios as a formative assessment tool can offer a learning environment that allows for increased engagement, motivation, and improved self-perception. All these areas and growth may lead to improved academic performance by the time the learner takes a summative assessment in class. School districts are looking for new strategies that can support increased engagement, collaborative discussion, annotations of complex texts, and improvements in assessments. To meet these needs, digital portfolios can be employed in all grade levels and subject matters as a collaborative tool to increase student engagement and improve learning.

This literature review chapter is devoted to discussing the guided theories surrounding digital portfolios; how traditional portfolios are similar to the digital version yet lacking in certain capabilities; how e-portfolio evaluation has been used in recent and previous studies in the field of education; how e-portfolios can be seen as a disruptor to traditional methods of assessing learners; and how they can be implemented in a learning environment.

Guiding Theories of the Study

Constructivism

Constructivism, derived from Jean Piaget's (1971) theory of cognitive development, refers to how learners guide and monitor their activities (Linn, 2006). It is a feature of active learning in which the learner is constructing new knowledge from prior knowledge (Jaleel & Verghis, 2015). Experimental, collaborative, and hands-on learning strategies are the centerpieces of this instructional theory. Constructivism supports active, student-centered approaches in the classroom and online environment (Gulati, 2008; Li & Guo, 2014). Learning is promoted by the constructivist theory as students use critical thinking skills to make sense of newly learned information (Blaik-Hourani, 2011). Piaget's theory (1971) proposes that people cannot be given information directly, but instead must construct their knowledge through experience. This experience that develops one's schema, or one's understanding about anything in the world, grows in complexity through experiences of assimilation and accommodation.

Learning takes place when students are engaged in "a continuous process of acquiring, generating, analyzing, manipulating, and structuring information" (Du & Wagner, 2005, p. 3). Du and Wagner (2005) conducted a study on how the continuous use of weblogs would affect student learning performance. The study promoted constructivist models for promoting cognitive and social knowledge construction and reinforcing individual accountability. In a senior level

college business course, Du and Wagner (2005) found that the student weblogs were better predictors of learning outcomes than traditional coursework. The study discovered that the quality of student work in their weblogs helped serve as predictors of test scores, or provided insight into student learning that tests could not record. Weblogs relate to the subject of digital portfolios because some are considered to be "Learning Logs" (Du & Wagner, 2005, p. 2). These pages document one's progression of learning on a frequent basis where the author documents their ideas and thoughts on a daily or weekly basis. With the ability of allowing comments to be provided by other people into these log entries, collaboration and constructive criticism can be provided to the blogger.

In order for experiential learning to take place at school, teachers are asked to adopt the constructivist mindset. Brooks and Brooks (1993) summarized what a constructivist teacher is likely to do in the classroom:

- encourage students to have autonomy and initiative
- compile information from a variety of sources
- inquire about the students' own understanding before sharing his/her own understandings
- encourage students to share their findings with one another and to have discussions with their teacher
- engage students in experiences that show contradictions to their initial ideas, in order to generate discussion
- provide time for students to construct their understanding, and to readjust
- provide time for students to create metaphors of their own understandings in order to make concepts accessible to the learner

- use open-structured tasks to assess student understanding

Stefani et al. (2007) emphasized that the learner interacts with the content focus, and gains understanding of the ideas or experiences from working on the content. Thus, the student constructs his/her understanding. They also encourage the learner to be independent and allow themselves to engage in problems at their own pace. Finally, the reflection piece allows students to reflect on what they have experienced while receiving constructive criticism from peers and teachers during their development process, also known as a scaffolded environment. In regard to showcasing work in a digital portfolio, the description above is what is supposed to happen in creating content for a digital portfolio. The learner exemplifies one's understanding of an idea and constructs a solution to a problem that is being resolved, while a metacognitive piece, in the form of self-reflection, is described in the collaborative conversations taking place in the comment section of a digital portfolio page.

Mezirow's (1997) constructivist theory of transformative learning focuses on the ideas of cognitive reconstruction, integration of experience, and reflection (Stansberry & Kymes, 2007). Transformative learning theory states that reflecting critically on experiences transforms the individual's frame of reference. As individuals get older, they are critically more reflective of themselves when faced with assumptions about other people or under the influence of their political, social, economic, and cultural environments (see Table 1).

Table 1

Differences Between Didactic and Constructivist Classrooms

Traditional/Didactic Classrooms	Constructivist Classrooms
Curriculum is presented part to whole, with emphasis on basic skills.	Curriculum is presented whole to part with emphasis on big concepts.
Strict adherence to fixed curriculum is highly valued.	Pursuit of student questions is highly valued.
Curricular activities rely heavily on textbooks and workbooks.	Curricular activities rely heavily on primary sources of data and manipulative materials.
Students are viewed as "blank slates" onto which information is etched by the teacher.	Students are viewed as thinkers with emerging theories about the world.
Teachers generally behave in a didactic manner, disseminating information to students.	Teachers generally behave in an interactive manner, mediating the environment for students.
Teachers seek the correct answer to validate student learning.	Teachers seek the students' points of view in order to understand students' present conceptions for use in subsequent lessons.
Assessment of student learning is viewed as separate from teaching and occurs almost entirely through testing.	Assessment of student learning is interwoven with teaching and occurs through teacher observations of students at work and through student exhibitions and portfolios.
Students primarily work alone.	Students primarily work in groups.

Note. From *In Search of Understanding: The Case for Constructivist Classrooms* (p. 16), by J. G. Brooks, & M. G. Brooks, 1993. Association for Supervision and Curriculum Development. In the public domain.

Much like Table 1, Lunenburg's (2011) article on Constructivist teaching techniques in order to improve student academic achievement. The article emphasized students as ultimately responsible for the formation of their own knowledge based on their learning, whether this is done individually or collectively. Teachers value their students' questions, facilitate lessons that

promotes cooperative learning, structures activities around primary concepts, and provides authentic assessments of student learning as opposed to the standardized multiple-choice tests usually given in the didactic classroom. Chaille (2008) stated the role of the teacher as a person who provides the learning environment, creates challenging activities, and scaffolds student comprehension in pursuit of solving a problem in the classroom. As students are forming their understanding and experience of new lesson topics, the teacher's job is to be a guide and as a moderator to elicit meaningful student discussions that moves toward the discovery of a solution, instead of direct-instructed lectures found occurring in most classrooms (Flynn, 2005).

Constructivism emphasizes the process of learners creating and developing their ideas. Effective curriculum should apply activities that not only promotes rote and memorization of student understanding, but ideas that can challenge student understanding in order to provide opportunities for growth and development (Baltes, 2007; Kincheloe, 2006; Leitner, 2010). Cooperative learning activities should be provided so that learners can share the process of constructing their ideas with each other in order to reflect and elaborate on their own work, as well as with their peers (Payne, 2010; Stewart, 2010).

Constructivist Teacher

Brooks and Brooks (2005) provide the following descriptors of constructivist teaching: facilitates learning, and provides opportunities for students to form their own understanding of subject content:

- Constructivist teachers encourage and accept autonomy and initiative. Students that formulate their own questions and pursues their own answers take responsibility for their own learning.

- Constructivist teachers use raw data and primary sources, along with manipulative and interactive and physical materials. Primary-source documents such as maps, graphs, and news articles can drive instruction and the formulation of student understanding of topics. The teacher gives students learning material to help students formulate their understanding of information.
- Constructivist teachers allow student responses to drive lesson, shift instructional strategies, and alter content. Teachers find opportunities to teach lesson objectives during the school year. These are moments that either happen at school, the community, current events, or in student interests that can provoke student-initiated discussions in class.
- Constructivist teachers inquire about students' understandings of concepts before sharing their own understandings of those concepts. Teacher provide students with an opportunity to form their own opinion or formulate their idea of an answer to questions before the teacher provides learners with answers.
- Constructivist teachers encourage students to engage in dialogue, both with the teacher and with one another. Students feel empowered when they are given the opportunity to voice out their opinions or ideas while also hearing opinions of classmates in order to accumulate new knowledge.
- Constructivist teachers encourage students' inquiry by asking thoughtful, open-ended questions and encouraging students to ask questions of each other. Complex issues that sets students to provide with more than one response, challenges learners to dive deeper to form new understandings.

- Constructivist teachers seek elaboration of students' initial response. First responses are not usually a learner's final thoughts on an issue, but allowing opportunities for students to elaborate deeper into their initial statements and allows for new reassessments and correcting errors. This process allows learners to literally construct their own understandings.

Metacognition

The other theory that is of importance in this research is the idea of deep self-reflection to the formation of knowledge. It is the cycle of finding, goal setting, planning, implementing strategies, monitoring, reflection on learning, and learning by gaining experience in how to learn (Barak, 2012; Flavell, 1979). Veenman et al. (2006) described two key aspects of metacognition: metacognitive knowledge (interaction between a person, the problem, and the strategy to do the task) and metacognitive skills (a person's ability to regulate his/her ability to problem solve; Brown & DeLoache, 1978; Veenman & Spaans, 2005). Livingston (1997) asserted that providing knowledge without experience is insufficient in developing metacognitive control of planning, monitoring, and evaluating one's learning. The idea of reflecting on one's own cognitive process in learning goes hand in hand with the use of digital portfolios in that the components required to build content require the learner to plan ahead, set goals, monitor the progress of content-building, and reflect on what he/she has learned.

Fisher and Frey (2013) defined metacognition as a reminder to learners to think about their thinking in order to determine the steps to solve a problem. Students will have to think about how their learning makes sense in their schema and the purpose of why the subject being covered is an important building block in their intellectual growth.

A study on learning and knowledge-building in open-source communities was conducted by Hemetsberger and Reinhardt (2006), using a social-experiential approach. Their study looked at how members used innovative online technologies to build collective knowledge and conduct practical discourse in an online setting. With a focus on reflective inquiry and collective learning practices, the study discovered that re-experiencing information by coding, group memory, instructive conversations, and reflection improved a participant's understanding. It all begins at the individual level, where an individual employ learning from experience, reflective observation, conceptualization, and active experimentation. Following these steps takes them into the collective mindset of the learning community. In the group setting, "collective reflection, collective conceptualization, virtual experimentation and participative practice" are conducted (Hemetsberger & Reinhardt, 2006, p. 187).

Kolb (1984) is another theorist who focused on metacognition, describing learning as a cycle of four stages: concrete experience, reflective observation, conceptualization, and active observation. Each stage supports and feeds the next. It is possible for a learner to enter any portion of the cycle and follow through the logical sequence; however, effective learning only takes place when the cycle is completed. In this model, the reflection component is what helps a learner make sense of experiences, and what sets their future actions. With digital portfolios, the comments of peers and teachers can help strengthen a learner's conceptualization and deepen their understanding. Topics can be cycled through by others through peer-review, and existing work can then be improved.

De Bruin et al. (2012) stated that metacognitive activities are an integral part of self-regulation. A learner who focuses on regulating their own learning is said to be concerned with

metacognitive processes (De Bruin et al., 2012). Students who reflect on the quality of their own work are constantly monitoring the progress and direction of their own understanding.

Student-Centered Classrooms

Today's students are often seen with technology tools, such as smartphones, and more classrooms are providing laptops. Many teachers in the secondary level still practice the dissemination of instruction through the traditional method of direct instruction, where teachers more often than not use lectures and PowerPoint slides to provide the class with new information. However, the danger lies when direct instruction takes up the entire class period. Students today argue that access to information should be easier to obtain by typing questions into Google or other sources, as opposed to the reliance of asking teachers for reference. The hard part in teaching is the need to gradually release the responsibility of learning to students, as opposed to providing students with the information directly. By having students look for answers online, they can find sources in multimedia that may not necessarily have been provided by their teachers. Students can find videos and other content online such as primary source documents that are not included in textbooks or lectures. Providing students with another way of obtaining content is an opportunity to hone research skills and take responsibility for their own learning. Learning then becomes more realistic, because they are actively engaging with the accumulation of useful information (Ozer-Kendig, 2010). Student-centered classrooms incorporate fact-finding and collaboration with other students and students can develop their own understanding of questions posed by the teacher through information they can comprehend. The teacher in turn can be the scaffolder, providing students with guidance and validation of sources for the class (Ozer-Kendig, 2010).

Engagement in Digital Environments

One main reason for adopting the use of online technology is increasing student engagement in a subject. Chapman (2003) defined engagement as the level of duration and intensity in terms of thinking, behaving, and feeling during the learning process. Learning engagement can positively affect learning outcomes (Lu & Churchill, 2014). Students who are engaged are more likely to perform better when demonstrating their skills and aptitude. These individuals are also more likely to demonstrate willingness to learn via multiple methods, such as interacting with peers, teachers, and using a multitude of tools. Engagement also allows learners to bring positive attitudes to a learning environment. Students who are motivated are likely to be more engaged since making sense out of what is being studied, analyzed, synthesized, and evaluated are parts of learning (Anderson & Krathwol, 2002).

Batson (2014) found that the key component in situated learning is experience, which fits with Lave and Wenger's (1991) theory. Batson (2014) emphasized situational learning as a constant learning in the real world, both outside and inside the classroom. He stressed that teacher-centered classrooms (augmented with the availability of online tools such as electronic portfolios) are rapidly changing the way people are gathering information and the creation of knowledge. Academic practices are already changing due to advancements in technology, which have yielded seminars, community forums, learning communities, collaborative projects, undergraduate research with students and professors, online global learning systems, and service-learning programs, all conducted through the internet (G. D. Kuh et al., 2013).

Traditional classrooms follow a teacher-centered setting: the teacher lectures, and students take notes. Students are then required to memorize and recall the information mentioned by the teacher. Direct instruction is needed for providing direction but should not be the only

modality of delivering information and learning. Frequent use of this method results in boredom and lack of motivation for students. Ozer-Kendig (2010) proposes incorporating technology tools into the classroom in order to design a student-centered model, one where students are learning by conducting collaborative work with other students, where learning is done by doing, and the topics presented are cross-curricular. More importantly, this type of learning arrangement is suitable to multiple styles of learning. With online tools today, students are more versatile with the usage of social media in learning. Many students are trained with tools offered by GAFE, many of which are learned by the time they reach high school. Along with the idea of inclusion of technology as a tool to increase motivation, Ozer-Kendig states that teaching students to incorporate online learning tools can help them increase their skills in problem solving, critical thinking, communication, and global awareness. Students who use technology to produce artifacts for presentation and archiving purposes are using tools that may enable them to become more marketable in future employment. Ozer-Kendig also argues that when technology is integrated into a classroom, student involvement increases. An example may be taken from a university study using the Blackboard or Canvas course management software, the creation of digital portfolios, and writing software in computer labs, which helped transform the school in the study into a student-centered learning environment. Professors became facilitators and scaffolders who were available for support, while college students produced content based on their own learning. A partnership between students and professors resulted in discussions and online mentoring granted by the conversations created in the Blackboard environment (Chalokwu & Achebo, 2003; Ozer-Kendig, 2010). Although this study was done in a post-secondary environment, one can imagine what a public secondary school setting could be like if given the appropriate budget to help adopt an integrated learning management system. Until

then, teachers must learn to cope with available technology tools. This issue of having a learning system such as Blackboard is costly, and many school districts disregard it as cumbersome to manage or too expensive to acquire. It is unfortunate that although they have advanced technology repertoire in the local school district away from DVD players and abysmally performing desktop computers, they still have a long way to go. Currently, many districts are undergoing the process of transitioning to the one-to-one computer model, that is, having enough Chromebooks for a class set per classroom. The next logical step is to have a learning management system that can make the university Blackboard environment a reality for students. Ozer-Kendig's study stated that money was the biggest problem as it is expensive to buy the equipment, train staff, and to have the necessary management system in place to have a proper student-centered classroom. The second issue found in the study was that teachers should not be afraid to use technology and that trainings should be provided for them to learn how to use these tools in their lessons (Ozer-Kendig, 2010).

Lawler (2013) conducted a case-study research regarding college-level students conducting a service-learning project. In order to increase student engagement, digital portfolios were implemented. Service learning is a type of learning that combines the idea of learning an academic topic with community service. This leads to the exposure of students to civic responsibility and awareness of issues in the community (Lawler & Li, 2005). The study evaluated the benefits and challenges of using the digital portfolios during the service learning project and monitored student engagement during the process of building the portfolios. The case study research found that students who created the digital portfolios were creative in the design of their portfolio through the incorporation of graphics, video, and other multimedia. Part of the design of each digital portfolio was the consideration of how the portfolio pages would appear in

various hand-held devices, as the class partnered with people who had intellectual and developmental disabilities, at whom the community service project was geared. Digital portfolios increased student engagement as personal student logs explained their progress or lack thereof in the personal sections. The project also discovered that digital portfolios supported students who had delayed interactions with people with intellectual and developmental disabilities, and students lagging in posts of portfolio content exhibited professionalism in the showcasing of their work (Lawler, 2013).

In a digital portfolio environment, teachers will be able to increase their ability to direct their attention to more passive members of the class, such as by asking them to recommend web links to the class. Lawler's (2013) study was helpful to those who want to apply social networking technologies to designing interactive learning experiences for students. The use of various media is recommended to meet students' different communication needs.

The key factor in any collaborative environment is the level of engagement of its members. Members of a learning environment should contribute by providing a substantial exchange of information and effective communication in order to resolve issues. These qualities, along with trusting relationships, create a cohesive foundation that enables students to work together as a class (Rovai, 2002).

Digital Portfolios

A traditional portfolio is a collection of a person's best examples of work. Artists, architects, and teachers are just some of the professions that create and keep portfolios to showcase their work and achievements. Digital portfolios or e-portfolios are the digital counterpart of the traditional portfolio. An e-portfolio is a collection of work that a person has collected, organized, edited, and reflected upon, in order to present what he/she has learned over

time (Barrett, 2006). Abrami and Barrett (2005) defined digital portfolios as digital containers capable of storing a combination of information in the form of text, images, video, and audio. Leslie and Camargo-Borges (2017) describe digital portfolios as tools employed by students and teachers such as social media, synchronous document editing such as Google, and audience response systems such as Poll Everywhere that can be embedded in these sites. Cambridge (2010) described digital portfolios as artifacts that convey information in different formats and synthesize meaning. E-portfolios can help educators gain a complete picture of what their students are learning by helping learners develop their self-awareness of their learning. Doing so helps teachers see where the students were and where they are going with their learning. The reflective and formative nature of digital portfolios has the potential to bring a learner to a deeper level of engagement (Barrett, 2006). Stiggins (1994) defined portfolios as "a collection of a learner's work that demonstrates achievement and growth" (p. 13). The works compiled must have a purpose, illustrating efforts, progress, and achievements. Stiggins (1994) adds that a characteristic of an academic portfolio is that the creator of the portfolio chooses the selection of works that are included and participates in the self-assessment of the works based on a stated goal.

Some environments used to create digital portfolios include Blogger.com, which can be synchronized with other Google tools. Other services online can be used for a small monthly fee such as Blogger, which offers technical support, data, security, and greater control of the digital portfolio's functions (Leslie & Camargo-Borges , 2017). Portfolios can be the vessels to capture a learner's growth and change in learning, as they are a medium that allow learners to conduct a critical self-reflection on what they are learning. Kilbane and Milman (2017) found a few studies that incorporated reflective practice and digital portfolios. For instance, Romano and Schwartz

(2005), and Pitts and Ruggirello (2012) investigated how digital portfolios, online discussions, and video recording are beginning to be used by teachers in the United States. Results of their finding indicated that video recording was the most meaningful of the three methods, but nevertheless, digital portfolios provided an avenue to the participants' self-reflective activities. Turner and Simon (2013) studied a master's program in teaching which required teachers to develop a digital portfolio during their course of study. The portfolios were discovered to promote critical reflection of teachers' pedagogy. The portfolio was incorporated in the graduate course as it was capable of archiving the change in student views over time. The usage of the portfolios also supported Mezirow's (1997) Transformation theory because participants in the study were able to discover and articulate values and beliefs received from classmates (Turner & Simon, 2013).

Knowledge-building is a complex process between personal and social knowledge (Elkjær, 2003). Students can often be seen working together in the classroom to create a solution to common problems. Digital portfolios are great tools for bringing learners together. Vygotsky's (1978) zone of proximal development functions within the scope of constructivism, which states that collaboration with one's peers fosters social interaction, facilitates interpersonal support from teachers and peers, and creates meaning during discussions (Alawdat, 2013). Digital portfolios can provide all these factors due to the interaction between the student and his/her peers as partners. Collaboration is an integral part of the learning process, not limited to the interactions between the student and the teacher, but with a network of like-minded people (Levin, 1999). In this case, when students are assessing their own work while receiving feedback from their peers and teacher, the classroom works as a student-centered environment where

student learning is occurring with the student's own efficacy and ownership of learning, peer-reviews, and teacher scaffolding.

Language Learning

Alawdat (2013) found that using digital portfolios motivated and enhanced student writing, assessment, learning, comprehension, and technical skills. Alawdat's (2013) study focused on the relationship between digital portfolios, literacy, and technical skills, asking questions about the influence of digital portfolios on student academic performance and investigating whether technical skills have an impact on language learners who are building using digital portfolios. Alawdat (2013) used different qualitative techniques to answer her questions. The first portion of her study showed that e-portfolios were suitable for project-based learning. The second portion found that students disliked using digital portfolios because it was time consuming and they did not want to face criticism from family and friends. The third component was a longitudinal study, in which language learners who learned to create digital portfolios were found to become more independent, were able to track their own development, and became aware of their weaknesses. The fourth part of the study found that students who used digital portfolios developed a sense of ownership of their own learning, becoming able to identify and concentrate on the purpose of their learning. Finally, students were able to control and plan their own learning. The fourth study found that using digital portfolios improved language learners' ability to learn English in terms of oral performance, quantity of vocabulary, and depth of conversation. The last study, which investigated the use of digital portfolios in an online distance-learning classroom, found that students initially had issues using online tools to create digital portfolios, but were able to overcome the challenge by collaborating with other classmates.

Alawdat's (2013) study concluded that, despite limited synchronous interaction, collaboration with peers continued in students' own free time away from the classroom. Alawdat's (2013) research is confined to the influence of digital portfolios on learning, requiring more investigation to convince other educators of the validity and efficacy of integrating digital portfolios into the classroom.

E-Portfolios as an Assessment Tool

Yastıbaş (2013) asserted that when e-portfolios are used as an evaluation tool, students can have the opportunity to improve their own self-assessment skills. As a result of his study, students learned to monitor their own learning processes, understanding their strengths and how to overcome their weaknesses, and how to take responsibility for their own learning and progress. As such, the students became more self-confident, motivated, and engaged in their learning. Yastıbaş' (2013) study suggests that using the e-portfolio as an assessment tool increased active participation due to students having control over the organization, selection, and content design of their e-portfolios.

Tonbul (2009) conducted research on an existing e-portfolio system for a university. The study revealed that using e-portfolios as an assessment tool enabled students to facilitate their own learning. Collaboration between students and their teachers improved as both worked together to improve the portfolios. The e-portfolio system made students more accountable for their own learning, helping them to see what they had learned, motivating them, and increasing their self-assessment skills. Portfolios can be reviewed with the learner and used to provide feedback to improve learning. As a formative assessment tool, digital portfolios can be used to assess future learning needs and observe the learners' work improve over time. Digital portfolios also can provide an opportunity for students to enhance their self-esteem. As a summative

assessment tool, the digital portfolios are graded on a rubric scale, and a score is tallied. Rubric grading methods are helpful for learners since they become aware of the benchmark requisites for achievement.

When discussing portfolios, one typically thinks of a collection of a person's best and latest work. However, for portfolios to be more formative, a student's learning should be viewed incrementally. Whereas performance portfolios display mastery and best works, a learning portfolio adds better work as it is completed, as opposed to replacing previous works (D. William, 2002). For example, persuasive writing assignments can show increased articulation and complexity over different drafts done over time. D. William (2002) found two benefits of using digital portfolios for learners: first, seeing what has improved and identifying a direction of improvement; and second, when a student focuses on development, they are more likely to see increments of improvement. When we say the best work of the student, we do not keep all the work in the digital portfolio, as grading the work would become too difficult (Kelly, 2008). If digital portfolios are rolled out from kindergarten through the senior year of high school, then student progress can be monitored by teachers, who in turn can coordinate with each other regarding the specific learning needs of each student, therefore providing a more personalized instruction for the following year (Kelly, 2008).

Kilbane and Milman (2017) examined the impact of the creation of digital portfolios by high school teachers and their students on teaching and learning. The study involved 29 high school in-service teachers from 20 school districts. Most research done on digital portfolios and teachers involve preservice teachers, those who may be considered graduation students in education, or candidates who are about to enter the teaching profession. It is noted that most studies done with portfolios and teachers are found in the preservice stage of teaching. A

majority of the studies found that when it came to digital portfolios and teaching, multiple papers and research have shown the benefits. This includes the topics of teacher identity, professional development, metacognitive studies, and technology skills. Other studies deal with the challenges associated with portfolios in teacher education, portfolios as assessment tools, and the needs of preservice teachers while developing their portfolios. However, upon searching for digital portfolio use and in-service teachers, only a few studies were found. As a result of the limited searches, there is an existing need for more empirical studies on digital portfolios and in-service teachers. A qualitative study by Milman and Kilbane (2005) investigated the role of digital portfolios on in-service teachers and found that benefits were discovered during a few professional development courses. One, using digital portfolios enabled teachers to learn more technology, and second, helped teachers internalize what it is like to be learners again. Sung et al. (2009) did a study of 44 in-service teachers in Taiwan, using the digital portfolio as a classroom assessment rather than as a developmental tool. The researchers found that the structure of the course helped these teachers in their journal writing, discussion forum experience, and opportunities for peer-assistance and self-regulating skills. Boulton (2014) studied how digital portfolios enhanced the careers of eight new in-service teachers in England. She discovered that, despite the promotion of teacher self-regulation, self-efficacy, self-reflection, and improvements in technology, obstacles hindered teacher progress. The study found that some schools are missing the component of embedding digital portfolios as professional development tools. Not having the opportunity to work in the digital portfolio environment means less opportunities for teachers to collaborate. Another obstacle encountered is the lack of a schedule that provides opportunities for first-year to teachers to work on their portfolios during the school year (Boulton, 2014).

Self-Regulation Strategies

Learners must improve their capacity to regulate learning on their own. Zimmerman (2000) defined self-regulation as "self-generated thought, feelings and actions that are planned cyclically and adapted to the attainment of personal goals" (p. 14). In the area of learning, one must plan ahead to identify what skills are required to complete a given objective. When doing the required tasks to accomplish a goal, a learner must reflect and review the steps they took previously to determine if their actions are moving them in the desired direction. Prior to Zimmerman (2000), Bandura's (1986) social learning theory addressed the same concept: that self-regulation includes personal, behavioral, and environmental processes. Bandura (1986) argued that a learner must consider his/her self-observation (critically observing one's actions), self-judgment (critically scrutinizing one's performance), and self-reaction (reflecting on one's performance). Zimmerman and Martinez-Pons (1986) defined 14 self-regulation strategies, including self-evaluation, organizing, transforming, goal setting, planning, seeking information, keeping records and monitoring, seeking peer assistance, reviewing tests, reviewing notes, and reviewing texts. According to Zimmerman and Risenberg (1997), learners are proactive and reactive in their learning process. They are proactive in the sense that they look for information needed and to take the steps necessary to master the necessary skills. They choose appropriate strategies to establish goals and have high levels of self-efficacy. The combination of appropriate strategies and commitment helps self-regulated learners achieve their goals. Simply stated, if learners have high levels of motivation, metacognition, and behavior, they can succeed and control their learning situation.

With online tools and hardware such as PC tablets and other handhelds becoming more of the norm in today's education system, educators tend to believe that, given the opportunity,

students would be well equipped to locate academic resources on their own. The reality is the complete opposite. Veen and Vrakking (2006) argued that while most students know how to use technology, their knowledge is limited to basic office suite skills, e-mails, texting, using social media such as Facebook, and surfing the web. Kirschner and Van Merriënboer (2013) argued that many of these "digital natives" (p. 169), a term used to describe people who are adept at using technology, are unable to process much of the information found in the Internet. Many of today's learners are poor managers of their own learning. However, students can be taught to be their own problem-solvers. It is the job of educators to help learners become effective researchers by teaching them what is good information and what is not.

Literature on E-Portfolios Based on High School Student Experiences

Donnelly (2010) conducted research on e-portfolios as a learning tool at the high school level. His study focused on students' thoughts and understandings of constructing a digital portfolio. The research sought to determine how creating digital portfolios facilitated their learning. Using the qualitative research method of a case study, Donnelly (2010) conducted interviews with 27 students and seven teacher participants. The student narratives were the primary source of data. The data were used to increase understanding of student experience in creating and using the digital portfolio as a learning tool. Teacher interviews complemented the student narratives regarding how digital portfolios affected student learning.

The study found that e-portfolios were highly useful in archiving and organizing prior work. Three benefits emerged from this process. First, student ease of recalling past works. Second, some students were able to remember facts, basic concepts, and procedures. Third, some students said that by creating their digital portfolios, they were able to track their growth and feel a sense of personal accomplishment. Data analysis determined that, overall, students felt

confused with respect to the impact of digital portfolios. On the one hand, some students said that real learning occurred when they participated in project-based activities and that the digital portfolio was a place to store their projects as evidence of their work in particular courses. On the other hand, some student interviews revealed that they centered on learning factual knowledge and how procedures from previous classes were carried out (Donnelly, 2010).

As suggested by Donnelly's (2010) study, only a few students felt that the creation of digital portfolios helped them retain their engagement with sustained and focused levels of reflection. There was also little evidence that student engagement with digital portfolios helped students transfer knowledge learned from previous courses and projects in order to solve new and unexpected problems. However, Donnelly's (2010) study made no attempts to measure what students had learned in completing digital portfolios, and data came from the narratives of students at a specific high school, rendering the data collected unique to that location. No students reported having daily routines with active metacognition, nor were they required to write a reflective essay as an assignment for a project.

Donnelly (2010) found that with shorter duration projects, students were able to write these reflective essays once a week, but as student projects increased in duration, the reflection essays decreased. Many students defined reflection in these essays as being able to recall past acts. However, an actual reflective practice found in metacognition is where a learner engages in ongoing dialogue that involves their thinking about thinking, not just the result of what has been learned or covered.

Reynolds (2010) conducted a study on how digital portfolios affected student attitudes and self-perceptions in Mathematics. Good attitudes can be promoted on a subject matter through the use of alternative assessments. In order to increase positive-perceptions toward students and

the subjects they are learning, the combination of a positive attitude from the teacher and alternative assessments such as the use of digital portfolios can increase student subject interest (Ediger, 1999; Reynolds, 2010). Ediger (1999) stated that a learner needs to enjoy the subject to learn effectively.

A. Williams (2013) completed research on how students can take ownership of their own learning by using digital portfolios. In a high school Economics course, he focused on the effectiveness of digital portfolios toward student cognitive performance. The study found that digital portfolios were effective at measuring a student's subject competency. Students were able to take ownership of learning because digital portfolios allowed them to integrate their Economics knowledge and skills in cross-curricular projects. The digital portfolios in the study required students to conduct peer-review processes and self-reflection of the work produced. This reflective process allowed them to assess their own learning as they progressed through the curriculum. One of the findings of this particular research is that students need prior preparation in terms of learning the tools needed in order to create a digital portfolio. Another consideration mentioned that the use of digital portfolios should be matched with appropriate maturity levels and personal qualities, such as following through and being able to complete tasks without constant instruction from the teacher. The researcher found that using digital portfolios overall did improve student test scores and understanding of new online tools. The study provides skeptics with evidence that digital portfolio assessments can be another option in designing a student-centered classroom. As part of the conclusion for this study, the researcher noted that students were observed to be relaxed and comfortable when left to complete the tasks at their own pace.

Effects on Student Efficacy

Donnelly's (2010) research found that students appreciated how digital portfolios stimulated their memories, helping them recognize their personal growth over time due to evidence of self-efficacy through certain phrases recorded from the interviews, such as giving them confidence in their own learning and faith in themselves, and helping them to meet new challenges. Self-efficacy refers to the belief that one's capabilities can produce given levels of achievement (Bandura, 1997). Where confidence refers to strength of conviction on any topic, self-efficacy is the affirmation of ability. Donnelly's (2010) study, in general, did not help students recognize how digital portfolios impacted their learning, but the data collected suggested that digital portfolios did act as a resource for students and teachers. Donnelly (2010) found that the school used digital portfolios as *dynamic archives* that could be accessed by an audience. However, the digital portfolios were designed to have a one-way interaction only with their authors. Metacognition might have increased if real-time interaction occurred within the digital portfolio itself, such as including the ability to comment on students' work. The study at this particular site focused on digital portfolios as an archival experience, as a place to store work and showcase student work, as opposed to an ongoing dialogue for reflection.

Self-efficacy has nothing to do with learners' actual capabilities, but instead speaks to what learners think about their capabilities and achievements (Mezirow, 1997; Milstein, 2007). Digital portfolio assessments are aimed at exposing the strengths and weaknesses of a person's learning progress (Powell, 2013). It is also important to note that self-efficacy is contextual, varying with each individual, and not to be taken as a universal definition (Wahab, 2007).

Effects of Digital Portfolio Formative Assessment on Attitudes and Self-Perceptions

The results of Reynolds' (2010) study suggest that formative assessments should reflect student learning through continuous dialogue between the learner and the teacher. Students engaged in formative assessments experienced significant learning gains compared to students who did not (Black & Wiliam, 1998). Barrett (2006) used digital portfolios for formative assessments as they have the potential to engage students in active participation while managing and assessing their own learning. Digital portfolios can be useful learning tools when they are part of a balanced formative and summative assessment system (Barrett & Wilkerson, 2004). Standardized test scores often fail to provide enough information for schools in order to improve student achievement (Stiggins, 2004), which is why Reynolds' (2010) research was conducted.

Reynolds's (2010) study revolved around math scores of sixth graders who showed weakness in certain areas of computation and estimation. A team of teachers worked to improve the curriculum by recommending alternative assessments to improve student learning in mathematics. Reynolds's study was conducted to establish the use of the digital portfolio as an alternative assessment that would provide a clearer and more complex picture of each student's academic growth and progress in mathematics from grades six to eight. There were four purposes of the study:

- Determine the effect of digital portfolios versus traditional assessment strategies.
- Determine the effect of these two methods regarding the problem-solving abilities of these students.
- Determine the effects of these two approaches on the data analysis and interpretation strategies.

- Determine the effect of these two methods on the attitudes towards math, student self-perceptions, and their competency in the subject.

Barrett (2006) asserted that digital portfolios could serve as formative and summative assessment tools. As formative assessment tools, they can be used to tell what students are learning or what they currently know. Teachers, in turn, can provide feedback to students on how they can improve on their current lesson. When using e-portfolios as summative assessments, schools can set the requirements with rubrics. The medium also permits students to learn in multiple ways and allows students to demonstrate what they know, understand, and can do. Rose et al. (2002) stated that applying digital portfolios in the classroom can reduce student barriers that impede learning due to their incorporation of various internet resources and multiple media sources.

An extensive number of studies were found in the use of digital portfolios in language arts and reading instruction. In math education, digital portfolios may include math artifacts that have the potential to demonstrate how learners can solve a problem by showing basic mathematical knowledge and using math language and vocabulary (T. M. Kuhs, 1997). Self-reflection allowed students to construct their knowledge regarding their approach to finding a solution to problems (Mezirow, 1997; Tosh et al., 2005).

Reynolds (2010) conducted a quasi-experimental study within a 1-year period. A digital locker system was created with the help of the school technology coordinator. In the digital locker, *reflection templates* were set up in order for students to document their perceptions in completing math tasks. The researcher also worked with the sixth-grade math teacher in creating formative assessments based on the national, state, and local standards. Surveys, test scores, and interviews were used to determine whether digital portfolios affected math scores and student

attitudes in mathematics. Students completed a survey regarding their attitudes at the beginning (pre-test) and the end of the year (post-test). The data regarding student attitudes were based on the reflective writing pieces recorded from the reflection templates. The control group of the study was composed of the sixth-eighth grade cohort in 2007-08. The experimental group made up the sixth-eighth-grade cohort for 2008-09, which created a digital portfolio.

Results indicate that digital portfolios had no effect between the control and experimental group (where digital portfolios were utilized). However, significant differences were found between the mean scores of the pre- and post-test assessments regarding attitudes toward success in mathematics. Regarding digital portfolios and attitudes and self-perceptions of male and female students, the pre- and post-test scores for females remained unchanged. The males, however, appeared to have increased in terms of confidence, attitude, usefulness, and effectiveness, and also showed reduced anxiety (Reynolds, 2010).

The researcher concluded that if students were given more time to develop reading and writing skills in math, then the process of using digital portfolios may have been more enjoyable for them. The study succeeded in offering information about the students' attitudes and self-perceptions of students. Despite the results being inconclusive, there were positive differences in student attitudes, especially in terms of anxiety in learning mathematics. Since students realized that reflections on their digital portfolios were formative assessments, they wrote anecdotes about why their lessons were relevant in their lives. The research data found that anxiety levels decreased in student attitudes during the written reflection portion of the math lessons. Reducing anxiety and the fear of failure can lead to student learning growth and achievement (Reynolds, 2010).

Effects on Student Learning and Writing and Teacher Assessment

Tezci and Dikici (2006) investigated the effects of digital portfolio assessment on the drawing and story writing of students aged 14 and 15 years old. The researchers believe that an important aspect of portfolio building is that the learner is not only the target of assessment but also an active player in assessing other people's works (Wolf, 1991). Since learners play an active role in the evaluative process, portfolios can give students an opportunity to assess their learning. Teachers focus on encouraging students to enhance their strengths when developing digital portfolios (Baturay & Daloğlu, 2010).

A pre- and post-test model was conducted using random sampling. Neither the students nor their teacher knew who was part of the control or the experimental group. Seventeen were in the experimental group, and 35 in the control group. Digital portfolios were graded based on an assessment rubric. Student drawings were graded based on four categories: character, action, creativity, and aesthetics. The written portion was based on subject, character, stage setting, and conflict. Points were awarded on a 0-5 scale. Eight evaluators participated in scoring the student digital portfolios, none knowing which student belonged to the control or experimental group (Tezci & Dikici, 2006).

The study found that digital portfolios improved students' drawing and writing performance. The researchers also found that the class environment's collaborative nature also improved cooperative learning attitudes (Tezci & Dikici, 2006). The data revealed that the digital portfolio assessment was adequate in scoring student abilities, but emphasized that the rubrics given to students have to be well prepared and reliable. The researchers found that students who learned with digital portfolios fared very similarly in terms of achievement as compared to students who learned the traditional method of drawing and writing. Similar to the Reynolds

(2010) study, the digital portfolio environment had a positive effect on student creativity, due to the non-threatening teaching and learning situations that took place during the study and the decrease of student anxiety. Tezci and Dikici (2006) stated that, despite not having much difference between the experimental and control groups, the interactions provided by the employment of digital portfolios can provide a safe, collaborative, low-anxiety environment that can increase student creativity, improve academic skills in artistic expression and writing, and increase student self-confidence.

Tehrani (2010) also studied the impact of digital portfolios on teaching university students how to write. The results of his study found that digital portfolios motivated students to be active, self-directed learners who were situationally aware of their progress. Students' motivation improved due to having control of their e-portfolio design. Improvements in self-assessments and feedback from peers improved students' ability to regulate their learning.

Erice (2008) researched the use of e-portfolio assessment and online tools in writing courses, finding that students improved their ability to self-regulate, becoming aware of their learning, and following the progress of their academic growth. According to Perfetti and Adlof (2012), the National Reading Panel (2000) found seven strategies via direct instruction supported comprehension gain: comprehension monitoring, cooperative learning, use of graphic and semantic organizers, question answering, question generation, story structure, and summarization. The use of these explicit reading strategies helped students with comprehension outcomes in the content-creation process of their digital portfolio. Another study found that students who were assessed with digital portfolios found that students were able to self-assess and improve their language skill development, while enabling learners to focus on language-

learning on ‘real-life’ applications involving creativity and problem-solving (Baturay & Daloğlu, 2010).

Digital portfolios were described as a ‘mediating object’ that enabled teachers to write critically and reflectively about professional learning (Turner & Simon , 2013). Drafting and reflecting during the writing process was itself proof of learning taking place. Interviews with participants took place after the creation of the digital portfolios. Student work was probed during the interview questions and students were observed externalizing their thought processes upon the defense of their works (Turner & Simon, 2013).

As part of language learning, reading and writing development can be monitored by the use of digital portfolios for each student. Samples of written work such as reports, essays and journal statements over time can show developmental progress of language acquisition. Teachers, peers, and the student can all see the progress of learning explicitly through collected artifacts of what may be considered representations of the student’s real abilities (Kelly, 2008). One consideration to maintaining student motivation and improving student writing development is keeping the portfolio of writing responses short and brief. Having learners write lengthy responses for dialogue purposes will be too difficult for teachers to manage (Kelly, 2008).

Digital Portfolios’ Influence on Self-Efficacy in an Online Course

Digital portfolios can positively influence students’ self-efficacy in online courses. Powell (2013) conducted a comparative case study on the relationship between the creation of digital portfolios and students’ performance in an online graphic design course, using the digital portfolios as a formative assessment tool to view student progress each week. The study’s second goal was to use the portfolios to measure changes in students’ perceived self-efficacy during the progression of the course. At the time of her investigation, Powell (2013) stated that no prior

research had been conducted on students' self-efficacy in online courses; this study was created to fill that gap.

Twenty participants in an online graphic design course participated voluntarily in Powell's (2013) study. Random sampling and the collection of surveys and portfolios were used to gather data. The instructor of the course, and not the researcher, graded the portfolios based on a rubric scale. The portfolio activities were based on skill requirements and the knowledge of software taught during the previous 5 weeks. Students who used a digital portfolio developed a progressive attitude towards self-enhancement because the portfolios left positive mental images of learning growth to their users. The findings also suggest that students who worked on the digital portfolios saw improvements in their achievements, self-efficacy, and comprehension.

Digital Portfolios as Disruptors

Niguidula (2002) stated that performance assessments are disruptors of the public-school system, where accountability is entirely entrenched in the Scholastic Aptitude Test (SAT). Portfolio evaluations of any sort are considered by some to be unreliable in reporting student scores (Lusi, 1997; Niguidula, 2002). An evaluation system overhaul may be required for portfolios if these are to be accepted as summative assessment tools of learning. Niguidula (2002) listed five areas that schools need to address. They are:

1. *Vision*: Schools need to know their students capabilities, as well as what students need to know and what is needed to be accomplished.
2. *Assessment*: Administrators and teachers need to have a plan for what students must demonstrate as described in the school vision. The school needs to know why they need students to build a portfolio, a rubric for the creation of the portfolio, and a guide for what constitutes great material in a portfolio.

3. *Technology*: Districts and schools must know the equipment in place to determine what kind of environment they have for adopting a digital portfolio environment. This includes an inventory of the types of hardware and software, internet services, and support staff that can assist students in the development of their work.
4. *Logistics*: The required amount of time that teachers and students need to collaborate in the digital portfolio environment. This is of great concern to educators as they need to follow course outlines that have stipulations of concepts that need to be covered in a specific, limited amount of time. Adopting digital portfolios may disrupt the amount of content covered by teachers.
5. *Culture*: The biggest challenge to creating a digital portfolio-friendly environment is the 'buy-in' of students. School faculty must understand the purpose of the digital portfolio and sell the idea to all learners. It is a process that will require learning environments to discuss student-work, especially previously created ones.

The Niguidula (2002) study found that all stakeholders in a school district require a careful, detailed method for tracking student performance. Collected information not only reveals the current status of student knowledge but a teacher's curricular progress and work toward the standards as well. Other conditions for a proper digital portfolio environment require ongoing dialog between the student, peers, and teacher. Some districts must make sacrifices in order to develop the proper environment to support performance-based evaluations like digital portfolios, such as developing three major changes: a portfolio requirement prior to graduation; team teaching per grade level in order to support student grade-level cohorts; and block scheduling to allow the school day to accommodate one extra class schedule (Niguidula, 2002).

Other recommendations included staff development, hiring, curriculum planning, and student advising as part of the support system (Newmann & Wehlage, 1995).

Joyes et al. (2009) also noted that the use of digital portfolios are not disruptors in technology, but rather in the current public school educational system. As students and teachers become more familiarized with the online tools, curriculum pacing and workload may be affected for the better. Digital portfolios can save students and teachers time; replace traditional paper submissions; can be shared with anyone online; and make access to student work easier (Joyes et al., 2009). Part of being a disruptor to an educational system is that the usage of digital portfolios is difficult to define. For some, they are tools of learning. Others use it for assessment, for setting academic goals, or for showcasing student work.

Digital Portfolio Implementation

Using digital portfolios in the classroom will enable educators to create a student-centered learning environment. Students will be able to have more freedom to explore and interpret course concepts. Teachers can assess students differently, as formative learning tools and monitoring student understanding as progress can be physically observed through the student-produced content in their own portfolios. Portfolios can also be used as a summative assessment tool for the class. Instead of traditional examinations at the end of each unit, students can be assessed by the content of their digital portfolios, exhibiting their depth of understanding of the course concepts covered in class, and graded with a portfolio rubric (Fitch et al., 2008).

Some schools have already started adopting digital portfolios as a requirement for students during their secondary years. Camino Nuevo High School for instance, trains their ninth graders to build and maintain a website that showcases the projects created in their freshmen level. In essence, these are digital portfolios to showcase student work, growth, and reflection to

multiple stakeholders and audiences. The skills learned to build and maintain the websites are transferable, 21st-century work skills that make the students better prepared for future workplace environments (Cramer, 2009). While students add content to their websites, they are conducting constant synthesizing of their work, while providing a professional presentation of their accomplishments (Cramer, 2009). Teachers at Camino Nuevo stated that students in the higher grade levels edited and refined content created in their earlier grade levels, or added extra content such as images or videos to written essays. These refinements happened because students were required to conduct a final presentation requirement during their senior year (Cramer, 2009).

Conclusion

The literature reviewed offers ample evidence that using digital portfolios can increase student efficacy and motivation. If these two variables increase, then perhaps test scores may increase as well. There are gaps in the research literature that can provide opportunities for further exploration. In other times, ideas can come from life or workplace situations. Demonstrated need for more emphasis on digital portfolio use as an assessment tool can lead to improvements in student academic performance in the classroom. This exploratory study aimed to verify previous studies by providing current evidence of utility and effectiveness of digital portfolios. The literature is lacking on information regarding the relationship of digital portfolio usage may have any relationship with student performance in test-taking.

Chapter 2 presented a review of current literature concerning digital portfolio effects on learners in different learning environments. Chapter 3 will provide discussion about this study's research design, data collection and procedures. Chapter 4 will report the results of this survey study through data collected. Last, Chapter 5 will provide conclusions on research findings and recommendations for future studies and improving teaching practice.

Chapter 3: Research Methodology

Overview

Some students say that they do not see the point of learning topics or fail to see the links between the topics they are covering in class. Other students mentioned that they have no method of keeping and preserving their best written work. Another group mentioned they do not see how the topics covered in their courses could help them stand out in a job application or college admissions. Many teachers are currently looking for interventions and digital portfolios can be the answer. However, educators are apprehensive and slow to adopt them due to the technical skills and access to technology required, as well as the extra time needed in order to teach students how to use and then to manage them, all of which may steal a large proportion of already limited time in their curriculum. Additionally, many teachers say that student reflection does not produce any results. As a result, only a handful of educators at secondary level actually employ the usage of digital portfolios in their pedagogy.

If educators refuse to adopt trends in technology and in changing their means of assessing their students, they fall in the danger of monotony and disconnecting with their students. It is important to link student learning to real-world situations, just like the challenges they will face upon graduation, students must be prepared to showcase their abilities to potential employers and higher institutions of learning. Digital portfolios can help showcase student ability, providing their audience with the skills and accomplishments that they have done for each of their subjects in order to showcase academic growth. Students may also learn to apply the skills of creating a digital portfolio for showcasing how the skills they have learned at school may apply to their future workplace. As action researchers, we should strive to look for alternative methods of assessment that will scaffold learning through the use of collaboration and 21st-century learning

skills. Through digital-portfolios, students will be able to learn in a collaborative environment with the help of their peers and teachers in order to enhance their skills in writing and comprehension of a subject matter. Students will be able to explicitly track the progress of their learning and have a place to share their best work with others. Teachers must also strive to look at student progress and improvement beyond quantitative test scores. They need to look at student growth in learning with a humanist approach. Some are simply awful test takers and numerous individuals manifest their learning through other means.

Digital portfolios can be quantified by having requirements set by the teacher. The requirements may come in the form of subcategories, often in the form of essential topics in a unit of study. Students are responsible with providing the information required by the teacher. Some portfolios are created by having a purpose to the creation of the portfolio; an audience to whom the portfolio is catered to; samples of student work, reflections, or notes; time allocation to the creation of the portfolio; evidence of communication from the teacher and students that can be found within the digital portfolio; and tracking of student growth by teachers based on the student content over time. Digital Portfolios can help challenged students in the classroom as they are given more independence and choice of options as students would be able to work with various media, such as photographs, music, or artwork. Enabling students to access various additions to their written work may increase interest and motivation to challenged students.

Re-Statement of Problem Statement

For the intent of this study, the following research questions are presented in order to explore the effects of utilizing digital portfolios in the classroom:

- RQ1: Do e-portfolios affect student academic performance?
- RQ2: Does the tool improve student subject-matter efficacy?

- RQ3: Do technical skills have an impact on academic performance and curriculum pacing while using e-portfolios?

Research Design

The purpose of the quantitative study was to explore how digital portfolios could influence student performance in summative test scores. The quantitative method collected distinct data and use them to represent a documented social phenomenon of improved learning with the development of a learning tool (Leedy & Omrod, 2010). This phenomenon focused on the teachers who have used digital portfolios as learning tools that may have an effect on student test scores.

For the purpose of this survey study, the effectiveness of digital portfolios as assessment tools was used to focus on educators who will apply the usage of portfolios in their classrooms for a period of time that fits their own course curriculum. This exploratory research focused on the effectiveness of digital portfolio interventions to the students in each class where data were collected from teacher surveys.

This quantitative study collected numeric data as opposed to the descriptive data of qualitative research. The research question begins with how the use of digital portfolios are effective in student learning and how this translates ultimately into their test scores. Teachers taking part in this study have varying degrees of expertise in the creation of digital portfolios and the understanding of their own students' thought processes. Andres (2012) describes sample surveys as quantitative numerical descriptions of some aspect of a study population (Fowler, 2013) which can be used either to estimate the common characteristics in a population (Dilman, 2009), or to allow researchers to generalize about a large population using a small representation sample (Rea & Parker, 2014). In addition, some survey findings can be used to investigate what

can be transferable to other studies or settings (Andres, 2012). The data collected from participants of this study will be assessed to give value to the phenomenon and can be quantified by counting the amount of occurrence (Andres, 2012).

Survey research is limited to questions of description, behavior, attitudes, and opinions used to generalize from an original sample (Andres, 2012). Survey is also not interested in the human interaction nor in directly capturing the effects of a treatment (Andres, 2012). Survey research is used as a supplemental form of data gathering (Andres, 2012).

For this study, a group of teachers who employ digital portfolios on a regular basis was difficult to find. While acknowledging that this research could have been carried out in the researcher's own classroom, the study instead was conducted using data collected from other educators to prevent bias or contamination of data collection. The relation between the researcher and the teachers who are being studied will be noted. While professional and personal relationships do exist, the study was not be discussed during the data collection period or after. Bias is a main concern in data collection. It is important to anticipate the audience of the research. Fine et al. (2000) mention that research outcomes can be used to enlighten the mood and feelings of research participants, or be distorted and misread by other researchers or policy-makers such as school administrators. Considering this, it is important for researchers to ensure that they choose the research questions, recruit their own participants, report findings without influence, and draw conclusions without bias (Andres, 2012).

Research Methodology

Ethical approval will be obtained through the local district's IRB process to gain access to teachers and administrators in the district. Initial contact has already been made with the research director of the local district of the schools employing prospective teachers. Participants

will be given written information about the study prior to deciding on their participation. They will be assured of anonymity and will be informed that they may refuse or drop out of the study at any time. The data collected on these teachers will also be withdrawn from the study if at any point they choose to leave the study. For the study, research was conducted using a survey. As a quantitative method, the researcher intended to ask subjects a set of predetermined questions about the effectiveness of digital portfolios as a tool that helps students with their learning and testing performance toward any subject matter.

The methodology was designed using previous studies involving in digital portfolios. The first is from the Powell (2013) study. The survey asks teachers to monitor how they have observed their students struggle through the process of creating their digital portfolios in class, and how interactions between students and their teachers may have improved their subject learning during the creative and collaborative processes.

The second survey was taken from Hartnell-Young's (2007) study, which focused on student experience when using digital portfolios. Where that study conducted qualitative research by interviewing students, this research will be focused on collecting self-administered surveys given to teachers who will employ digital portfolios and their impact in the classroom. The survey was altered to be taken by teachers rather than students.

Hartnell-Young (2007) conducted a report to investigate digital portfolios' potential effects on learning. The study found that digital portfolios are not to be used extensively in learning, but with certain types of learning and depending on what is being learned. The research found that digital portfolios can support curriculum outcomes while enabling learners to collaborate with others. Digital portfolios were also found to be a tool that helps learners with the development of their thinking process, where the learner can overtly express their thoughts to

teachers and peers. and can also be used as a communication tool with others. Learners were also found to experiment with the information delivery experience, as different mediums can be included to present information in various ways. The most important finding of this study was that students' digital portfolios are of the highest quality when there is a school-wide buy-in in regard to the digital portfolio process, allowing various teachers across different subjects to conduct similar scaffolding in the students' portfolio development. This also opens the possibility for more interdisciplinary projects.

The third survey based its questions on the Kilbane and Milman (2017) study, which was concerned about the effectiveness of digital portfolios as learning tools in a teacher credentialing program. Results of the study found that digital portfolios were helpful in reflective practice (Kilbane & Milman, 2017). Their research questions focused on teacher perceptions on the impact of digital portfolio usage in the classroom and on student learning.

Population

The study targeted secondary teachers in local high school in the Los Angeles County and neighboring areas of Southern California. These teachers belong to various academic departments and are not limited to a specific subject matter. By opening the study to teachers from various disciplines, the chances are higher for finding more participants. The study only involved teachers, and no students took part in the survey study. Data collected for this study were anonymous in order to protect the anonymity of teachers and any other pertinent data for the safety of all those involved. In addition to the initial teachers mentioned above, the third subject, also from the researcher's high school, is a Career Technical Educational teacher, who has a class of Medical Terminology, providing technical instruction to health medical pathway students. The course prepares students with the rigors of an exam taken at the end of the year and

can earn post-secondary credit. This teacher also provides health and career-exploration opportunities in the curriculum.

The site of the research subjects was selected due to its having access to the access of equipment necessary to build a digital portfolio in a classroom. Each department was assigned a cart of forty Chromebooks that are quite accessible to all teachers. The site has a diverse population of students with varying academic abilities. The researcher works in the site and has the support of teachers, school administrators, and district officials. Those who were aware of the study understood the benefit of conducting this research, and that results would be beneficial to teachers and students alike. The site location allowed teachers to experiment and promoted various pedagogies that would enhance learning experiences for students with minimal disruption. A disadvantage of conducting research at the researcher's workplace is that the reporting of negative remarks or data may result in discomfort to the school and the district's reputation (Mallette, 2017).

Sampling Method

A quantitative exploratory research study was the preferred method for addressing the question of whether digital portfolios contribute to better test scores in summative assessments. While digital portfolios can provide students with a medium that can deepen their learning experience, they also allow teachers to explicitly see their pupils' constructivist thought processes. The objective is to see how worthwhile a task it would be for teachers to employ digital portfolios in their classrooms on a regular basis. The research is useful as public schools are often criticized for measuring student evaluation on standardized test scores, which often does not reveal the entire description of student growth in their learning.

A sample of convenience initiated the pool of teachers involved in this research. Colleagues and friends of the researcher from the school were invited to take part. These friends were targeted based on the researcher's knowledge of their usage of digital portfolios for archiving student work and tracking student performance. As part of the convenience sample, the researcher asked initial participants to market the study to other colleagues from different school sites and in neighboring districts. This second link to invite more participants, known as snowball sampling, is an informal method of collecting data in order to conduct survey research. It is sometimes called chain-referral sampling, a nonprobability sampling technique whereby subjects may recruit potential subjects from acquaintances.

The researcher reached out to colleagues who teach in the secondary school level and were willing to use the digital portfolio as an assessment tool for monitoring student learning prior to a summative assessment. These individual teachers were then be approached by the researcher for an interview. During the interview, the subjects were asked to provide the names and contacts of colleagues who are also employing digital portfolio assessments and might be willing to be a part of the study.

Teachers who employ digital portfolios are difficult to find. For the study, the only requirement was that teachers who do use digital portfolios would provide evidence that students have taken a pre-test and post-test of a chapter or unit of study in their curriculum, and concrete proof that students would use digital portfolios as part of their pedagogy, prior to a summative assessment. Although no particular template was assigned, the portfolios should have a metacognitive component, such as an entry where students reflect on what they have learned and rewrite their understandings of the subject matter as proof. Subject candidates were open to veteran teachers and student teachers alike. The only requirement was that teachers must have a

set plan or description of what students would be covering, and that the lesson coverage would provide multiple informal assessment opportunities such as working on the digital portfolios in class prior to a summative test. Teacher candidates chosen for the study must also agree to fill out survey for data collection (see Appendix B).

There were two initial participants in the study, both of whom are social studies teachers in the sophomore and junior grade levels. One teaches Advanced Placement World History and the other covers Advanced Placement US History. Both courses are rigorous and provide students with college level course curricula. The initial teachers were located within the Los Angeles County area, at the same school and department as the researcher. This public high school serves students in the 9th-12th grades, from varying demographics and with a wide range of academic abilities. It is quite common to find gifted students mixed with English language learners and students with special needs in this district (even in advanced placement courses). The teachers were chosen due to their expertise in great pedagogy and their teaching reputation. With the application of snowball sampling, other educator contacts were identified and contacted through the social network of these two teachers. The minimum number of desired participants was 12. These educators may teach any course subject, as long as they employ the use of digital portfolios for their students to work on for a minimum of one chapter in their course curriculum. An ideal number for the sample is around 20-30 people, however this study realistically set the number to around 10 or 12 secondary school teachers. If the sample becomes too difficult to obtain, the scope of teachers may be extended to local professors in the vicinity in order to obtain a higher chance of gathering participants in the study. These professors teach at the local university and nearby community colleges.

Sampling Techniques

There were two methods of sampling considered for collecting data on teachers who use digital portfolios in their courses. They are snowball sampling and convenience samples. The advantages and disadvantages for both are provided in the subsequent paragraphs.

Advantages of Snowball Sampling

There are many reasons why researchers have used snowball sampling in explorative, qualitative, and descriptive studies (Atkinson & Flint, 2001; Blanken et al., 1992). As this was an exploratory study, the method applied well as the researcher was seeking participants who are well hidden or difficult to access in the school district. This sampling technique may be applied as a more formal methodology for making inferences about a population of individuals who have been difficult to describe. It is a great method for obtaining respondents when they are few in number, or where some degree of trust is required to initiate contact.

Disadvantages of Snowball Sampling

Snowball sampling is not without problems. First, there is the issue of sampling bias and margin of error. Sample bias can happen in a snowball sample because researchers may find subjects they may have some relationship with, and in turn, may know other individuals who share similar traits. Second, a margin of error may occur as research is often conducted with a small group of people, and the researcher may not collect enough subject data in order to collect conclusive results. A sample is supposed to reflect a population a researcher is studying, yet there is no guarantee that a sample is a true representation of the population.

Convenience Sampling

It is not possible to include every person in a population. This is where a sample of convenience can be utilized as a method to capture a sample of a particular population. A

convenience sample (also known as accidental sampling or sample of convenience) is a nonrandom sample where the subjects of a target population share a certain criteria for practical purposes, such as geographic proximity to the researcher, and general accessibility, and willingness of the subjects to participate (Etikan et al., 2016). One thing to bear in mind when conducting a convenience sample is the necessity to describe the subjects that might be excluded from being a part of the study or those who are overrepresented by the sample, as participants in convenience samples tend to be homogenous (Etikan et al., 2016).

Advantages of Convenience Sampling

Convenience samples are conducted by researchers for many reasons. First, this method is affordable to carry out, and second, subjects can be easily available (Etikan et al., 2016).

Disadvantages of Convenience Sampling

There are two major disadvantages. Some researchers steer away from conducting this form of collecting data due to its major disadvantage: bias (Etikan et al., 2016). The data collected should not be interpreted as a representation of the population. Second, data collected may also produce outliers produced from selecting subjects that can be based on bias. Outliers are considered devastating in data collection with convenience samples because biases or the probabilities of the said biases are not quantified (Etikan et al., 2016). In short, the researcher does not know the impact of their own bias in the collected sample, and are then vulnerable to these hidden biases (Etikan et al., 2016). With bias and outliers, data collected from convenience samples can be criticized, as the research can be vulnerable to the unpredictability of hidden biases not seen in the data collection (Etikan et al., 2016).

Instrumentation

The first part of the research used questions from the Powell (2013) study, which studies portfolios' effects on students' self-efficacy and comprehension in an online graphic design course (see Appendix C). The survey dealt with the self-efficacy of online students. However, this survey was used to measure student efficacy based on teacher observation. The questions surveyed teacher-learner interactions. The second portion of Powell's (2013) survey was altered in order to measure teacher perceptions of their own students' self-efficacy with the outcome of building the digital portfolio. The third part constituted open-ended questions that capture teacher observations of student subject competency after building digital portfolios.

The survey also included questions from Kilbane and Milman's (2017) study on the creation of digital portfolios by high school teachers (see Appendix D). His questions were incorporated in the instrumentation due to their pertinence to the impact of digital portfolios on teaching and learning.

Kilbane and Milman's (2017) instrumentation involved using questions concerned with the instructor's interactions with students during class sessions, where the activity involved the creation of a digital portfolio, using a Likert scale that measured the agreeability of Hartnell-Young's (2007) survey questions (see Appendix E). A survey of e-portfolios was given to instructors with questions focusing on their technology background and their interpretations of the primary purpose for incorporating digital portfolios in the classroom.

A copy of the survey based on the questions discussed above can be found in Appendix F. A questionnaire for surveying the perceptions of portfolio use in education was created for this survey using a five-point Likert response scale, with the respondents to be asked to note their level of agreement from 'strongly agree' (coded as 5) to 'strongly disagree' (coded as 1). The

questions have been designed to mirror each teacher's experience working with digital portfolios.

A snowball sampling technique was used for the study. This technique is a research method for accessing hidden or hard to reach populations (Atkinson & Flint, 2001). Snowball sampling consists of identifying initial respondents who are then used to refer the researcher to other potential respondents. This is an appropriate method of study due to the nature of the subjects. Teachers who actually do employ digital portfolios are difficult to pinpoint in any educational institution, and as such, can be considered to be isolated cases in the high school setting. Those who use digital portfolio creation in their class pedagogy may have a higher chance of knowing fellow teachers who have adopted the portfolio technique in their classrooms.

Consent Procedures

Informed consent will be obtained after initial contact has been made with potential participants, using the form included in Appendix A. District protocol and guidelines regarding conducting research will not be necessary, as participants will be from various school districts.

Data Collection Procedures

The study did not involve subjects under the age of 18 nor the direct participation of minors. The researcher did not collect any identifiable information from participants. The study did not include any secondary school or coded data that were sensitive. No one interviewed was i pregnant, terminally ill, wards of the state, fetuses, or prisoners. Data collected came from interviews and survey data collected from teacher participants. Finally, the study did not involve any quasi-protected populations. Data were only collected after Pepperdine's IRB approved the study (see Appendix G).

Data came from the following sources:

- Surveys
- Planning materials and artifacts for proof of digital portfolio activity

Data collection was conducted after teachers had completed their unit of study and taken a summative assessment after the completion of student digital portfolios. The steps involved are laid out in Table 2.

Table 2

Steps to Get Participants

Step	Procedure
1	Contact potential population using an explanation letter via non-random snowball sampling.
2	Send a message to other potential volunteers informing them of the study and explaining how they were identified.
3	Contact further potential participants
4	Monitor responses via e-mail reply, until enough participants agree to take part.
5	Send e-mail containing survey link using a private e-mail address to keep the e-mail separate from work. See that enough participants are volunteering to conduct the study.
6	Send out an e-mail to willing participants containing the instructions of how to roll out a digital portfolio and what areas of improvement in student achievement that teacher participants should be looking for.
7	Give teacher at least four weeks to cover a unit of study in their course subject and to create a digital portfolio activity as part of the unit. Once done, send a link to the survey for teacher participants to complete.
8	Collect data from the survey and e-mail reminders to participants reminding them to complete the survey.
9	Analyze the nominal data, looking for the central tendencies
10	Analyze the collected data and thank participants for participating via e-mail.

Step 1: Make initial contact with two teachers in the researcher's workplace who are interested in the study. This occured with teachers who are identified by the researcher to having used digital portfolios in their curriculum. The potential for recruiting more than two teachers was possible, depending whether or not the teachers had any experience working with digital portfolios as teaching tools.

- They were informed with a letter and rationale for the study (see Appendix B). The letter included introductory details about the researcher and the purpose of studying digital portfolios.
- Potential participants were informed that they would not be asked to modify or change their curriculum. The only requirement was that they use a digital portfolio for a unit of study or a period of time, and that an explanation of the teacher's goals and expectations for utilizing the digital portfolio in the classroom would be requested.

Step 2: Sent a message to other potential volunteers informing them of the study and explaining how they were identified.

- Questions included formative and summative expectations of student performance in the classroom.
- If the person was contacted, it was due to other volunteer participants providing their name as users of digital portfolios.
- The researcher continued to snowball further potential volunteers by reviewing contacts in the workplace and social networks for leads to other teachers in the local and neighboring school districts who would like to participate in the study.

Step 3: Contact further potential participants. This step was done by word of mouth at the researcher's workplace. The researcher discussed the project with department heads, who would

be able to share information and contact information to their department members in the researcher's workplace. Department head teachers also attend meetings such as district level department head meetings, to whom information about the project could be passed on to other teacher leaders from different schools in the area.

Step 4: E-mail was sent out to potential participants who had been previously contacted by the researcher. Depending on the response time, the researcher monitored the activity on the responses. If none replied, a follow up e-mail was sent out. At the same time, continued snowballing took place by conducting the advertising of the research on campus with other teachers or following up with leads from local teachers to other educators within the school site, district, or area. The researcher provided an e-mail address for the sole purpose of communicating with participants and conducting the project.

Step 5: Wait until enough respondents have replied. This duration to collect enough participants is ideal within two weeks but could last up to thirty days to collect enough participants. The ideal number is about 30 volunteers within that given time.

Step 6: Sent out an e-mail to willing participants containing the instructions of how to roll out a digital portfolio and what areas of improvement in student achievement that teacher participants should be looking for. The study had no control or concern regarding the subject or unit of study but should be as substantial as a unit of study in order for teachers to see any significant effect that digital portfolio creation is contributing to the overall class performance. An ideal unit should be about four weeks in length, to which students should have developed a course digital portfolio. Teachers do not need to share these student examples with the researcher unless any individual identifier is carefully removed prior to sharing. No scores or data were collected from teachers either, in order to protect the privacy of students and schools.

Step 7: The researcher checked in with the participants after four school weeks of instruction. Once the confirmation of the portfolio rollout was complete, and assessments had been given to students, a link to the survey of this research study was sent out to the participants. A private e-mail address was used to keep the e-mail separate from work e-mail addresses.

Step 8: Collected survey data from the participants. The surveys were e-mailed to the participants in the form of online surveys such as SurveyMonkey. To protect the identity of participants, the survey did not collect the name of the teacher or the name of the school. Reminders were e-mailed every day to ensure that data collection would be provided by each teacher participant.

Step 9: Analyzed the nominal data collected, looking for the central tendencies.

Step 10: Analyzed the collected data.

Data Analysis Processes

This study aimed to provide data demonstrating the importance of creating a digital portfolio and improving student efficacy. The improvement in student learning might lead to improvement in test scores. Based on teacher perceptions, student participants in the study should be able to see their subject success in efficacy through their portfolio work. Mezirow's (1997) transformative learning theory stated that a "frame of mind" (p. 6) transfers a mental image into personal success. In the case of the digital portfolio, the student comprehension improves along with self-efficacy.

Validity of Data Collecting Instrument

The research questions were valid as they were adopted from studies by Powell (2013), where one of the research questions in that study asked about the impact of digital portfolios on

student self-efficacy and comprehension. The research questions in this study can be considered valid as they were inspired by a dissertation conducted by a researcher. The survey questions provided in the Hartnell-Young (2007) study are considered valid as the questions were used in a governmental report in the United Kingdom. The Kilbane and Milman (2017) survey are considered valid as the survey questions were part of a research article published in the *International Journal of ePortfolios*, a legitimate source of information for digital portfolio research.

Reliability of Data Collecting Instrument

The reliability of the survey is high as the questionnaires were taken from Powell 's (2013) dissertation and Hartnell-Young's (2007) research on the impact of digital portfolios on learning, a report commissioned by BECTA (British Educational Communications and Technology Agency). Powell's (2013) survey questions were deemed sufficient in design to implement the study questions. The questions were approved by the IRB, the university, and by the dissertation committee. In order to avoid bias, Powell (2013) conducted a field test to appropriately measure self-efficacy and digital portfolios with a control group and his research participants. The field tests were completed and approved by his committee prior to data collection for the study. The set of questions that were used as part of the survey was taken from Kilbane and Milman's (2017) research article on the impact of digital portfolios in the high school environment. The survey questions adopted for this research were part of a two-year, statewide grant project.

Protection of Human Subjects

An application for exempt status was submitted to Pepperdine University's Graduate and Professional Schools Institutional Review Board (IRB). Under the IRB's definition of exempt

status, this study falls under the definition of Exempt Category 2 (educational tests, surveys, interviews, and observations of public behavior) under 46.104(d)2(iii). Procedures of the study involved no more than minimal risk to adult human subjects. Informed consent forms were distributed to willing participants and will confirm their participation voluntarily (see Appendix A). The consent form addressed the purpose of the study; the benefits of participating; the minimal risks involved; ensured that any information that could serve as an identifier would not be referenced directly; and explained that collected data would be kept confidential. Any data print-outs would be stored in a locked cabinet, and electronic data would be stored on a password-protected laptop. Participants of the survey were given a code identifier to ensure anonymity of survey data. E-mail correspondence to these individuals will be limited to providing information, alerts, and reminders. Participants were asked to provide permission to use the portfolios (see Appendix H).

Chapter Summary

This chapter reiterated this exploratory study's three research questions: do digital portfolios affect student academic performance, do they improve student efficacy, and do students' technical skills affect academic performance. It showed how these questions would be addressed using the perspectives of classroom teachers based on survey questions.

An exploratory quantitative method was conducted via survey collection in order to collect data from various teacher research participants. A sample of convenience was used to recruit teachers initially, followed by a snowball sample technique to recruit other educators. Teacher volunteers made up the initial pool of participants in the study. No students or minors were involved in the data collection. Teachers could incorporate any secondary-level subject matter in order to increase the pool of participants.

For the instrumentation, the survey used was composed from three valid and reliable question sets taken from researchers and experts in the field of digital portfolios. These survey questions were used from another dissertation, an official government report, and from an academic research article for a digital portfolio journal.

Chapter 4: Results and Data Analysis

Introduction

The purpose of the study was to show the utility of digital portfolios in a learner's self-regulation in learning. By creating a digital artifact that display students' knowledge and understanding of an essential concept from any discipline, the growth in learning is demonstrate and shared with teachers, parents, and peers.

The purpose of this chapter is to report the collected data from the survey given in the past few months. The survey comprised of multiple questions to address the three research questions stated in Chapter 1.

- RQ1: Do e-portfolios affect student academic performance?
- RQ2: Does the tool improve student subject-matter efficacy?
- RQ3: Do technical skills have an impact on academic performance and curriculum pacing while using e-portfolios?

The research purpose was to improve the understanding of student experience in creating and using the e-portfolio as a learning tool. The exploratory investigation aimed to find out whether the implementation of e-portfolios would make a difference in the student learning experience and whether it makes a positive influence on student scores.

Demographics

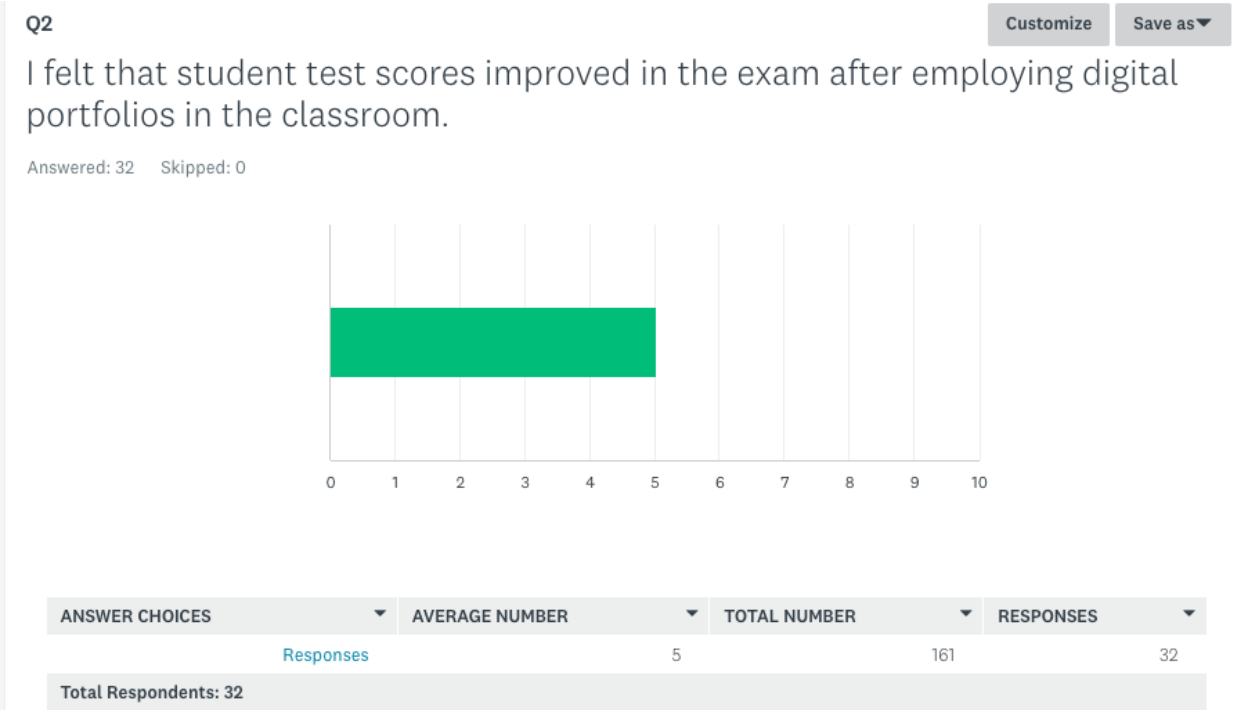
All participants were current teachers at the secondary level. Most participants were from the local school district, while the other few belonged to neighboring school districts in an urban area in Southern California. Most participants came from a secondary-level learning institution. The teachers who participated in the survey were volunteers and willing participants to the study.

Results

RQ1: Do E-Portfolios Affect Student Academic Performance?

Figure 1

Responses to Survey Question 2

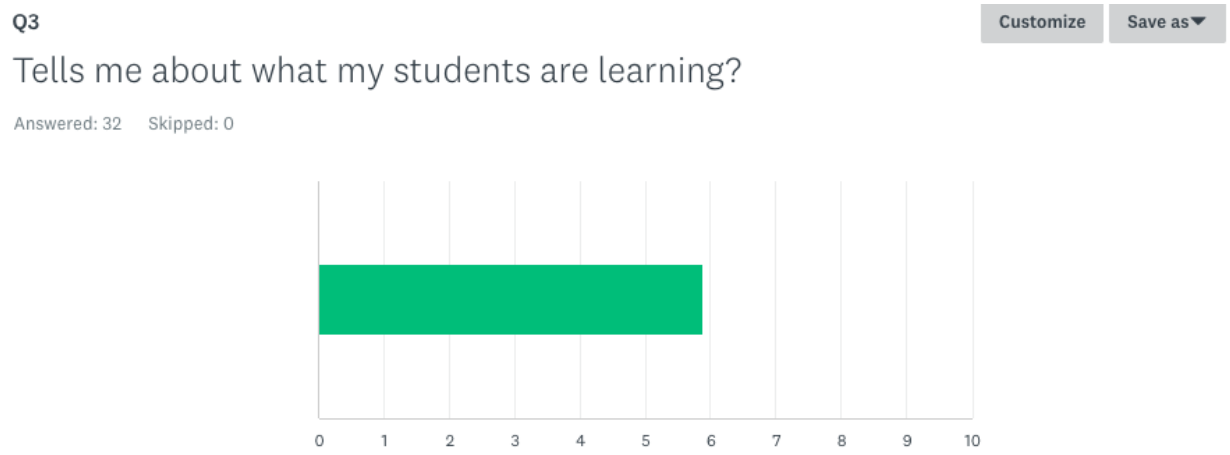


For Survey Question 2, survey respondents were asked if they felt that student test scores improved in the exam after employing digital portfolios in the classroom. Out of the 32 survey participants, a scale of 0 to 10 on a sliding scale was provided. Zero represented no effect on test scores, and 10 had a great effect on test scores. The data resulted in a score of "5," a median of 5.03, and a standard deviation of 1.43 (see Figure 1).

Survey Question 3 provided survey information to whether students in their subjects are currently learning the lessons in their courses where they have used digital portfolios. The mean was 5.88, median at 6.0, and standard deviation at 1.17 (see Figure 2).

Figure 2

Responses to Survey Question 3



Survey Question 4 asked whether digital portfolios help students think more about learning in general. Participant responses averaged 5.8 out of 10. Zero indicated no effect, and 10 indicated extremely helpful. The mean is 5.8, the median at 6, and the standard deviation at 1.40 (see Figure 3).

Figure 3

Responses to Survey Question 4

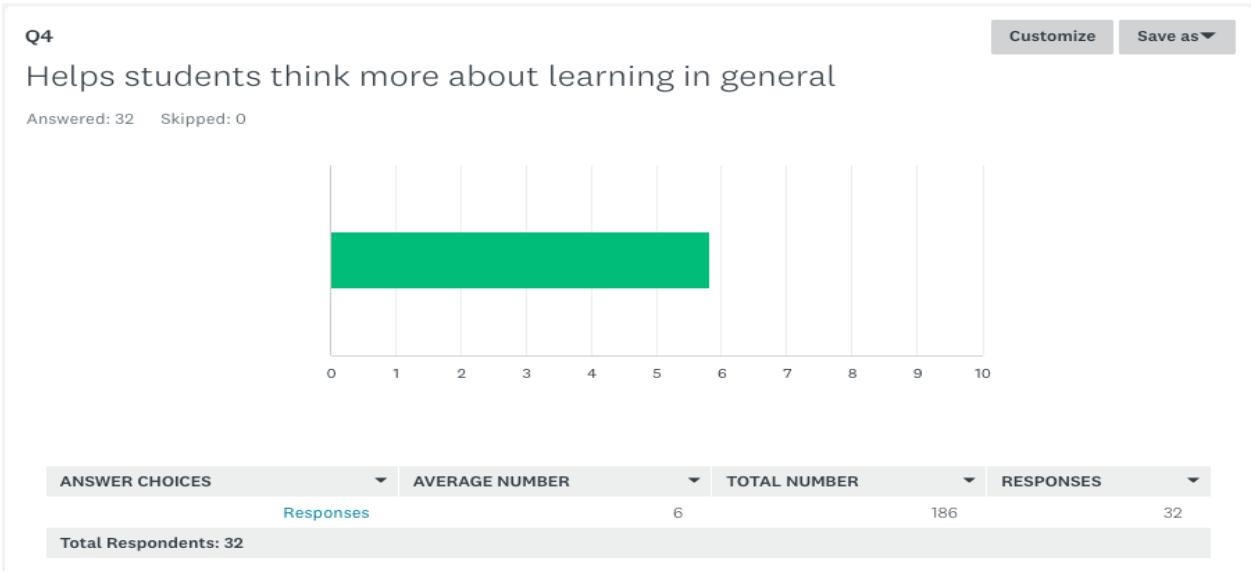
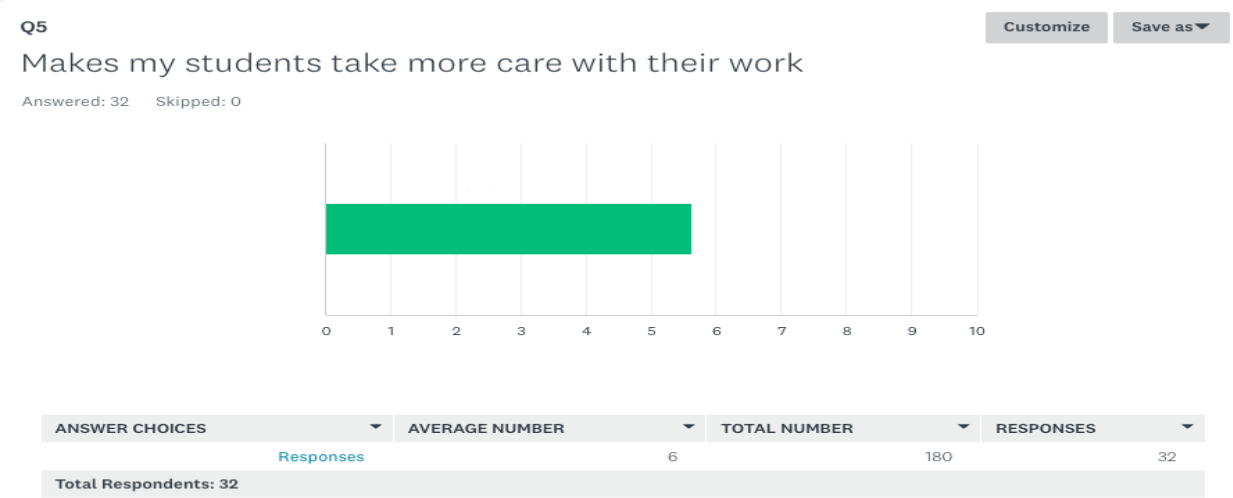


Figure 4

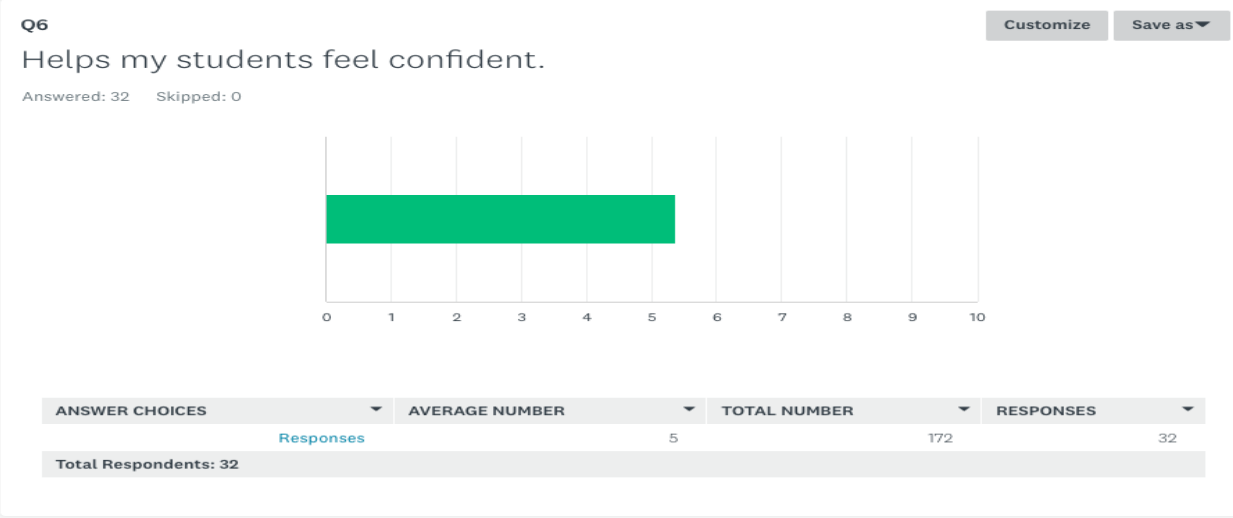
Responses to Survey Question 5



Survey Question 5 asked whether digital portfolios helped students care more about their work. Participant responses averaged to 5.6 out of 10. Zero indicated no effect, and 10 indicated extremely helpful. The mean is at 5.63, the median at 6, and the standard deviation of 1.36 (see Figure 4).

Figure 5

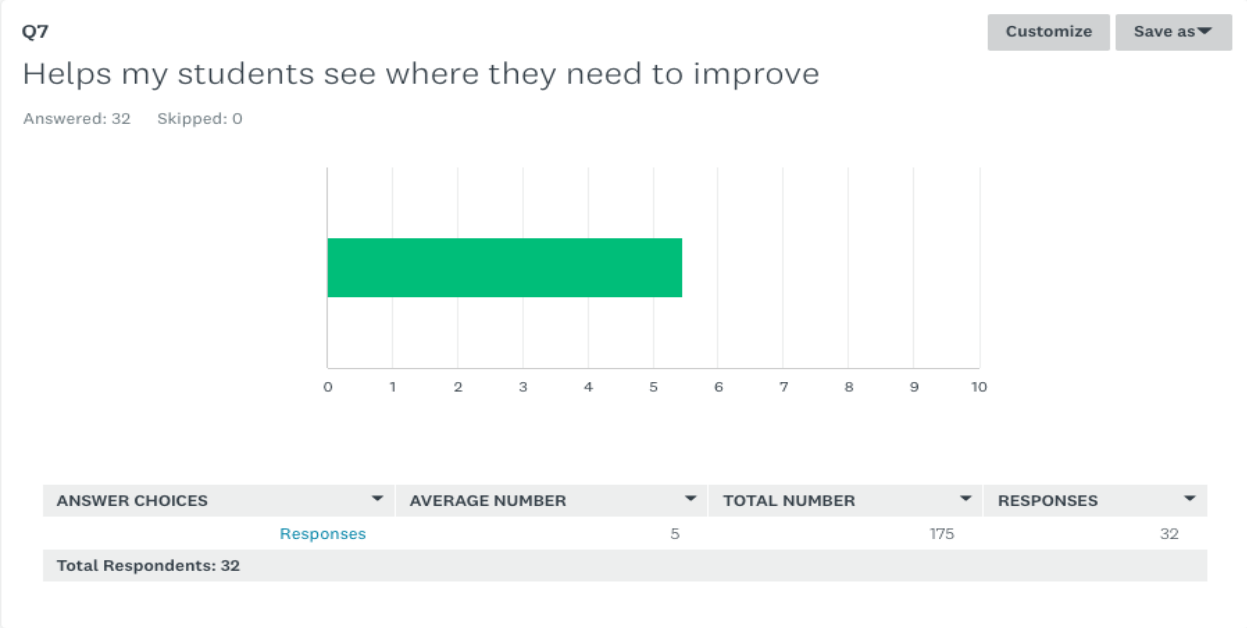
Responses to Survey Question 6



Survey Question 6 asked whether digital portfolios helped students feel more confident. Participant responses averaged a 5.3 out of 10. Zero indicated no effect, and 10 indicated extremely helpful. The mean is 5.38, the median is 6.0, and the standard deviation is 1.36 (see Figure 5).

Figure 6

Responses to Survey Question 7



Survey Question 7 asked whether digital portfolios helped students see where they need to improve. Participant responses averaged a 5.4 out of 10. The mean is 5.47, the median at 6.0, and the standard deviation is 1.35 (see Figure 6).

Survey Question 8 asked if digital portfolios helped teachers judge how students have improved over time. Participants averaged to 5.4 out of 10. The mean is 6.28, the median at 7.0, and the standard deviation is 1.18 (see Figure 7).

Figure 7

Responses to Survey Question 8

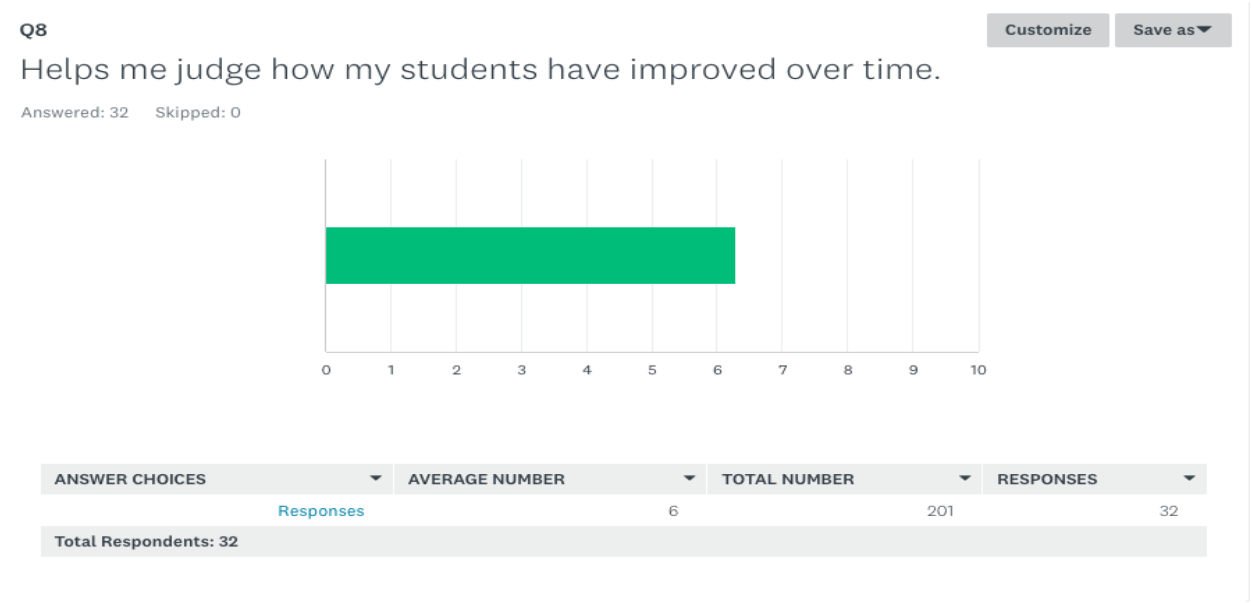
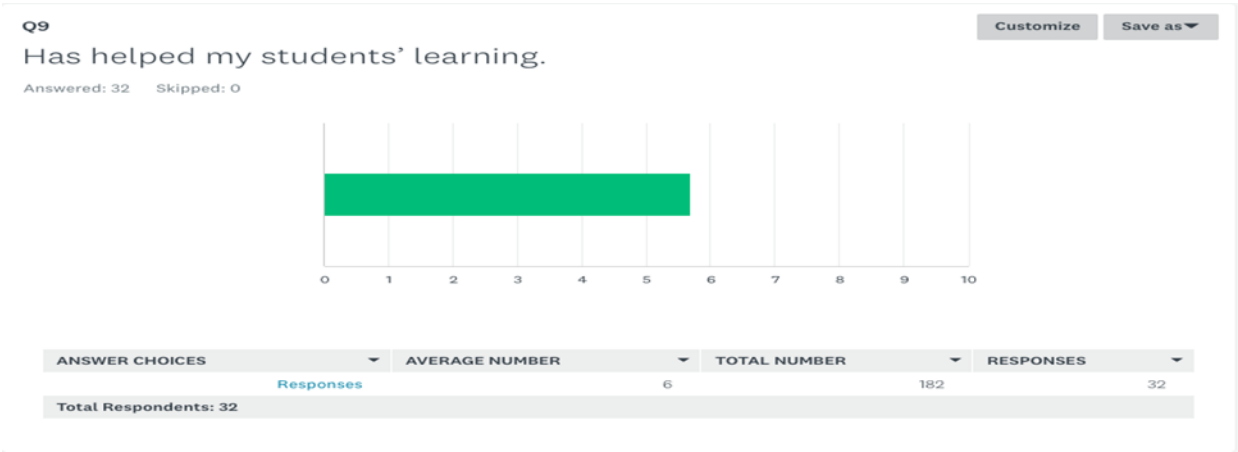


Figure 8

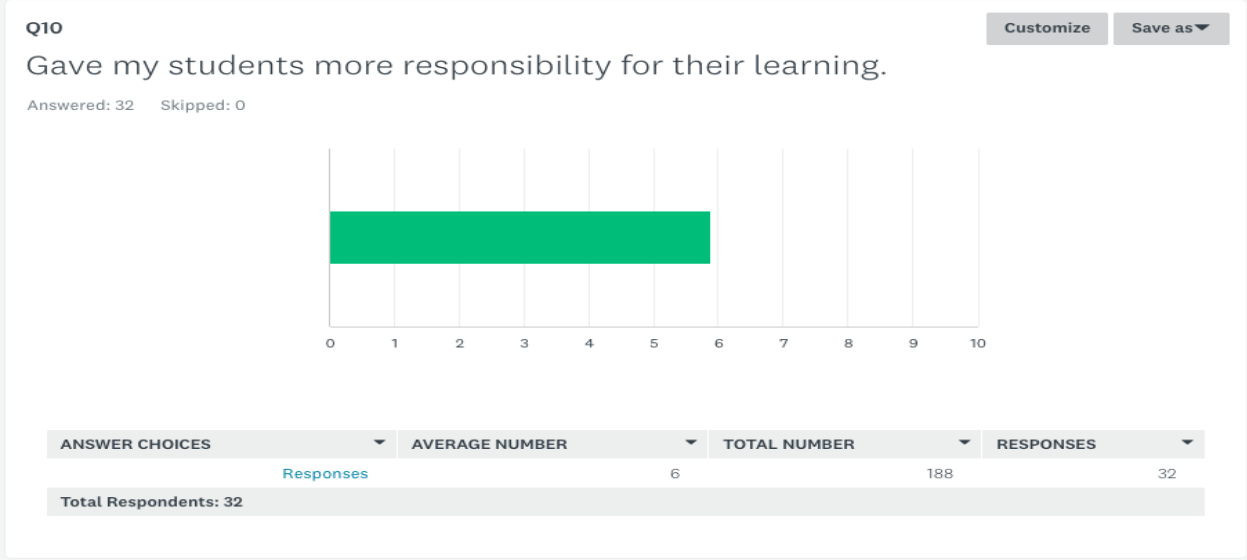
Responses to Survey Question 9



Survey Question 9 asked teachers if the use of digital portfolios helped with their students' learning. Participants averaged 5.8 out of 10. The mean is 5.69, the median at 6.0, and the standard deviation is 1.29 (see Figure 8).

Figure 9

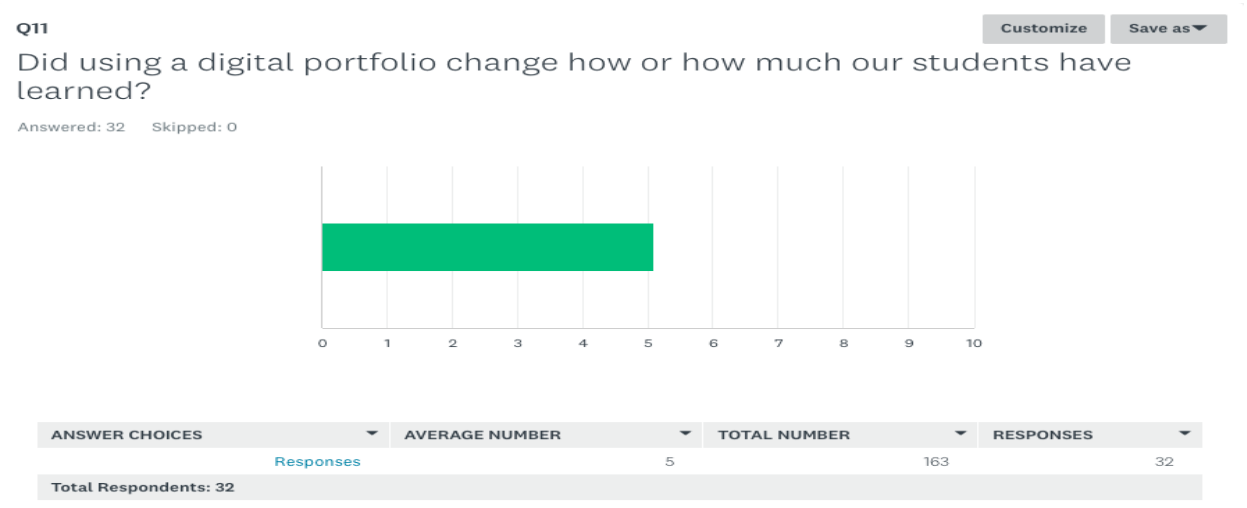
Responses to Survey Question 10



Survey Question 10 asked teachers whether digital portfolios gave their students more responsibility for their learning. Participant responses averaged a 6 out of 10. The mean is 5.88, the median at 6.0, and the standard deviation is 1.27 (see Figure 9).

Figure 10

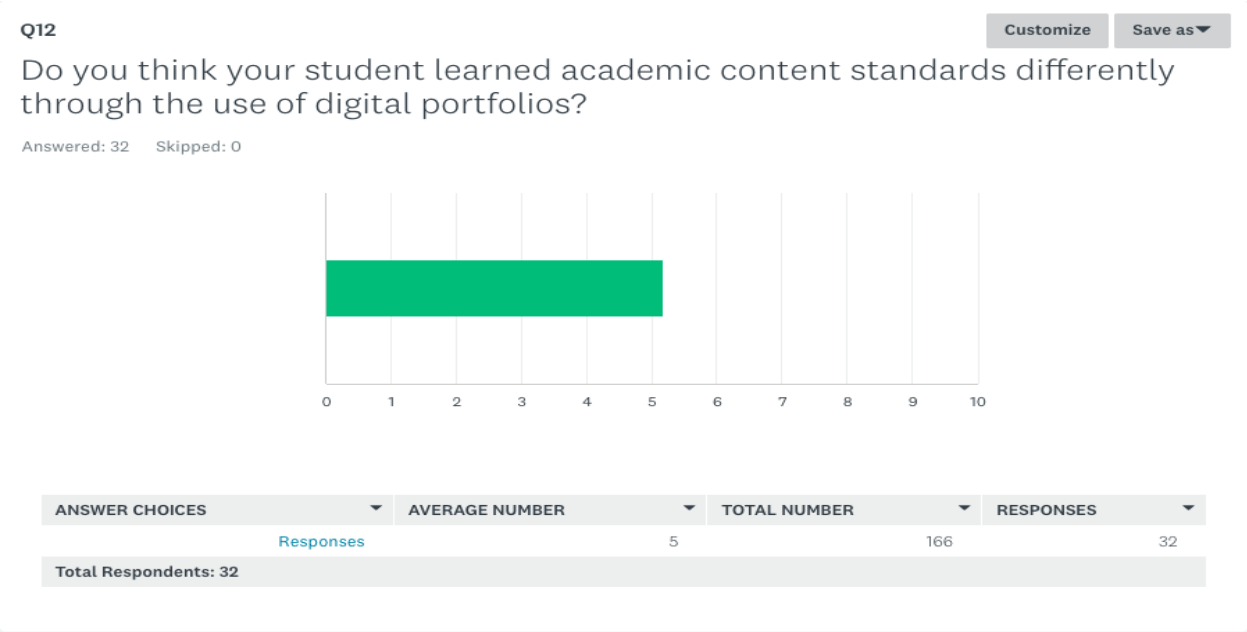
Responses to Survey Question 11



Survey Questions 11 asked teachers if the usage of a digital portfolio changed how much they have learned. Results indicate a score of 5 out of 10. The mean is 5.09, the median at 5.0, and the standard deviation is 1.35 (see Figure 10).

Figure 11

Responses to Survey Question 12



Survey Question 12 asked teachers if they thought that their students learned academic content standards differently through the use of digital portfolios. The average score was a 5 out of 10. The mean is 5.19, the median at 5.0, and the standard deviation is 1.49 (see Figure 11).

For Survey Question 13, survey participants were asked if they received positive and informative feedback on how they could help students improve their portfolio. The score recorded based on the responses resulted in a score of 5 out of 10. The mean is 4.97, the median at 5.0, and the standard deviation is 1.70 (see Figure 12).

Figure 12

Responses to Survey Question 13

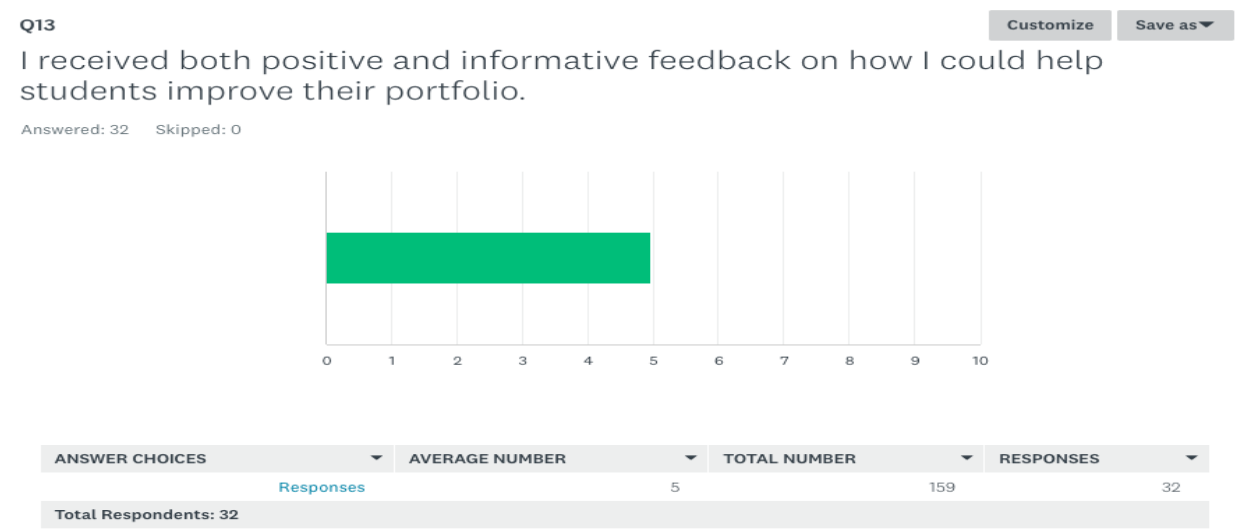
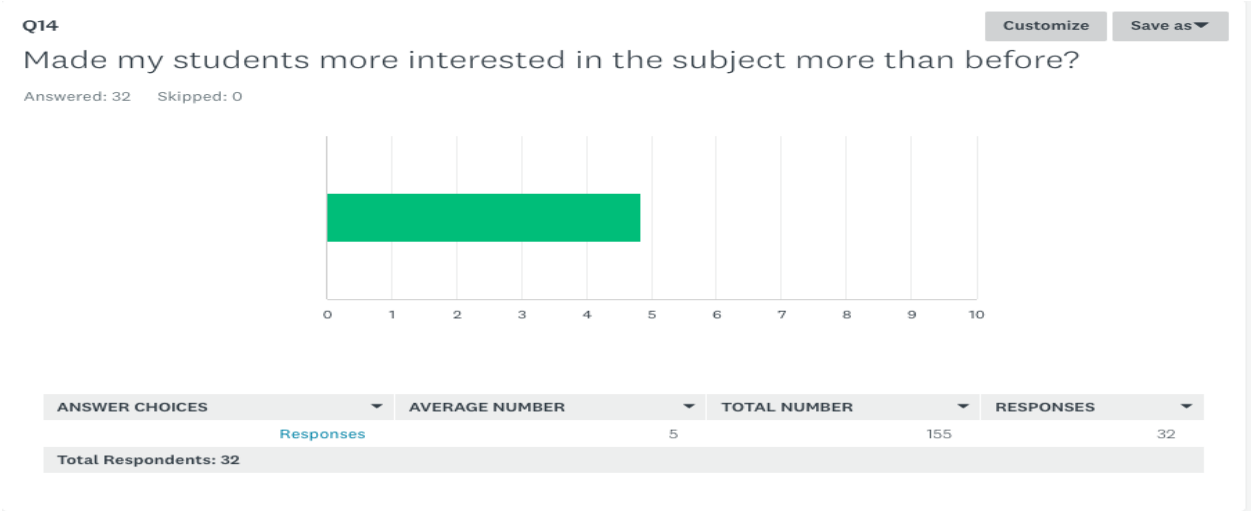


Figure 13

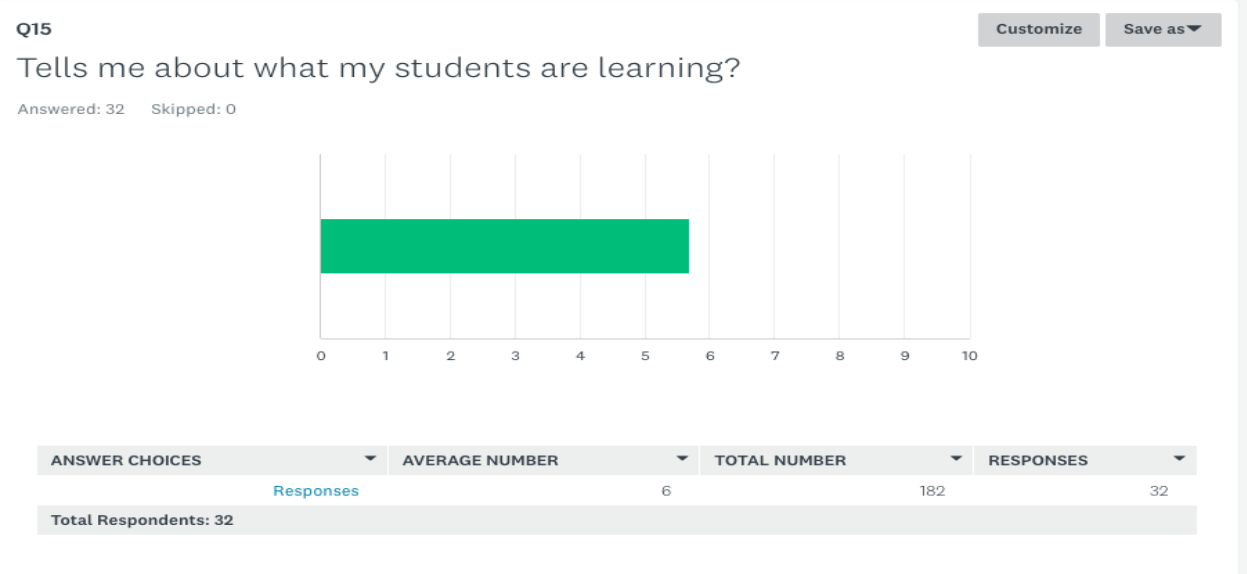
Responses to Survey Question 14



For Survey Question 14, survey respondents were asked if digital portfolios have made their students more interested in the subject more than before? Results have recorded a score of 4.8 out of 10. The mean is 4.84, the median at 5.0, and the standard deviation is 1.30 (see Figure 13).

Figure 14

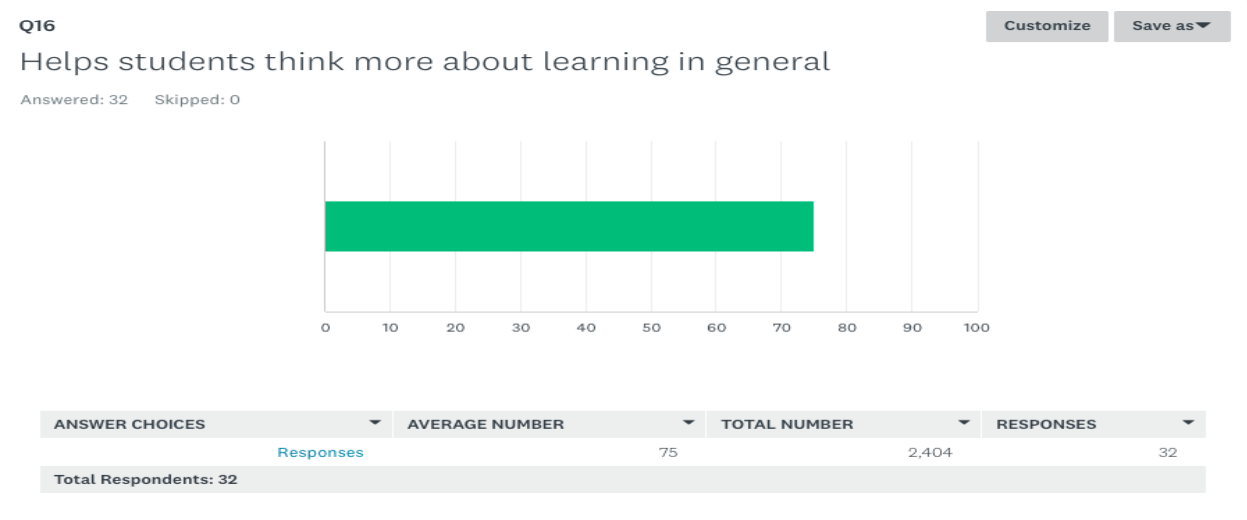
Responses to Survey Question 15



For Survey Question 15, survey respondents were asked if digital portfolios provided participants with what their students are learning. Survey results resulted in a score of 5.7 out of 10. The mean is 5.69, the median at 6.0, and the standard deviation is 1.38 (see Figure 14).

Figure 15

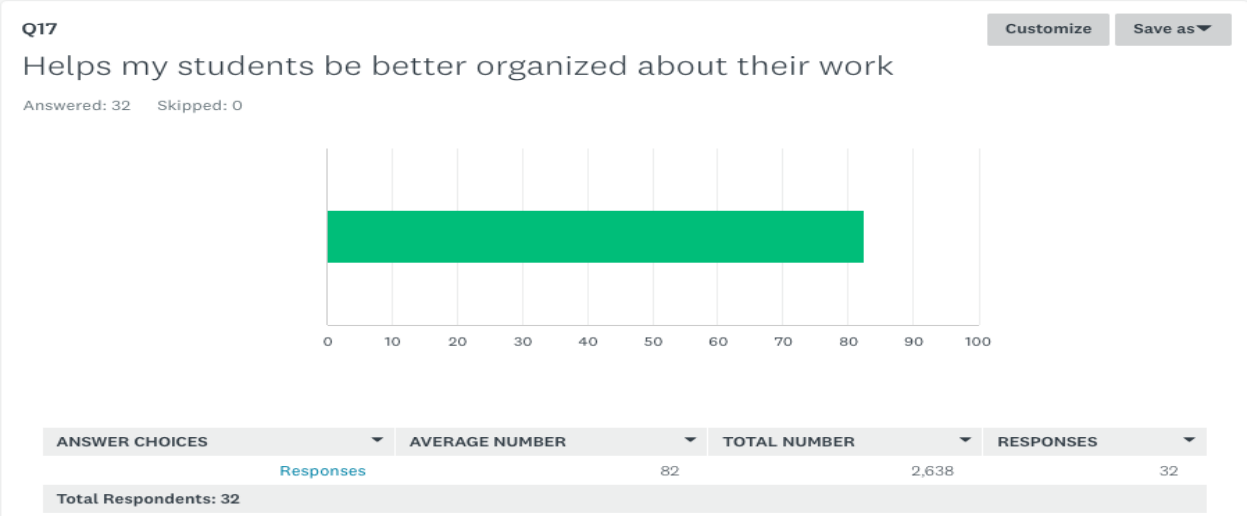
Responses to Survey Question 16



For Survey Question 16, survey respondents were asked if digital portfolios helped students think more about learning in general. Survey results resulted in a score of 7.6 out of 10. The mean is 7.51, the median at 7.65, and the standard deviation is 1.89 (see Figure 15).

Figure 16

Responses to Survey Question 17



For Survey Question 17, survey respondents were asked if digital portfolios helped their students be better organized about their work. Survey results resulted in a score of 8.2 out of 10. The mean is 8.24, the median at 8.8, and the standard deviation is 1.87 (see Figure 16).

For Survey Question 18, survey respondents were asked if digital portfolios helped their students see where they need to improve. Survey results resulted in a score of 5.7 out of 10. The mean is 5.72, the median at 6, and the standard deviation is 1.10 (see Figure 17).

Survey Question 19 asked survey respondents whether digital portfolios understand their schoolwork better. Survey results resulted in a score of 5.3 out of 10. The mean is 5.31, the median at 6.0, and the standard deviation is 1.24 (see Figure 18).

Figure 17

Responses to Survey Question 18

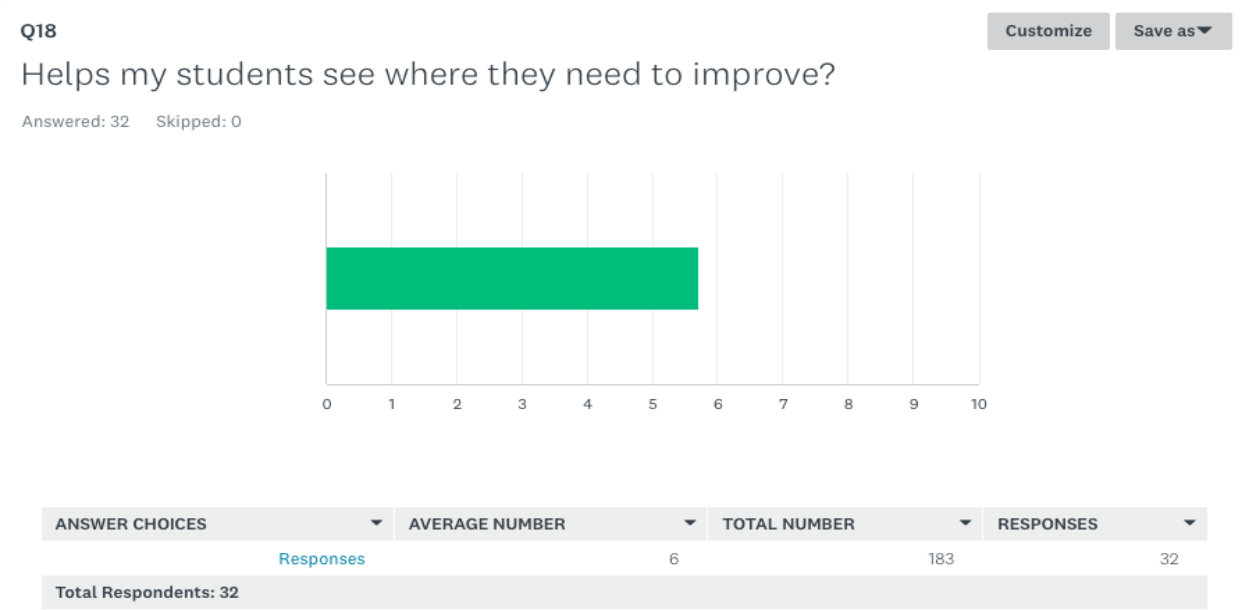


Figure 18

Responses to Survey Question 19

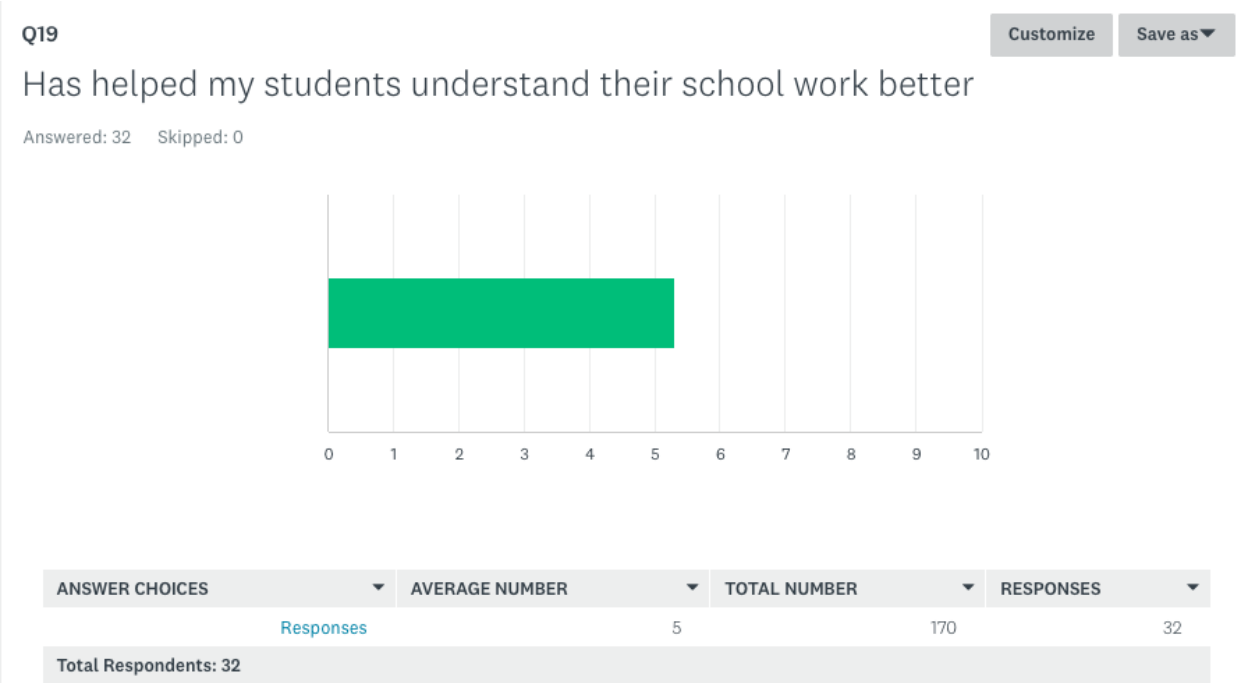
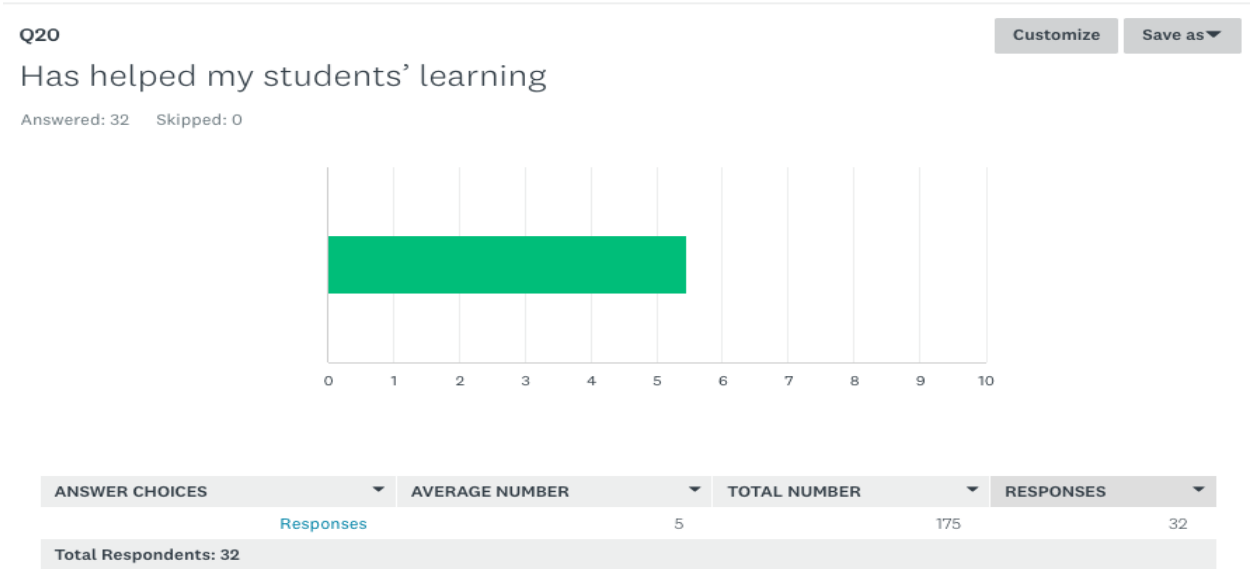


Figure 19

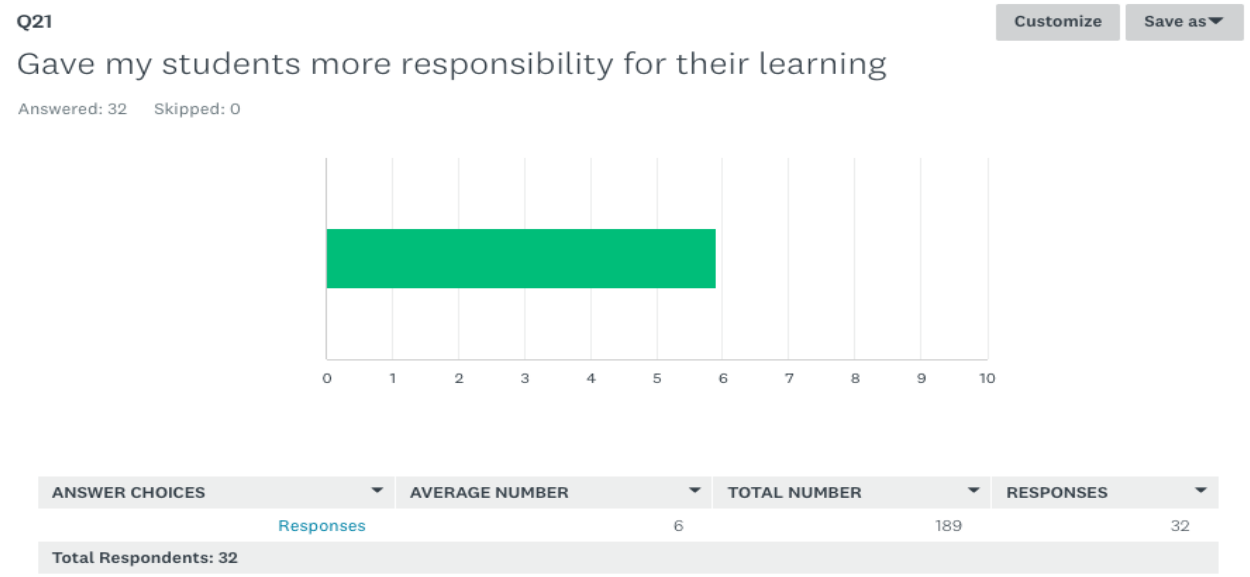
Responses to Survey Question 20



Survey Question 20 asked survey respondents whether digital portfolios helped in their students' learning. Survey results resulted in a score of 5.4 out of 10. The mean is 5.47, the median at 5.0, and the standard deviation is 1.22 (see Figure 19).

Figure 20

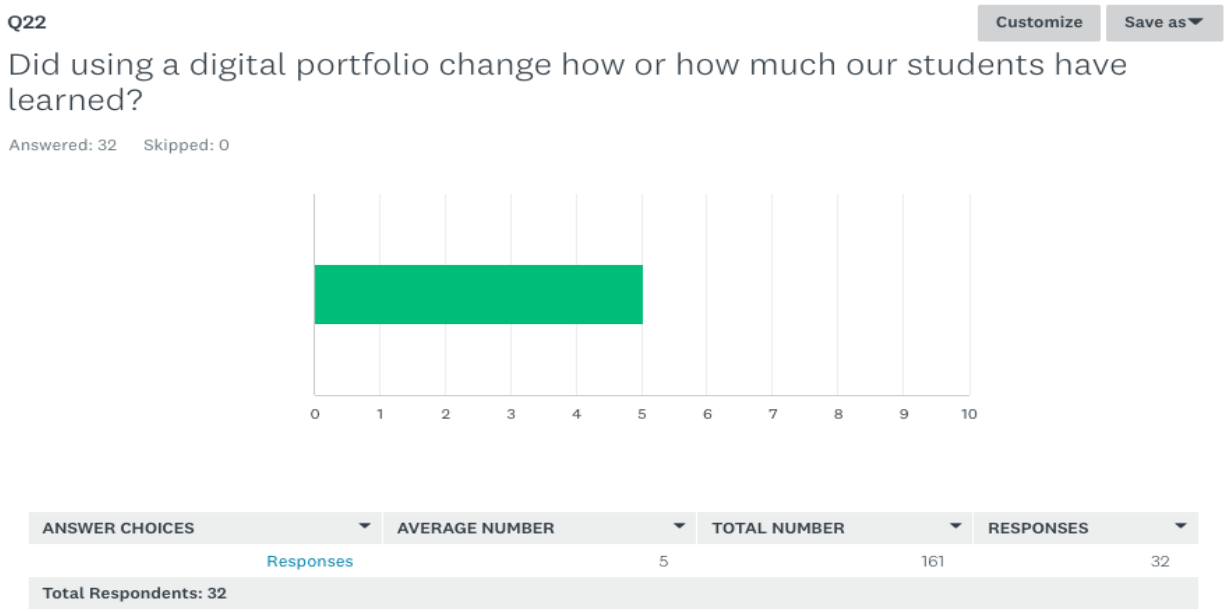
Responses to Survey Question 21



Survey Question 21 asked survey respondents whether digital portfolios gave their students more responsibility for their learning. Survey results resulted in a score of 5.9 out of 10. The mean is 5.91, the median at 6, and the standard deviation is 1.23 (see Figure 20).

Figure 21

Responses to Survey Question 22



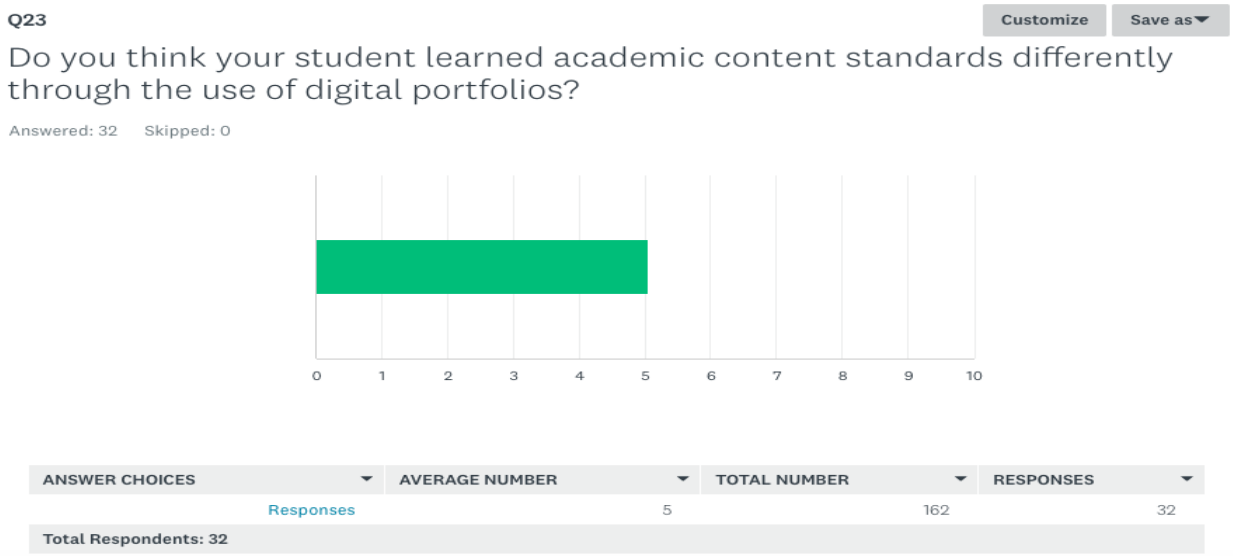
Survey Question 22 asked survey respondents if the use of digital portfolios changed how or how much of their students have learned. Survey results resulted in a score of 5 out of 10. The mean is 5.03, the median at 5.0, and the standard deviation is 1.33 (see Figure 21).

RQ2: Do Digital Portfolios Improve Student Subject-Matter Efficacy?

For Survey Questions 23 through 26, the survey participants are asked to respond in order to gather data for RQ 2, “Do digital portfolios improve student subject-matter efficacy?”

Figure 22

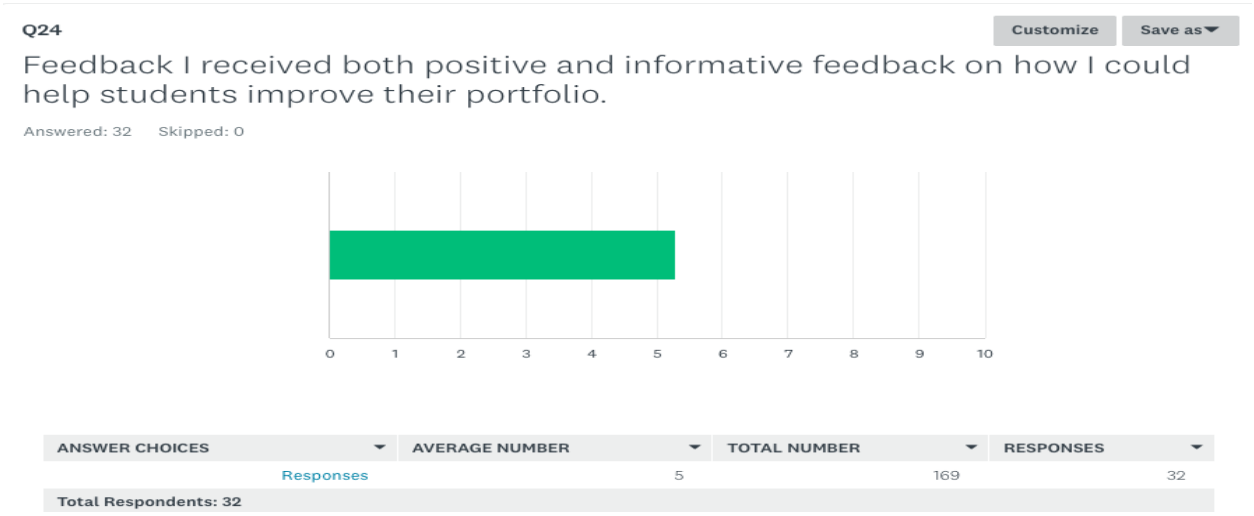
Responses to Survey Question 23



Survey Question 23 asked survey respondents if they think their students have learned academic content standards differently through the use of digital portfolios. Survey results resulted in a score of 5 out of 10. The mean is 5.06, the median at 5.0, and the standard deviation is 1.39 (see Figure 22).

Figure 23

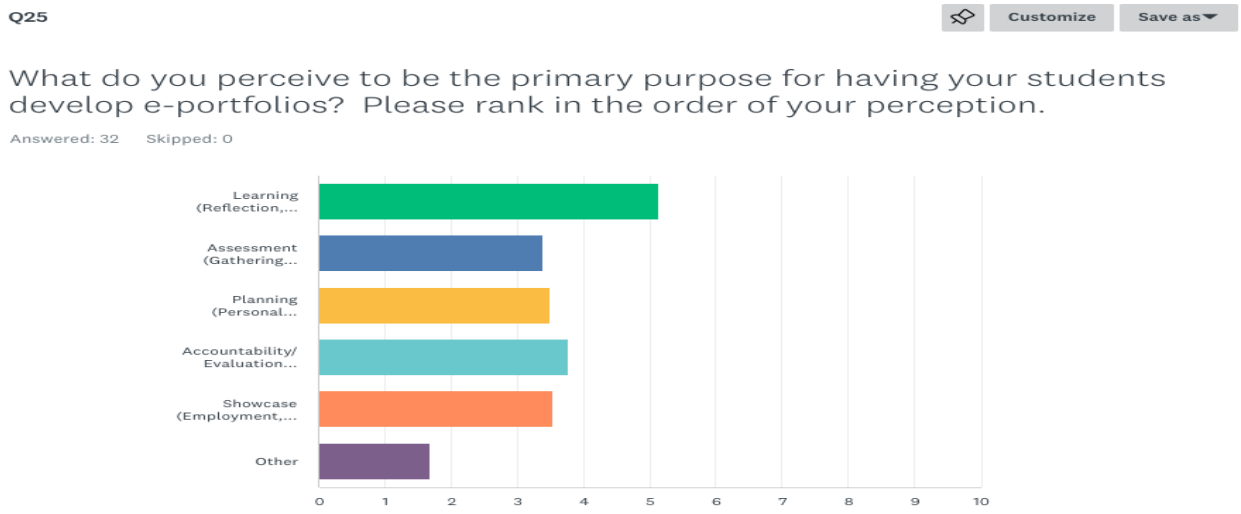
Responses to Survey Question 24



Survey Question 24 asked survey respondents if they received both positive and informative feedback on how they could help students improve their digital portfolios. Survey results resulted in a score of 5.2 out of 10. The mean is 5.28, the median at 5.0, and the standard deviation is 1.35 (see Figure 23).

Figure 24

Responses to Survey Question 25 – Part 1



Survey Question 25 asked survey respondents what they perceived to be the primary purpose for having their students develop e-portfolios. Respondents had to rank what was most important for them between the following choices: Learning, Assessment, Planning, Accountability/Evaluation, Showcase, or other (see Figure 24).

Figure 25

Responses to Survey Question 25 – Part 2

	1	2	3	4	5	6	TOTAL	SCORE
Learning (Reflection, documenting the learning process over time)	56.25% 18	25.00% 8	6.25% 2	6.25% 2	0.00% 0	6.25% 2	32	5.13
Assessment (Gathering information from student work samples to improve teaching and learning—for both students and teachers)	3.13% 1	15.63% 5	31.25% 10	25.00% 8	15.63% 5	9.38% 3	32	3.38
Planning (Personal Development Planning, setting academic goals)	9.38% 3	18.75% 6	15.63% 5	28.13% 9	25.00% 8	3.13% 1	32	3.50
Accountability/Evaluation (demonstrate achievement of required outcomes, goals or standards)	3.13% 1	28.13% 9	34.38% 11	15.63% 5	15.63% 5	3.13% 1	32	3.78
Showcase (Employment, Marketing, Personal Branding)	18.75% 6	12.50% 4	9.38% 3	21.88% 7	37.50% 12	0.00% 0	32	3.53
Other	9.38% 3	0.00% 0	3.13% 1	3.13% 1	6.25% 2	78.13% 25	32	1.69

BASIC STATISTICS

	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Learning (Reflection, documenting the learning process over time)	1.00	6.00	1.00	1.88	1.36
Assessment (Gathering information from student work samples to improve teaching and learning—for both students and teachers)	1.00	6.00	3.50	3.63	1.27
Planning (Personal Development Planning, setting academic goals)	1.00	6.00	4.00	3.50	1.37
Accountability/Evaluation (demonstrate achievement of required outcomes, goals or standards)	1.00	6.00	3.00	3.22	1.19
Showcase (Employment, Marketing, Personal Branding)	1.00	5.00	4.00	3.47	1.54
Other	1.00	6.00	6.00	5.31	1.53

Survey results recorded that digital portfolios were mostly used as a learning tool, with a score of 5.1 out of 10. The mean is 1.88, the median at 1, and the standard deviation is 1.36 (see Figure 25).

In the second place, was the use of digital portfolios as an accountability tool, where results recorded accountability a score of 3.8 out of 10. The mean is 3.22, the median at 3.0, and the standard deviation is 1.19.

Third on the list was digital portfolios as a showcase tool for students, a score of 3.5 out of 10 was collected. The mean is 3.47, the median at 6, and the standard deviation is 1.53.

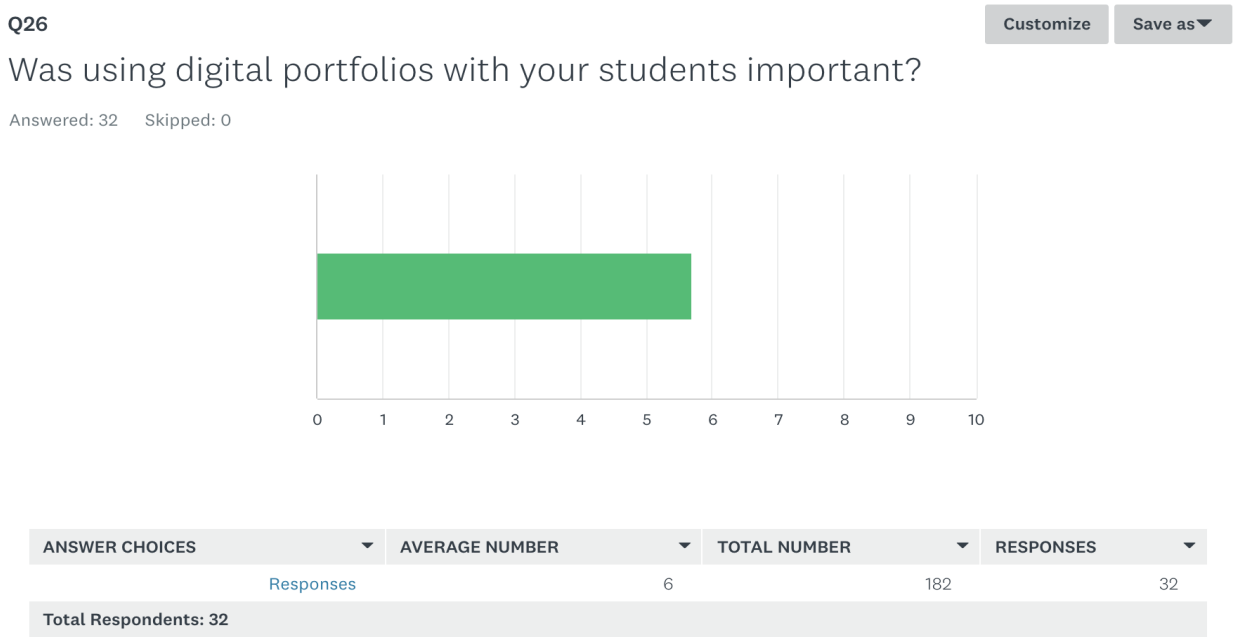
In fourth place, digital portfolios were used as a planning tool, with a score of 3.4 out of 10. The mean is 3.50, the median at 4.0, and the standard deviation is 1.37.

The fifth highest selection was digital portfolios as an assessment tool, with a recorded score of 3.3 out of 10. The mean is 3.63, the median at 3.50, and the standard deviation is 1.27.

The lowest of the selection, went to "Other," as in whatever fell out of the other categories in the selection. This came to a score of 1.7. The mean is 5.31, the median at 6.0, and the standard deviation is 1.53 (see Figure 25).

Figure 26

Responses to Survey Question 26

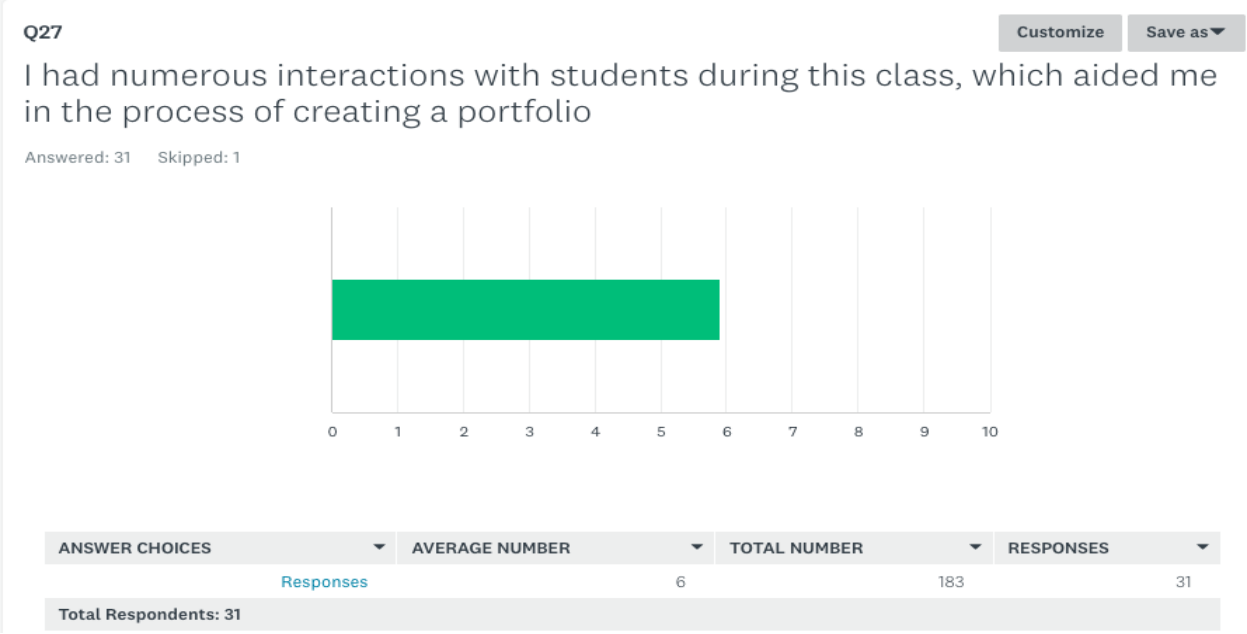


Survey Question 26 asked survey participants if using digital portfolios with their students was important. Average score for the thirty-two respondents resulted in a score of 5.7. The mean is 5.69, the median at 6.0, and the standard deviation is 1.31 (see Figure 26).

RQ3: Do Technical Skills Have an Impact on Academic Performance and Curriculum Pacing While Using Digital Portfolios?

Figure 27

Responses to Survey Question 27



Survey Question 27 asked survey participants whether they had numerous interactions with students during the class, which aided the teacher in the process of creating a portfolio. Survey participants responded with a score of 5.9 out of 10. The mean is 5.90, the median at 6.0, and the standard deviation is 1.15. One survey participant did not reply to this question. Out of the 32 participants, only 31 posted a response (see Figure 27).

For Survey Question 28 participants responded about whether students replied to the teacher's constructive feedback during the digital portfolio creation process in a timely fashion. Survey results came in at a score of 5.1. The mean is 5.19, the median at 5.0, and the standard deviation is 1.40. Only 31 out of the 32 participants responded to this survey question (see Figure 28).

Figure 28

Responses to Survey Question 28

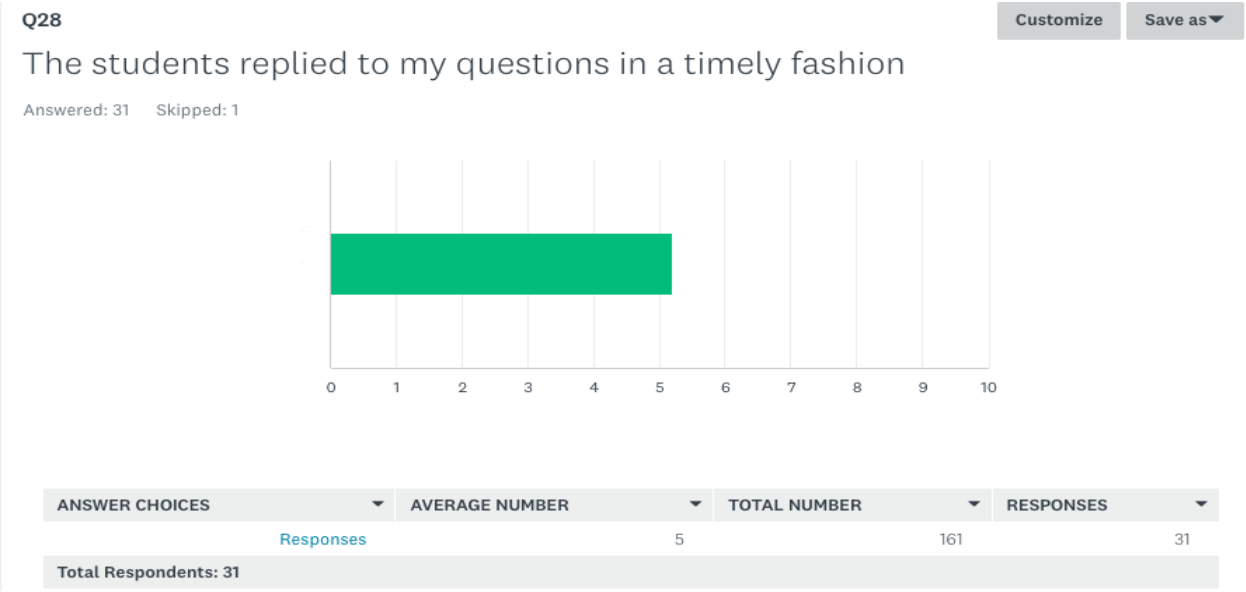
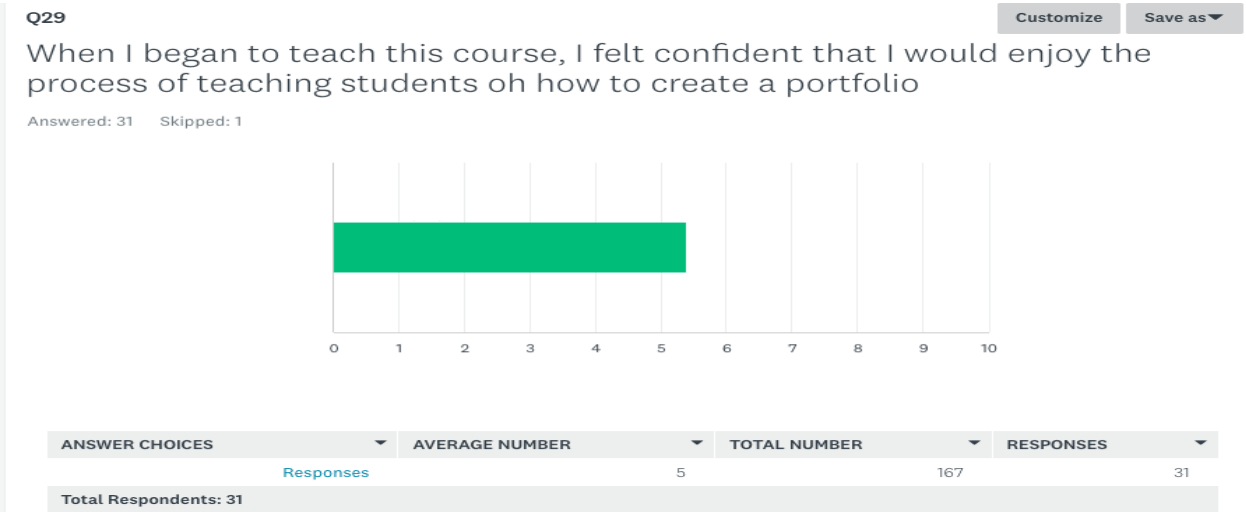


Figure 29

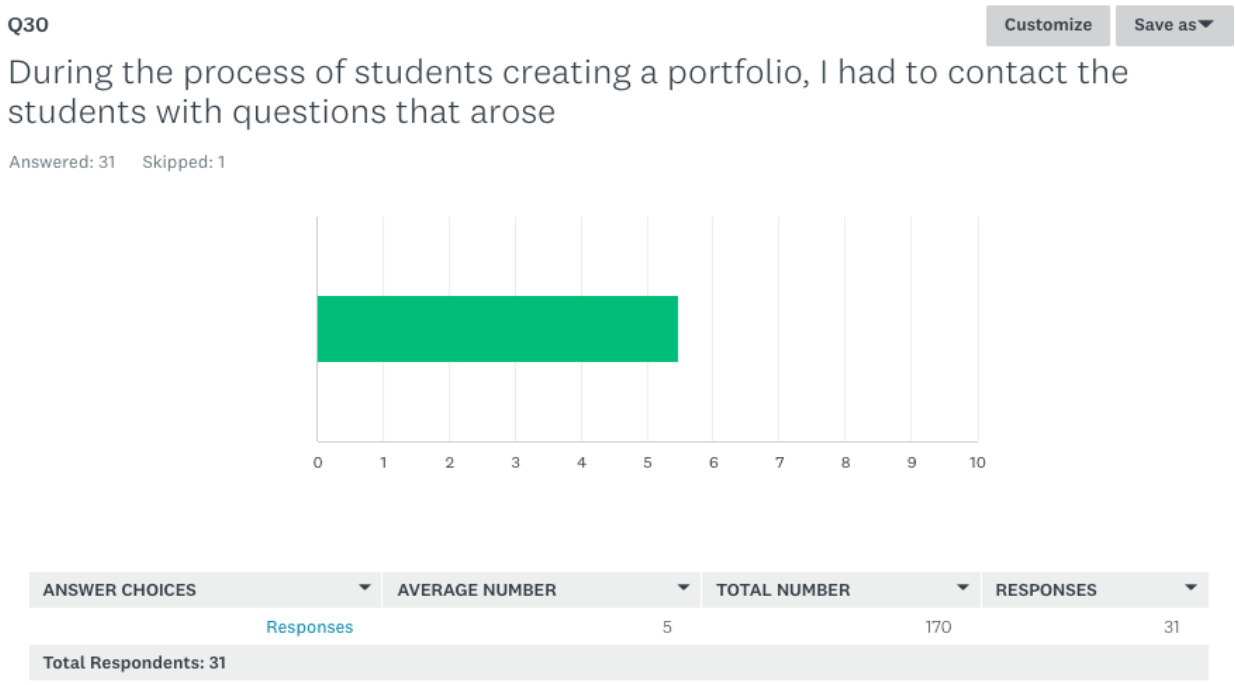
Responses to Survey Question 29



For Survey Question 29, survey participants were asked if they felt confident that they would enjoy the process of teaching students how to create a digital portfolio. Results tallied at 5.4 out of 10. The mean is 5.39, the median at 5.0, and the standard deviation is 1.54. Only 31 out of the 32 participants responded to this survey question (see Figure 29).

Figure 30

Responses to Survey Question 30



Survey Question 30 asked survey respondents if they contacted their students with questions that arose during the process of creating a digital portfolio. Survey results resulted in a score of 5.4 out of 10. The mean is 5.48, the median at 5.0, and the standard deviation is 1.24. Only 31 out of the 32 survey participants responded (see Figure 30).

Survey Question 31 asked survey respondents if they will recommend the process of creating a digital portfolio for all their courses. Survey results resulted in a score of 5.2 out of 10. The mean is 5.29, the median at 5.0, and the standard deviation is 1.49. Only 31 out of the 32 survey participants responded (see Figure 31).

Survey Question 32 asked survey participants if the incorporation of digital portfolios has taken too much of their class time. A score of 3.1 out of 10 revealed that most of the teachers in the survey felt otherwise. The mean is 5.29, the median at 5.0, and the standard deviation is 1.49. Only 31 of the 32 survey participants responded (see Figure 32).

Figure 31

Responses to Survey Question 31

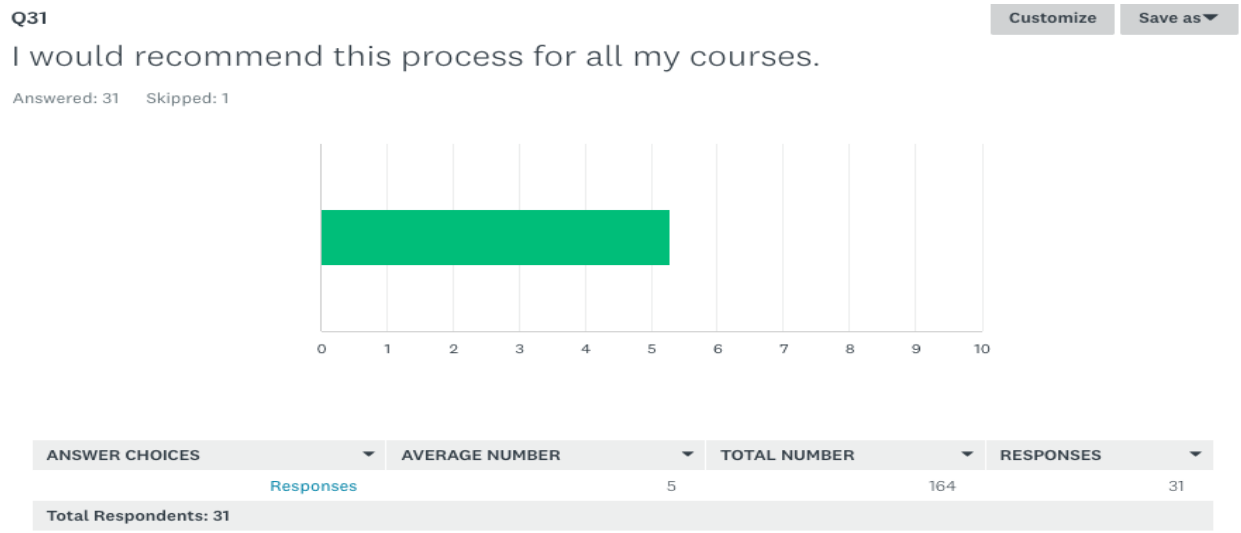
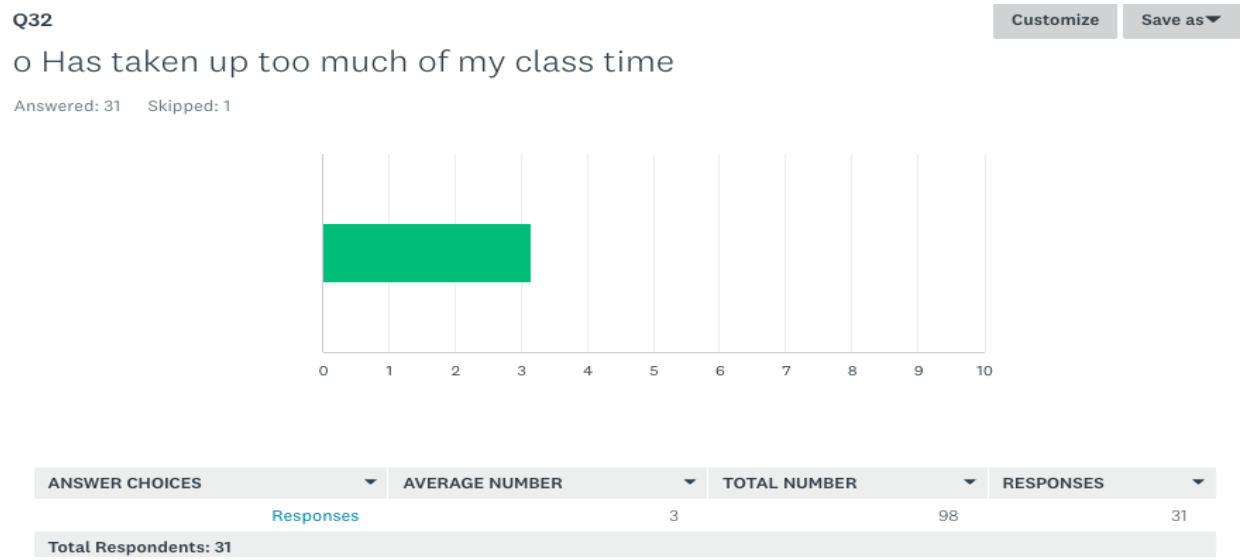


Figure 32

Responses to Survey Question 32



Survey Question 33 asked survey participants if the incorporation of digital portfolios has taken too much of their own time outside of classes. A score of 3.1 out of 10 was recorded. The mean is 3.23, the median at 3.0, and the standard deviation is 1.72. Only 31 of the 32 survey participants responded (see Figure 33).

Figure 33

Responses to Survey Question 33

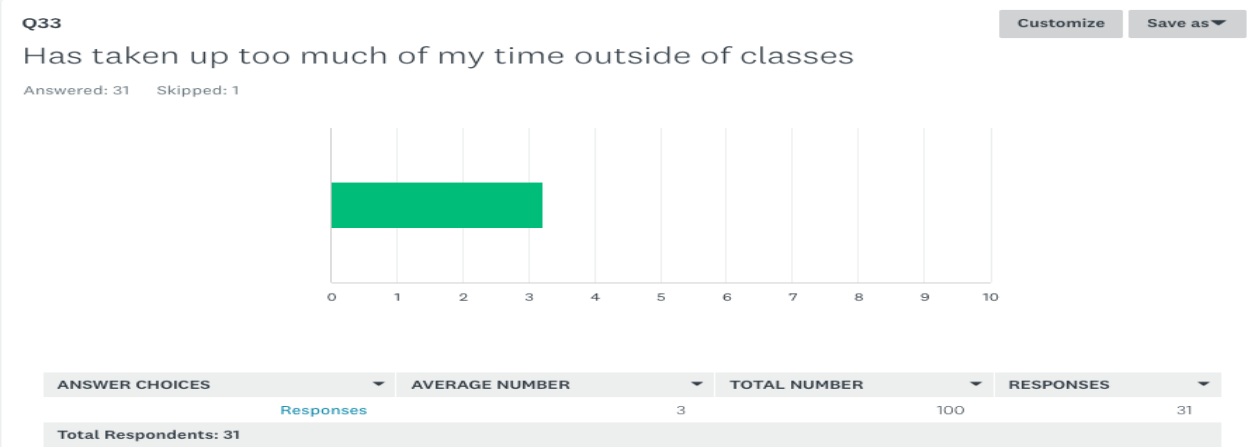
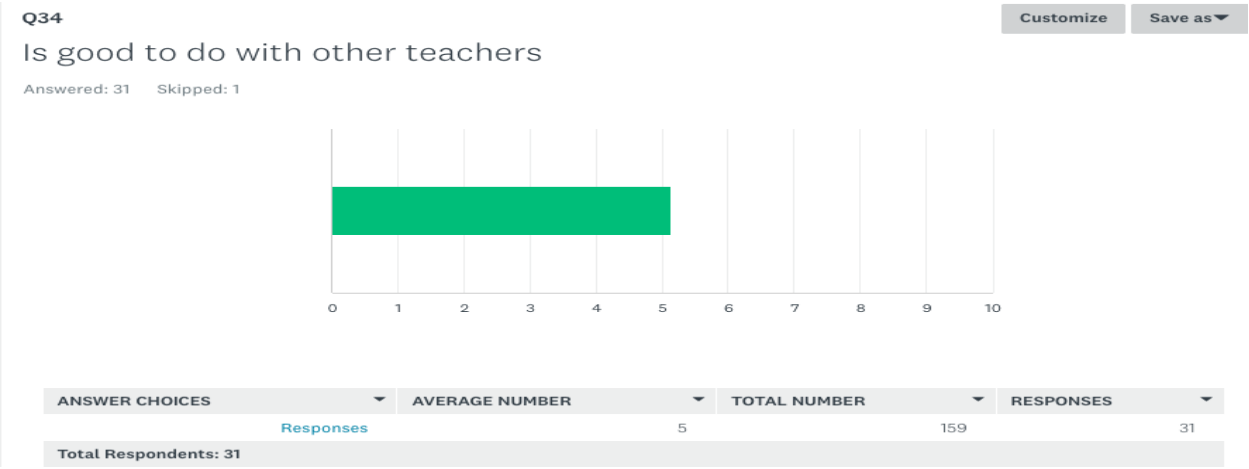


Figure 34

Responses to Survey Question 34



Survey Question 34 asked survey participants if digital portfolios are good to do with other teachers. A score of 3.1 out of 10 was recorded. The mean is 5.13, the median at 5.0, and the standard deviation is 1.34. Only 31 of the 32 survey participants responded (see Figure 34).

Survey Question 35 asked survey participants if digital portfolios are something they will continue to do. A score of 5.6 out of 10 was recorded. The mean is 5.58, the median at 6.0, and the standard deviation is 1.39. Only 31 of the 32 survey participants responded (see Figure 35).

Figure 35

Responses to Survey Question 35

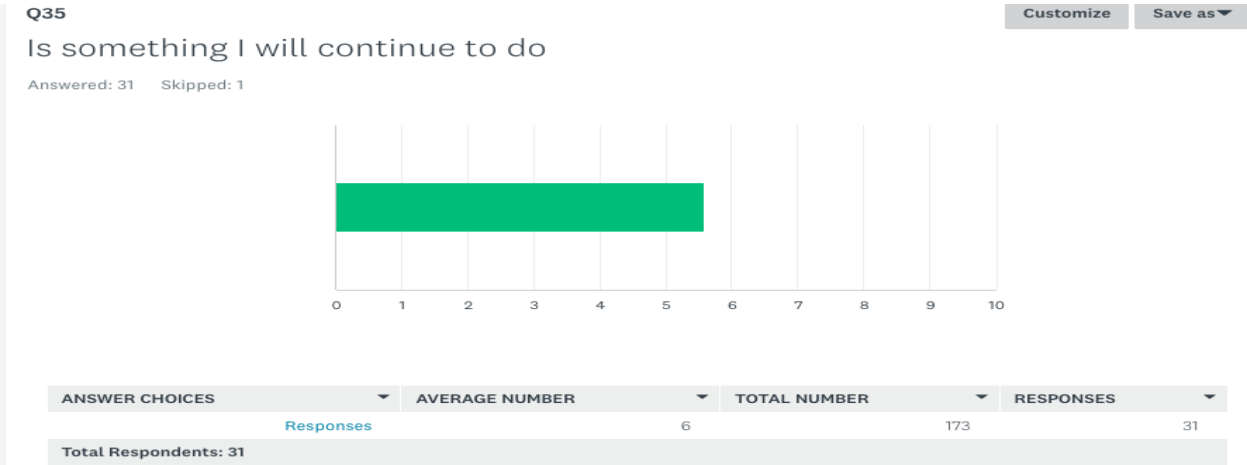
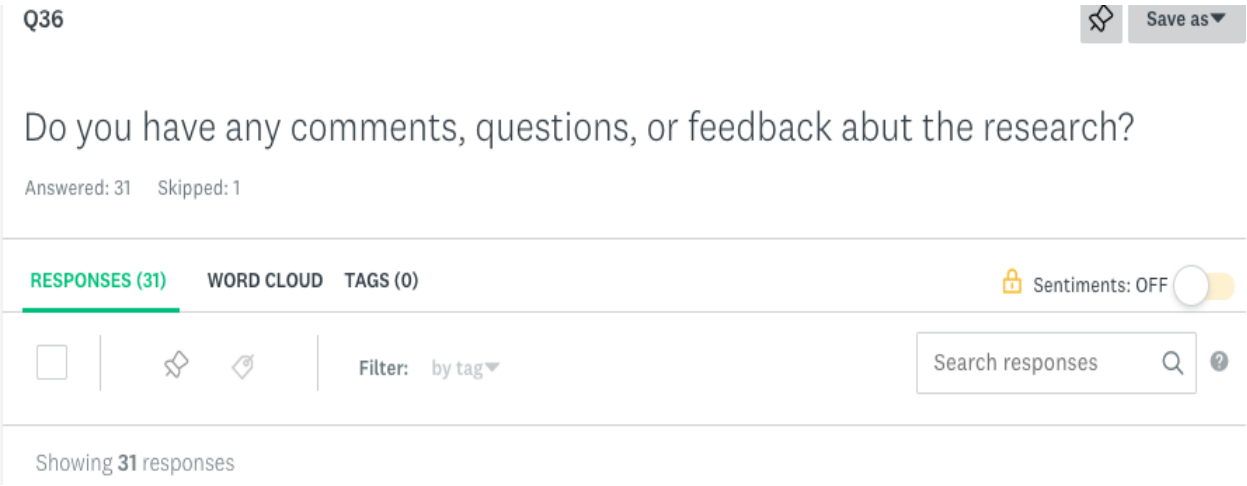


Figure 36

Responses to Survey Question 36



Survey Question 36 is the only question that asked for open-ended responses from the survey. Seventeen of the 32 survey participants indicated they did not have any questions about the survey. One participant mentioned that some of the questions did not align to agree or disagree (see Figure 36).

Another teacher commented that it is up to the teacher to provide the student buy-in, if the teacher believes in the digital portfolio, then students will believe in it as well. The same

respondent also mentioned that it is rare for students to see and track growth and progress but this gives them real-time growth tracking and that most of the time, the growth is only shown in point-based form.

Another teacher mentioned that digital portfolios have been employed in their class for years, as they are essential for upper-level art courses. Another art teacher mentioned that since the class they use the digital portfolio in their two-dimensional Art and Design class, and used it more as a showcase tool.

Another participant teaches study skills through a program called Advancement Via Individual Determination (AVID) classes, and that digital portfolios are essentially in place for students to compile and track their requirements for college applications as well as for high school graduation. The AVID teacher admitted that digital portfolios in that particular class are used differently than they would have in a general area content class, but gave no specific details. Another participant stated that the pandemic and online teaching laid the groundwork for the incorporation of digital portfolios in their class.

An educator who participated in the survey added that digital portfolios are great but do not require class time for students to work on and frequent check-ins on progress, having checkpoints with rubrics can be just as helpful to the students.

Another participant commented that the use of digital portfolios helped their students better understand their achievement in the class and helped the students' understanding and appreciation of their work in other classes. One respondent mentioned that the digital portfolio is a great end product for documenting and presenting student work.

One of the survey participants added, that most students benefit from the structure and organization of e-portfolios. They turn in their work on time and see the value of contributing to

a process. This participant continued by stating that some students cannot work with deadlines where they cannot continue if they did not contribute to prior stages. Hence these particular students struggled to complete their digital portfolios.

A different survey participant mentioned that creating digital portfolios based on each lesson was helpful. In each of their folders (class pages), the students included a warm-up, all classwork, and an assessment. These students were provided with an opportunity to write self-reflection writing opportunities which helped them see where and how they can be successful in the class.

One teacher mentioned that using digital portfolios helped the students in the class better understand their achievement and understanding and appreciation of their work in other classes.

Digital portfolios were a great way for students to also a great tool to organize content, a great way to follow the sequence of the course curriculum for the class, and serve as a study guide, said one teacher. However, employing digital portfolios required extra time outside of the school day to review student work. The same participant added that the experience did provide some insight into the students' level of understanding, but the evaluation or interpretation of the technical tasks required depended on the student's skills with technology. The teacher also commented that using digital portfolios may be a disadvantage for students that are not technically proficient with the use of computers. This survey participant concluded that if the student creating the digital portfolios just documented facts, but did not complement the information with their own expanded explanation of the content being learned, then the portfolio is not to be considered complementary to that student's learning style.

The final unique comment for this question is that this survey participant mentioned that they use an online application called Bulb. The subscription permits students to have lifetime access to their e-portfolios.

Insights

Figure 37

Insights

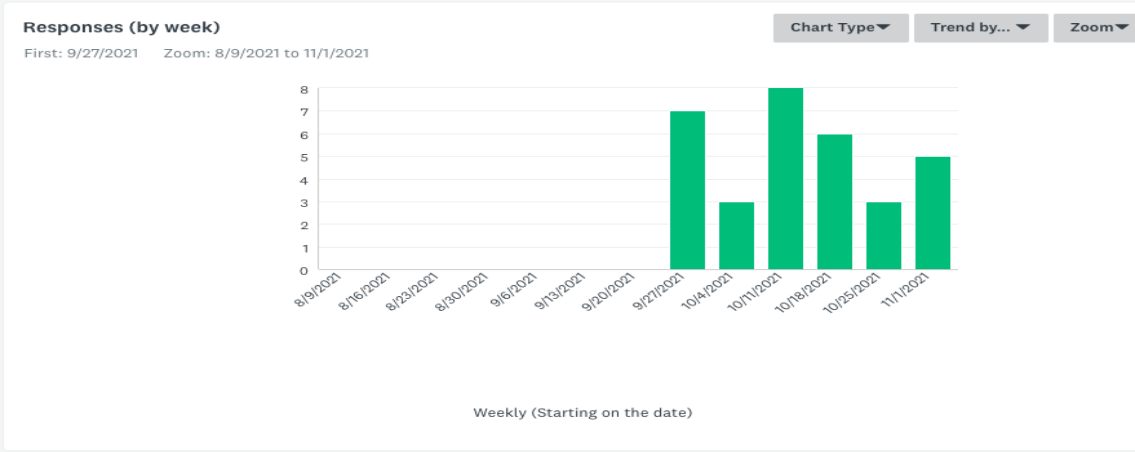
The study had 32 participants, with a completion rate of 97% . The average time to complete the survey was 7 minutes and 54 seconds (see Figure 37).

Survey Trends

Participant recruitment occurred at the beginning of September. The first batch of surveys came on September 27, with seven surveys completed, three on October 4, peaking on October with eight surveys, six surveys on October 18, three on October 25, and the last five surveys were collected on November 1 (see Figure 38).

Figure 38

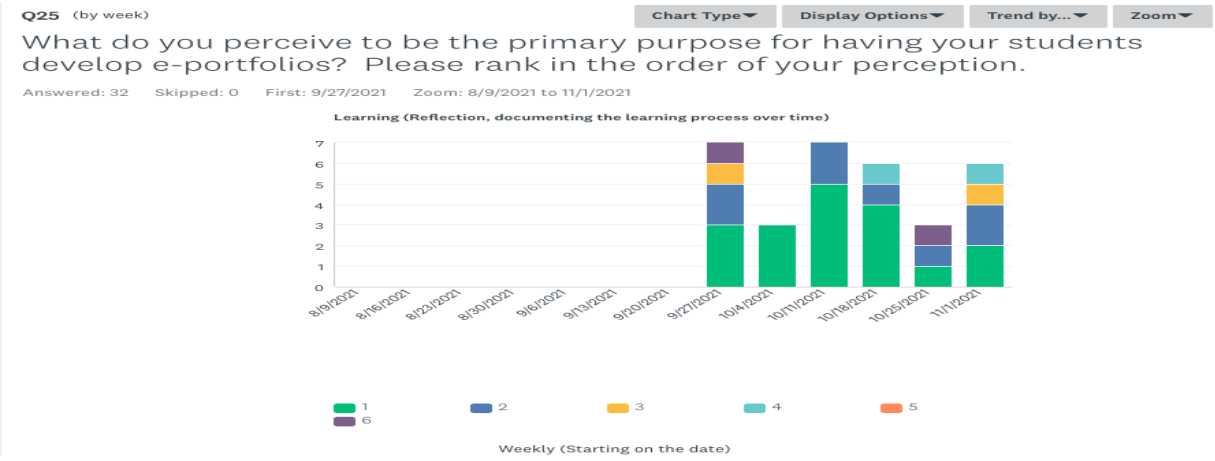
Survey Trends



Most of the survey questions in the survey did not have data trends, however, a few of the questions provided information based on the categorical answers provided. Question 25, which asked survey participants what they perceive to be the primary purpose for having your students develop digital portfolios, were then asked to rank in the order of their perception of its usage (see Figure 39).

Figure 39

Using Portfolios as Learning Tools

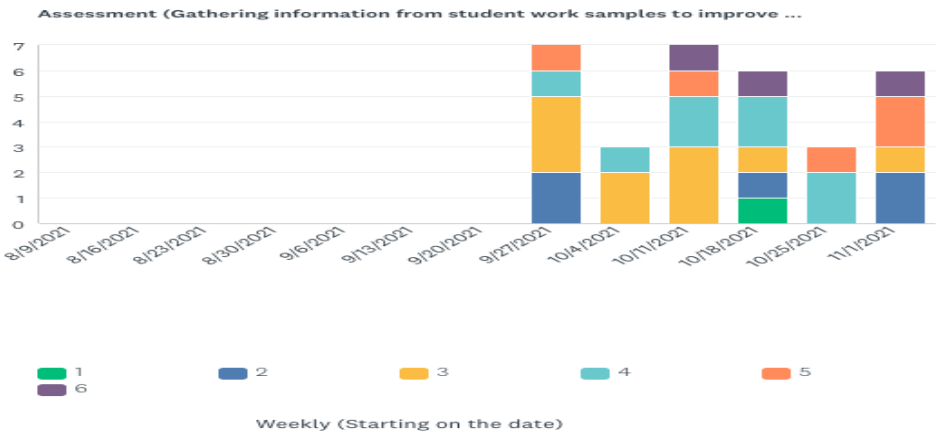


Note. Key for Figure 39: 1-Learning/Reflective Tool, 2- Assessment, 3- Planning, 4, Accountability/Evaluative, 5- Showcase, 6- Other

Eighteen of the 32 participants (56%) indicated they use digital portfolios as a *learning* tool (see Figure 39).

Figure 40

Using Portfolios as Assessment Tools

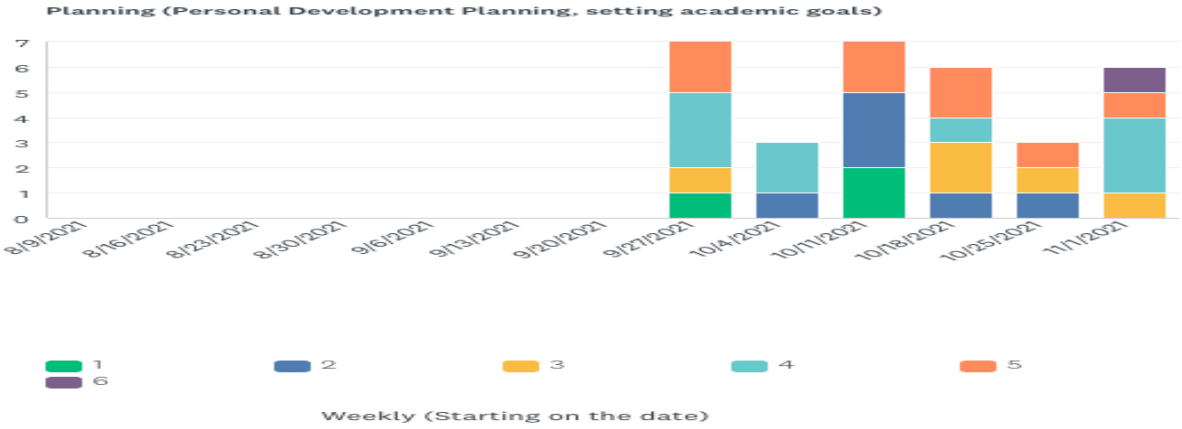


Note. Key for Figure 40: 1-Learning/Reflective Tool, 2- Assessment, 3- Planning, 4, Accountability/Evaluative, 5- Showcase, 6- Other

Five of the 32 survey participants (15%) indicated they can use digital portfolios as an *assessment* tool (see Figure 40).

Figure 41

Using Portfolios for Planning Purposes

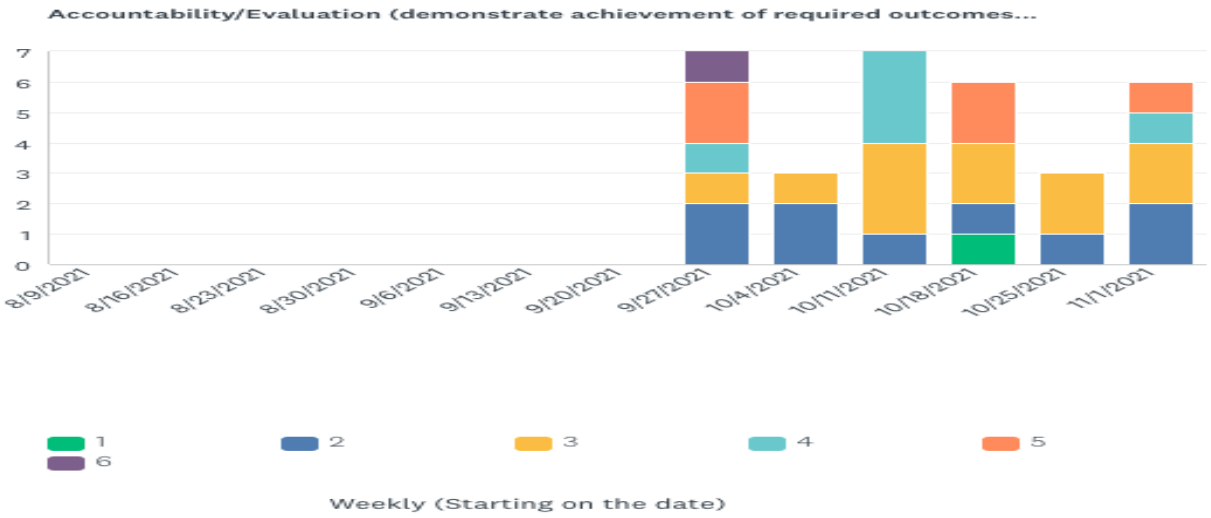


Note. Key for Figure 41: 1-Learning/Reflective Tool, 2- Assessment, 3- Planning, 4, Accountability/Evaluative, 5- Showcase, 6- Other

Five out of the 32 (15%) survey participants indicate they do or can use digital portfolios for *planning* purposes (see Figure 41).

Figure 42

Using Portfolios for Accountability/Evaluation

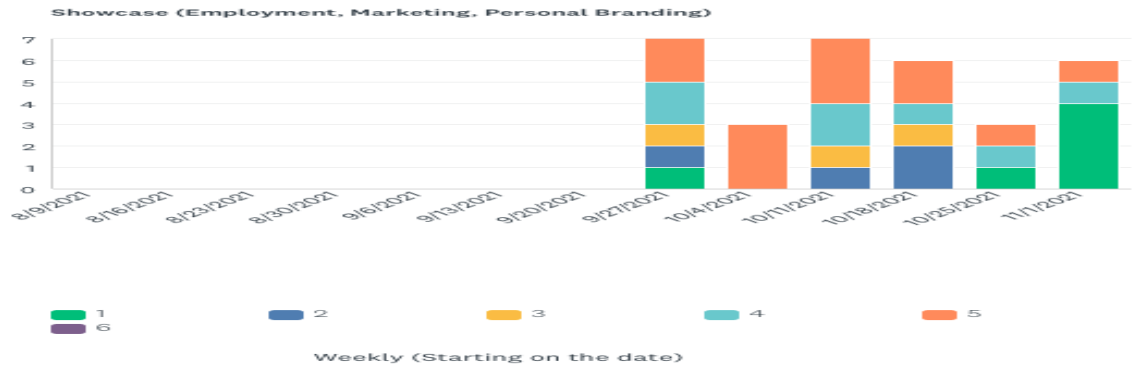


Note. Key for Figure 42: 1-Learning/Reflective Tool, 2- Assessment, 3- Planning, 4, Accountability/Evaluative, 5- Showcase, 6- Other

Five of the 32 survey participants indicated that they can or have used digital portfolios as *accountability/evaluation* tools (see Figure 42).

Figure 43

Using Portfolios as a Showcase Tool

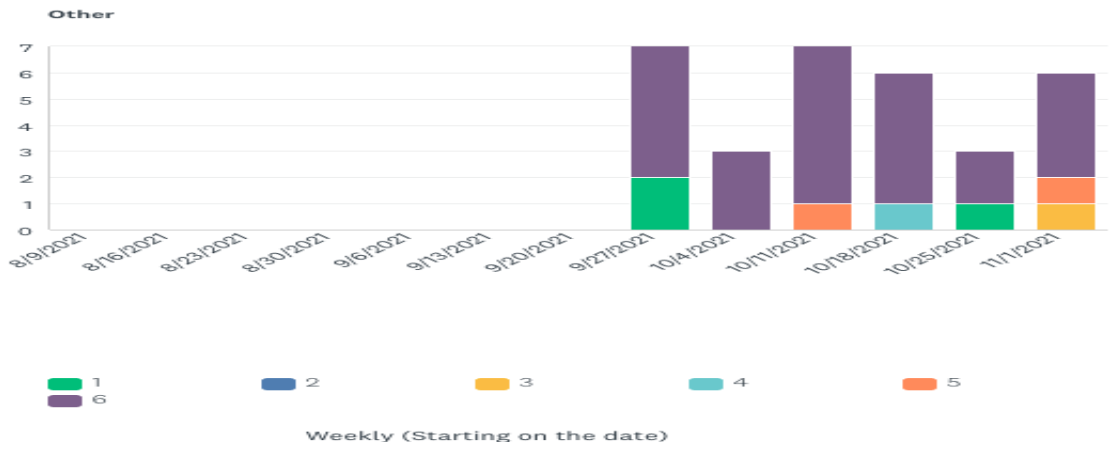


Note. Key for Figure 43: 1-Learning/Reflective Tool, 2- Assessment, 3- Planning, 4, Accountability/Evaluative, 5- Showcase, 6- Other

Twelve out of the 32 (37.5%) survey participants indicated that they can or have used digital portfolios as a *showcase* tool (see Figure 43).

Figure 44

Using Portfolios for Other Purposes



Note. Key for the graph above: 1-Learning/Reflective Tool, 2- Assessment, 3- Planning, 4, Accountability/Evaluative, 5- Showcase, 6- Other

Twenty-five of the 32 (65%) survey participants indicated they can or have used digital portfolios in the *other* category (see Figure 44).

Chapter Summary

This chapter explored the themes of the three research questions that emerged from the data analysis of survey responses from 32 survey participants who are teachers in various schools in Southern California. The survey comprised of multiple questions to address the three research questions:

- RQ1: Do e-portfolios affect student academic performance?
- RQ2: Does the tool improve student subject-matter efficacy?
- RQ3: Do technical skills have an impact on academic performance and curriculum pacing while using e-portfolios?

Each of the research questions above is comprised of sub-questions. Chapter 5 will draw conclusions about the findings, make recommendations for further study, and reflect on the study.

Chapter 5: Discussion, Conclusions, Recommendations, and Reflection

Introduction

Over the last decade, teachers have looked into assessments of student learning aside from traditional examinations. This study looked at various literature in support of the utility of digital portfolios in promoting the self-regulation of student learning. Some students are frustrated with their inability to earn high marks at school due to their poor test-taking abilities. Digital portfolios are also an alternative way of grading students beyond traditional test-taking to measure student learning. Public schools are continually looking for ways to teach students 21st-century skills and technology integration with their subjects in an authentic and purposeful way. The aim of this study was to enhance student learning through the use of digital portfolios in order to improve subject-matter efficacy in the classroom.

The central guiding research question for this dissertation was: can the use of digital portfolios improve student achievement? The guiding questions to the study were:

- RQ1: Do e-portfolios affect student academic performance?
- RQ2: Does the tool improve student subject-matter efficacy?
- RQ3: Do technical skills have an impact on academic performance and curriculum pacing while using e-portfolios?

Discussion of Demographics

There were 32 educators from various schools in an urban school district found in the Southern California area. All 32 survey participants are current secondary school teachers. No students were included in this study. The number of volunteers met the threshold number of participants required for the study. Almost all participants were able to complete the survey, 31 were able to finish the survey, and only one participant skipped the last 10 questions of the

survey. No explanation was given by any participant to why the survey was left incomplete. Regardless, with 32 participants, a rate of 98.6% were able to finish the survey.

Discussion of Results

For RQ1, Do e-portfolios affect student academic performance, the results were mixed. One of the first questions in the survey asked participants whether test scores improved in exams after employing the use of digital portfolios. The average score was 5 out of 10. Another question asked if using the digital portfolios helped teachers see what their students are learning, and the score revealed at about 6 out of 10. When asked if digital portfolios helped students think more about learning in general, teacher participants responded with an average of 5.81 out of 10. When teachers were asked whether students started to care more about their work, the question recorded a 5.63 out of 10. To whether digital portfolios helped students feel more confident, the responses averaged at 5.38 out of 10. When asked about how digital portfolios helped students see where they need to improve, the average score was 5.47 out of 10. When asked if digital portfolios helped teachers judge their students' improvements over time, the score of 6.28 out of 10 was recorded.

For Survey Question 2, "I felt that student test scores improved in the exam after employing digital portfolios in the classroom," the survey result was not significant. The average score was 5 out of 10. With a minimum score of 1 and a maximum score of 7, many of the participants did not seem to think that student testing scores improved significantly with the incorporation of the digital portfolio. More than half of the participants gave a score ranging from a 3 to 5, which states that the portfolios had no significant impact on student scores during summative assessments. The finding is important to know because educators need to be able to learn how digital portfolios may help with learning, but testing skills might be another issue to

address that digital portfolios may not be able to help with. While students may be able to remember more information about their lessons, teacher participants in the survey reported that academic scores did not improve much during testing.

Survey Question 3 asked whether digital portfolios tell teachers the level of their students' understanding about their subject matter. The average score of 6 out of 10 is not statistically significant. With an average score of 5.88, participants indicate that the portfolios produced in their classes were not a good instrument to measure what they know. Similar results came for Survey Question 4, "helps students think more about learning in general," where the average of 5.8 was recorded. Survey Question 5, "helps students care more about their work," averaged at 5.6. Survey Question 6, "helps my students feel confident," averaging at 5.38. And Survey Question 7, "helped my students see where they need to improve," averaged at 5.47.

These first few questions were recorded to have similar averages, suggesting that the incorporation of digital portfolios in the classroom for learning may not have impacted student learning significantly. As for whether digital portfolios helped teachers with judging of their students over time, responses were a bit higher at 6.28 in the mean, but still inconclusive, and when survey participants were asked to whether the usage of digital portfolios have played an effective role in helping with student learning, the mean reported in at 5.69, inconclusive. Further questions were asked to teacher participants to whether digital portfolios provide students more responsibility for their learning, with question ten recording a mean of 5.88, barely more than half said this to be the case. When asked, did using a digital portfolio change the way students have learned, the mean was 5.09. Basic statistics recorded the minimum response score out of thirty-two was one, and the maximum at a 7. The survey participants most likely did not feel that creating the digital portfolio did much to change student learning habits. When asked whether

students learned their academic content standards differently through the use of digital portfolios, results also averaged at a score of 5, which is insignificant.

To address the third research question, "Do Digital Portfolios improve student subject-matter efficacy," the following questions were given to the survey participants. Survey Question to address this asked whether the teacher received positive and informative feedback from students in improving their portfolio. The average score was a 5. When asked whether digital portfolios made students more interested in the subject more than before, teacher participants reported a mean of 4.84, less than the responses from other questions that preceded this particular question. When asked whether digital portfolios exposed what students are learning, the teachers replied with an average of 5.69. Some teachers found the tool useful, but the score was left at a score that is insignificant. For Survey Question 16, "helps students think more about learning in general," the mean is at 7.51. The survey respondents replied more favorably that digital portfolios seem to have an effect in the classroom. The mean was also higher for the next question, "helps my students be better organized about their work work." Of all the questions to be discussed, this Survey Question has the highest mean at 8.2. It is significant in the research as this backs up the idea that digital portfolios do help students organize their thoughts about the subject they are currently learning. Regarding Survey Question 18, "helps my students see where they need to improve," the mean recorded for the survey was at 5.72, insignificant. Prodding further with teachers to whether digital portfolios helped students understand their schoolwork better, a mean of 5.31 was recorded, statistically insignificant. To see if digital portfolios helped students' learning, the mean of 5.47 was recorded. To see if the incorporation of digital portfolios provided more responsibility for students' learning, a mean of 5.91 was recorded (statistically insignificant). To see if using digital portfolios changed how or how much students

have learned, the survey mean was at 5.03 (statistically insignificant). When asked whether survey participants felt that their students learned academic content standards differently, the answer indicated a mean of 5, insignificant. When asked whether teachers thought about how they received both positive and informative feedback on how they could help students improve their portfolio, the response was not very significant. The mean response was at 5.28. When teachers were asked how they perceived the primary purpose of having students develop digital portfolios, survey participants ranked the portfolios as learning tools, showcase, accountability, assessment, and as a planning tool in that order. The question provided the highest mean with digital portfolios as a learning tool, with a mean of 5.13. Fifty-six percent of the teachers in the survey ranked digital portfolios as a learning tool, and 25% ranked it second as a learning tool. The second most popular category was digital portfolios as a showcase tool, where 18% of teachers ranked it as first on their ranking list. When asked "if using digital portfolios with your students is important? The mean score was about 5.69. Regarding Survey Question 27, "increased interactions with students during class," teachers indicated a mean of 6. More than half stated an increase of interactions with their students, but with the maximum score of 7 for this question, the increase was not very significant. To explore the question of whether students replied to the teacher's questions in a timely fashion when creating a digital portfolio, the mean was at 5.19. No significant changes with the average student teacher interactions were reported. Survey Question 29 surveyed teachers whether they felt confident that they would enjoy the process of teaching students on how to create a portfolio, the mean was at 5.39. Some teachers were somewhat excited but not most were. As part of increasing interactions with students and teachers, Survey Question 30 asked if they had to contact students with questions that arose. The mean was at 5.48. The response was similar to the previous questions, where the mean was in the

middle range. When asked whether the process of creating digital portfolios is recommended for the survey participants' courses, again, a similar mean was recorded at 5.29. For Survey Question 30, the survey asked participants if incorporating digital portfolios had taken too much of their class time, the mean score was at 3.16. Surprisingly, most teachers in the survey felt that creating these portfolios were not in the way of their lesson plans or were too cumbersome to employ in the classroom. Similar results were recorded for Survey Question 33, when participants were asked whether digital portfolios "has taken too much of their time outside of classes," the mean score of 3.23 indicated that the incorporation of this tool was not burdensome in their courses. The next question asked if digital portfolios are great tools for collaborating with other teachers, the mean recorded was at 5.13. Many teachers were not too excited about using digital portfolios for collaborating with their peers which was surprising, considering a big push in education for integrated projects with grade-levels or pathways. When asked whether digital portfolio incorporation is something that the teacher participants will continue to do, a mean score of 5.58 were recorded. The average number however was 6, meaning to say a little more than half of survey participants may continue to use digital portfolio projects in their courses when it is appropriate to incorporate. The final question in the survey provided survey participants with open-ended comment entries. Eighteen of the 30 participants stated no questions. One person stated that these questions did not really align to agree or disagree questions. Another participant stated that s/he used digital portfolios before for years in their upper art-level courses. Another art teacher commented that their digital portfolios are specific in parameters as they teach 2-Dimensional Art and Design. Another participant concluded that it is up to the teacher to provide the student buy-in. If the teacher believes in the project, so will the students. This participant continued that most of the time, students only see their learning growth from the scores they

receive after assessments, so digital portfolios allow students to see and reflect on their subject understanding and learning growth. Another teacher mentioned that in their in-school academic support class, they already are working on digital portfolios, so essentially the students were already compiling and tracking their requirements for high school graduation and college applications. Another teacher mentioned that the Covid-19 pandemic paved the way for alternate methods of teaching and thus had some experience working with digital portfolios. Another survey participant commented that the digital portfolio is a great end product to document and present student work. Another participant echoed the sentiment by stating that most students benefit from the structure and organization of digital portfolios because students turn in their work on time and see the value of contributing to the process. The same participant continued by saying that other students who cannot work with deadlines where they cannot continue or contribute to prior stages of digital portfolio stages will struggle to complete their digital portfolios; and these students wait until the last second to finish with work that is *choppy*. The next comment stated that in their digital portfolio creation, students were creating folders of each lesson and found the process to be helpful. Each of the folders included the student work for warm-up activities, all the classwork, and an assessment. Students were also provided with self-reflection activities which helped them see where and how they can be successful in that class. Another survey participant commented that using digital portfolios helped their students do better in understanding their class achievement and their understanding and appreciation of their work in other classes. One participant commented that they actually use the *Bulb* digital portfolio application in class. Finally, the last commenter stated that digital portfolios are a great way for students and teachers to organize content, follow the sequence of the course, or the study guide of the course. However, the last commenter added that digital portfolios do require extra time

outside of the school day to review each student work. Some tasks can provide insight into what the student is learning while the evaluation or interpretation of the tasks can be affected by the level of technical skills that students bring with them. This commenter added that digital portfolios are also a great way to show evidence of their work experience but can be a disadvantage for students who are not technologically educated. The person concludes that as long as the student can use the digital portfolio to express the knowledge gained, then it is an excellent tool. If on the contrary the student just documented facts but cannot expand the explanation of the content, then the portfolio would possibly be not within the student learning style.

What do the Results Mean?

Much of the survey results had averages that made it quite difficult to distinguish the effectiveness of digital portfolio intervention. Much of the survey questions had mean scores averaging in the fives from a 10-point Likert scale, which states that survey responses were mixed. Some say that digital portfolios are either effective or did not have a lot of effectiveness. Others may argue that digital portfolios did have potential as it is a tool that allows students to regulate what they are learning. In either case, the results are unclear to the effectiveness of digital portfolios and how they may improve student achievement overall.

What are the Implications?

The exploratory research provided a snapshot of the digital portfolio as a learning tool. Teachers in this study are indicated that digital portfolios can be part of their teaching tool arsenal in the classroom but not in some parts of their courses. Due to the data collection's insignificant or inconclusive scores, we may need to further investigate the effectiveness of digital portfolio intervention in classrooms in a much longer duration. While this study lasted

thirty days for teachers to conduct their digital portfolio implementation, scores may improve if data collection lasted for a semester or an entire school year. The information recorded in these digital portfolios may allow educators to see the strengths and challenges of their student. The data collected in this study suggested that though not a positive trend, still had some helpful effects on student learning. Future studies should consider collecting artifacts from the participants classrooms to explicitly see essential parts of effective digital portfolio design, effective student content, and the summative assessment of the class.

Are the Results Good or Bad?

Results of this digital portfolio study are somewhat reliable but may also be insignificant or inconclusive, due to the survey scores being found somewhere in the middle of the Likert scale survey questions.

Should Someone do Something About It?

Due to the results reported as having mixed significance, and in much of the survey questions, future researchers should look into expanding the study. Teacher participants were only given about four weeks to complete their digital portfolios. Results may have been different if the study's duration were longer. For example, instead of one month, the study should be moved at a minimum of one quarter (ten weeks), or a semester. Perhaps the scores would provide more clarity regarding student participation and efficacy.

What do You Think of These Results?

Results indicate that there is a level of effectiveness, although the study may have been too short of a time, there is still a statistical significance found in the study regarding the effectiveness of digital portfolios as a learning tool that helps students regulate their own

learning in class, increase their interaction with teachers, and enabled students to organize their thought processes.

How Did This Study Compare to the Literature Review?

Compared to the literature review, results in the survey were not as strong as previous researchers have collected. The idea of constructivism in the digital portfolio construction was meant to elicit for students to construct their own understanding, and to readjust their thoughts. Stefani et al. (2007) emphasized that the student constructs his/her understanding, encouraging the learner to be independent and allow themselves to engage in problems at their own pace. That may be the case in the exercises, however the amount of time given to the study and the lack of interviews from students does not provide this research a clearer understanding to why some students did not improve in their assessments or academic achievement.

Batson (2014) article in situated learning is experience, emphasized situational learning as a constant learning in the real world, both outside and inside the classroom. One major issue is that many of the teachers taught core subjects that were taught using curriculum standards based on the state of California's Department of Education. The topics presented in the classes may not have been linked to outside applications such as utilizing the lessons in the workplace or real-life scenarios. Ozer-Kendig (2010) argued that when technology is integrated into a classroom, student involvement increases. Student involvement in creating the portfolios may increase, but students still need to conduct their reading and note-taking, and pay attention to class discussions. Some students may have participated in the technical creation of digital portfolios but may not have conducted other classroom activities such as reading assignments. Other confounding variables such as attendance and behavior may have affected the quality of the

digital portfolios produced in some of the participants' classes, but were not mentioned in the survey.

Yastıbaş (2013) asserted that students learned to monitor their own learning processes, understanding their strengths and how to overcome their weaknesses, and how to take responsibility for their own learning and progress. This may have been the case in the classrooms, but with teachers indicating that student learning has been more or less insignificant, students may have been focused with explicit tasks at hand. Some classes may have had difficulty with the breadth and depth of learning and that some students may have only focused on the questions or topics discussed in the digital portfolio creation and nothing further that may indicate further learning.

Donnelly's (2010) research on digital portfolios as learning tools in the high school level conducted a qualitative study where research involved the collection of student narratives based on student interviews. This research only provided the survey results from teacher participants and no interviews were conducted. Instead, this research was supposed to extend some of Donnelly's (2010) findings by looking to see for a pattern of teacher responses and to see if there were similarities. Unfortunately, results were vague. The research conducted by Donnelly (2010) provided clearer data to increase understanding of student experience in creating and using the digital portfolio as a learning tool. The Donnelly (2010) study also found that students were more organized with their recall of past works in class. Second, student ability to recall facts, concepts, and procedures increased. Third, students were able to track their own learning growth and a sense of accomplishment. Teacher interviews complemented the student narratives regarding how digital portfolios affected student learning. Donnelly's (2010) study also focused on increasing student self-efficacy, but the study did not prove that the creation of digital portfolios

helped the students understand its impact on learning. Due to the methodological nature of this research (survey), the study focused on asking the teachers if there was an impact on student learning due to the creation of digital portfolios. Teacher participants provided mixed responses that were too inconclusive to state that digital portfolios may have an impact on student learning and regulation.

Comparison to Earlier Studies

Compared to earlier studies, this research adds to the lexicon of knowledge by providing a snapshot of how teachers may feel about the utility of digital portfolios. Comparatively speaking, this study focused on how digital portfolios had an effect on student academic performance, an improvement on subject matter efficacy, and to whether a student's technical skills had an impact on student performance when using digital portfolios. While other studies explored those questions separately, this research was a combination of previous research. Moreover, 10 to 12 years have passed since the popularity of digital portfolios in education. This exploratory study wanted to find out how teachers may see digital portfolios as an option for helping students perform better in their classrooms, or if its utilization is insignificant. Previous studies also were grounded in the collegiate and graduate university level. This study took place in the secondary level, where such studies on digital portfolios are not plentiful.

Researcher's Observations

The results were not clear as the researcher hoped for them to be. Most of the responses were in the middle of the Likert scales. Some teachers were in favor but were countered by others who found them to be insignificant in overall student achievement. Though teachers in the study incorporated digital portfolios in the classroom, the duration given for carrying out the digital portfolio and requesting them to carry out a summative assessment may have been too

short of a period. Expectations were supposed to be more favorable as teachers indicated that teaching the portfolios to their students was not an issue. However, when it came to the graded assessments, grades supposedly remained similar prior to the digital portfolio activities.

Recommendations for Future Study

Although the survey research provided a snapshot of the perceptions of teachers regarding the use of digital portfolios, there is much left to be desired. For one, it is recommended that a mixed-method study be conducted in future studies. Survey research provided some information regarding teacher perceptions of how well the digital portfolios have gone in their classrooms. However, the critical voice here are the students themselves. It is highly urged that interviews and recording the narratives of students as well as teachers are key in grasping the effects of incorporating digital portfolios in learning, and how it may have affected student self-regulated learning and academic achievement in the classroom.

Second, a longer interval period for conducting digital-portfolios in classrooms may be needed. Whereas the data collection was only for a month, it is recommended that observation and data collection should be given in longer intervals. Preferably, a minimum of a semester. This would more likely provide researchers with any patterns that might occur in class with student work.

Third, collecting artifacts from teachers may help future researchers understand if teacher directives and delivery of instruction in digital portfolio creation and learning. It is also recommended that researchers collect a copy of exams given in class to study how questions in summative assessments were directly related to the content found in the class digital portfolios. Future researchers should consider looking into the grades of student work and tests for the unit of study in which digital portfolios were used.

Fourth, research should also create a database for collecting assessment data based on other tasks or standards for the subject matter. This would enable them to help with the triangulation of data regarding the effectiveness of digital portfolio incorporation to student learning.

Fifth, future research should consider collecting survey data, not just teachers. It was difficult to get the truth on how or what students were learning in this study. Future studies should include a student survey which asks questions on the effectiveness of creating their digital portfolios to their subject-matter efficacy and preparation for assessments. This proposed survey should also provide students with an opportunity to comment on how the teacher can modify the incorporation of digital portfolios to enhance their learning.

Chapter Summary

This chapter reported the results of the research-survey analysis of the three research questions. The survey results were discussed. Digital portfolio activities continue to have potential for encouraging student knowledge construction. The study aimed at attempting to improve the understanding of the creation and use of digital portfolios as a learning tool. Moreover, the study aimed to investigate whether digital portfolios had a positive influence on student scores. Another aim of the study was to determine if there was a difference between the learning of high academic performers and underachievers when teachers used digital portfolios. The survey study collected responses from teachers regarding the effectiveness of the incorporation of digital portfolios on student learning and subject-matter efficacy. Survey results however proved to be inconclusive. Further research is required by conducting a longitudinal study and providing the current survey data with substantive qualitative data. Answers to RQ1 yielded inconclusive results on whether digital portfolios affected student performance.

Responses in the survey were 6.28 out of 10. At least more than half of the teachers in the study agreed that the digital portfolios positively impacted student learning. On whether test scores improved in exams after the digital portfolio exercises provided a vague conclusion with survey results in the 5 range out of 10. The third question, do digital portfolios help students with their subject-matter efficacy, the data collected yielded a score of 5.88 out of 10. While the result barely surpassed the middle-point, more than half of the teachers admitted that digital portfolios improved student understanding of what was being learned in the classroom. More time is needed for collecting data. A semester or a period of four months should have been ideal. That would have provided more time for teachers to see emerging patterns compared to the one-month period that they have been allotted in this study.

Although the study did not provide enough evidence of digital portfolios as a tool that greatly improves test scores in classes, it is sufficient to say that there is a positive direction from the scores analyzed in the one-month data-collection period. The scores' vagary may have been a result of not having enough time to see a trend in student learning. Some teachers in the study might not have benefitted with the short amount of time given for carrying out the digital portfolio exercise in the classroom.

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APPENDIX A

Pepperdine's Informed Consent

PEPPERDINE UNIVERSITY

Graduate School of Education and Psychology

INFORMED CONSENT FOR PARTICIPATION IN RESEARCH ACTIVITIES

Note: PLEASE USE SECOND PERSON, SINGLE-SIDED, SINGLE-SPACED. DELETE INSTRUCTIONS IN BOLD PRIOR TO SUBMITTING THIS DOCUMENT)

- **This model is flexible based on the type of research.**
- **Use language and simple sentences understandable to the average 8th-grader. If subjects don't understand the study or procedures, they may not agree to participate.**
- **Instructions are provided below in bold, with example wording.**
- **Delete the instructions and, where applicable, the examples. Revise the document to be consistent with your study/procedures.**

EXPLORING DIGITAL PORTFOLIOS AND THEIR EFFECTS ON TEST SCORES

You are invited to participate in a research study conducted by Dithmar Rualo, M.S. Ed, and Leo Mallette, Ed.D at Pepperdine University, because you are identified as a secondary school educator with technical skills that may help in our research. Your participation is voluntary. You should read the information below, and ask questions about anything that you do not understand, before deciding whether to participate. Please take as much time as you need to read the consent form. You may also decide to discuss participation with your family or friends. If you decide to participate, you will be asked to sign this form. You will also be given a copy of this form for you records.

(All text in the parentheses are instructions for how to complete that section. Be sure to delete this text before submitting the final version.)

PURPOSE OF THE STUDY

The purpose of the study is to look into the effectiveness of digital portfolios as learning tools that can improve test scores. The study will use a snowball-sample to find teachers who already employ digital portfolios in the local area who uses digital portfolios as learning tools to help students improve their subject efficacy, and retain information through constructive means. The study will analyze teacher perceptions of digital portfolio usage in their classroom through an online survey regarding the efficacy of their students after taking part in their digital portfolio activities in the classroom.
The purpose of the study is…

(State what the study is designed to assess or establish. Technical or complicated language should be avoided. Participants should be able to easily understand the purpose of the study and that it is research.)

STUDY PROCEDURES

If you volunteer to participate in this study, you will be asked to carry out their instruction without any modification or external instruction from the researcher. The requirement is that the class participates in a digital portfolio activity, followed by an assessment. You have four weeks to incorporate digital portfolios in your teaching, then provide an assessment to the class. Please observe student achievement as a result of using the digital portfolios as learning tools prior to taking the assessment. After four weeks from agreeing to participate with the study, teachers will be given an online survey. The surveys will be anonymous, and not have any identifiers. No student work or

data will be asked in this study. The survey given will composed of thirty-eight likert-styled questions. All anonymous submissions will secure through Surveymonkey.
If you volunteer to participate in this study, you will be asked to…

(Describe the procedures in the order they will be administered or experienced using simple language, short sentences and short paragraphs. . If several procedures will be used, the use of subheadings may help to organize this section and increase readability. . If scientific terms need to be used, they should be defined and explained. . If experimental procedures will be used, they should be identified as such. . If survey or questionnaire instrument(s) are used, briefly describe the types of questions asked. If applicable to the study, clearly state participants will be photographed and/or audio/video-recorded. Clarify if the participant can still participate in this research study if they do not wish to be audio/video-recorded or photographed.)

(If applicable, specify the participant's assignment to study groups, length of time for participation in each procedure, the approximate total length of time for participation, frequency of procedures, location where the procedures will be take place, etc. For research involving randomization, specify the randomization procedure, for example, "you will be assigned randomly, much like tossing a coin, into…...)

POTENTIAL RISKS AND DISCOMFORTS

The potential and foreseeable risks associated with participation in this study include the loss of free time to their daily lives, and perhaps some stress and or exhaustion normally attached to daily teaching.

The potential and foreseeable risks associated with participation in this study include…

(Describe any reasonable foreseeable risks, discomforts, inconveniences, including physiological risks/discomforts; describe any psychological, social, legal or financial risks to the participant, and how these will be minimized. . If there are no anticipated risks, state so.)

POTENTIAL BENEFITS TO PARTICIPANTS AND/OR TO SOCIETY

While there are no direct benefits to the study participants, there are several anticipated benefits to society which include: being one of the first to gain access to the study's discoveries. Insights discovered in the study will be beneficial to the participants' pedagogical skills.
While there are no direct benefits to the study participants, there are several anticipated benefits to society which include:

(Describe direct benefits from participating in the study. . Also, state the anticipated benefit to society. If there are no anticipated benefits to the participant, state so. . Note that as this is a research study, the benefits are contingent upon the results. . The investigator can state only that benefits are anticipated, not that they will occur. In the vast majority of studies there are no direct benefits to study participants, therefore, address the anticipated benefits to society.)

CONFIDENTIALITY

I will keep your records for this study anonymous as far as permitted by law. However, if I am required to do so by law, I may be required to disclose information collected about you. Examples of the types of issues that would require me to break confidentiality are if you tell me about instances of child abuse and elder abuse. Pepperdine's University's Human Subjects Protection Program (HSPP) may also access the data collected. The HSPP occasionally reviews and monitors research studies to protect the rights and welfare of research subjects.

The data will be stored on a password protected computer in the principal investigators place of residence. The data will be stored for a minimum of three years. The data collected will be de-identified.

There will be no identifiable information obtained in connection with this study. Your name, address or other identifiable information will not be collected.

Any identifiable information obtained in connection with this study will remain confidential..

The data will be stored on a password protected computer in the researcher's office for three years after the study has been completed and then destroyed. I will keep your records for this study ***(anonymous*** *or* ***confidential – cannot be both)*** as far as permitted by law. However, if I am required to do so by law, I may be required to disclose information collected about you. Examples of the types of issues that would require me to break confidentiality are if you tell me about instances of child abuse and elder abuse. . Pepperdine's University's Human Subjects Protection Program (HSPP) may also access the data collected. The HSPP occasionally reviews and monitors research studies to protect the rights and welfare of research subjects.

The data will be stored on a password protected computer in the principal investigators place of (***residence, office, etc…)***. The data will be stored for a minimum of three years. The data collected will be coded, de-identified, identifiable, transcribed etc…

(If the data will be released to a third party or transcribed, please describe this process… if not applicable – then delete)
(State where and how the research data will be stored). [If applicable to the study, describe the participant's right to review/edit the audio/video-recordings or transcripts, who will have access (including transcribers), if the audio/video-recordings will be used for educational purposes, describe how personal identities will be shielded/disguised and, if/when the audio/video-recordings will be erased (approximately). If the audio/video-recordings will be maintained indefinitely, state how anonymity or confidentiality will be maintained. . If information will be released to any other party for any reason, state the person/agency to which the information will be furnished, the nature of the information, and the purpose of the disclosure. Give a brief description of how personal information, research data, and related records stored, etc., to prevent access by unauthorized personnel (list the personnel who have access). .

EXAMPLES:

Example: There will be no identifiable information obtained in connection with this study. Your name, address or other identifiable information will not be collected.

Example: Any identifiable information obtained in connection with this study will remain confidential. Your responses will be coded with a pseudonym and transcript data will be maintained separately. The audio-tapes will be destroyed once they have been transcribed.

Example: The data will be stored on a password protected computer in the researcher's office for three years after the study has been completed and then destroyed. .

PARTICIPATION AND WITHDRAWAL

Your participation is voluntary. Your refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study.

(If appropriate, describe the anticipated circumstances under which participation may be terminated by the investigator without regard to the participant's consent.)
ALTERNATIVES TO FULL PARTICIPATION

The alternative to participation in the study is not participating or completing only the items which you feel comfortable.

EXAMPLES:

Example: Your alternative is to not participate. Your relationship with your employer will not be affected whether you participate or not in this study.

EMERGENCY CARE AND COMPENSATION FOR INJURY (DO NOT DELETE THIS SECTION)

(For greater than minimal risk studies, include the "Emergency Care and Compensation" section which provides evening/emergency phone numbers.)

If you are injured as a direct result of research procedures you will receive medical treatment; however, you or your insurance will be responsible for the cost. Pepperdine University does not provide any monetary compensation for injury

INVESTIGATOR'S CONTACT INFORMATION

I understand that the investigator is willing to answer any inquiries I may have concerning the research herein described. I understand that I may contact Dithmar Rualo at dithmar.rualo@pepperdine.edu or Leo Mallette at leo.mallette@peppedine.edu if I have any other questions or concerns about this research.
I understand that the investigator is willing to answer any inquiries I may have concerning the research herein described. I understand that I may contact ***(insert name and contact information include e-mail address for faculty supervisor or other collaborator)*** if I have any other questions or concerns about this research.

RIGHTS OF RESEARCH PARTICIPANT – IRB CONTACT INFORMATION

If you have questions, concerns or complaints about your rights as a research participant or research in general please contact Dr. Judy Ho, Chairperson of the Graduate & Professional Schools Institutional Review Board at Pepperdine University 6100 Center Drive Suite 500
Los Angeles, CA 90045, 310-568-5753 or gpsirb@pepperdine.edu.

SIGNATURE OF RESEARCH PARTICIPANT

I have read the information provided above. . I have been given a chance to ask questions. . My questions have been answered to my satisfaction and I agree to participate in this study. . I have been given a copy of this form.

AUDIO/VIDEO/PHOTOGRAPHS ***(If this is not applicable to your study and/or if participants do not have a choice of being audio/video-recorded or photographed, delete this section.)***

□ *I agree to be audio/video-recorded /photographed* ***(remove the media not being used)***

□ *I do not want to be audio/video-recorded /photographed* ***(remove the media not being used)***

_____
Name of Participant

_____
_____ _____
_____
Signature of Participant
Date

APPENDIX B

Call for Participants

Hello Fellow Educator,

My name is Dithmar Rualo and I am a doctoral candidate at Pepperdine University. Under the guidance of my dissertation chair, I am working on a research project to explore the impact of digital portfolios on student test scores. For this study, I am seeking teachers who employ digital portfolios and how the method is impacting student learning and summative test scores.

If you have been teaching for at least two years and have access to certain classroom technologies such as chromebooks and internet connection, this study might be for you. Participants will engage in two surveys. Benefits to you include an expanded understanding about the current state of educational technology and your professional role as articulated by the collective opinions and experience of the fellow participants. Your identity will remain anonymous and will not be published in the dissertation manuscript.

For more information and to join the study please refer to “dithmar.net” and click on the button, “participate.” Your help and expertise are greatly appreciated, and I invite you to forward this opportunity to your colleagues at this and other schools.

Sincerely,

Dithmar K. Rualo, Teacher
Pepperdine University, Graduate School of Education and Psychology

APPENDIX C

Efficacy Survey (Powell Study)

Course title:
On average, how many hours do you spend online working with students with digital portfolios each week?

Less than 5 hours
6 – 10 hours
11 – 15 hours
16 – 20 hours
above 20 hours
(Please mark the appropriate number on the scale below each statement.)

(Strongly disagree 1 2 3 4 5 N/A Strongly agree)

Instructor interactions:

1. I had numerous interactions with the students during this class, which aided me in the process of creating a portfolio.

2. I asked the students my questions through different electronic means such as e-mail, discussion board, instant messaging tools, or phone.

3. The students replied to my questions in a timely fashion.

4. I replied to messages from my students.

5. I received both positive feedback and informative feedback on how I could help students improve their portfolio.

Perceived Student Satisfaction with outcome of creating a portfolio

(Strongly disagree 1 2 3 4 5 N/A Strongly agree)

6. I have students who have created portfolios prior to this course, so there were no issues in completing this process.

7. When I began to teach this course, I felt confident that I would enjoy the process of teaching students on how to create a portfolio.

8. During the process of students creating a portfolio, I had to contact the students with questions that arose.

9. During the student process of creating a portfolio, I felt confident enough that my students will be able to problem solve on their own.

10. I would recommend this process for all my courses.

11. I felt that student test scores improved in the exam after employing digital portfolios in the classroom.

APPENDIX D

Kilbane Study (2017)

Please answer the following questions by circling Y for Yes, or N for No

1.) Did using a digital portfolio with your students have any effect on your teaching or planning for teaching? Y N

2.) Did using a digital portfolio change how or how much our students have learned? Y N

3.) Do you think you students learned academic content standards differently through the use of digital portfolios? Y N

4.) Was using digital portfolios with your students important? Y N

5.) Did this project have any effect on your relationship with your students? Y N

6.) Did creating a digital portfolio yourself have any impact on your implementation of digital portfolios with your students? Y N

APPENDIX E

Based on Dr. Elizabeth Hartnell Young's Survey

ESUSD Teacher Survey on Electronic Portfolios, Fall 2009

Who Are You? (to be kept confidential)

1. Grade Levels You Teach (check all that apply)

[ ] Primary (K-3)
[ ] Intermediate (4-6)
[ ] Junior High (7-8)
[ ] High School (9-12)
[ ] Other:

2. What is your prior experience with paper-based portfolios and electronic portfolios?

(Check one in each column)	A. Paper-based portfolios	B. Electronic portfolios
None	[ ]	[ ]
Just starting (less than a year)	[ ]	[ ]
Some experience (1-3 years)	[ ]	[ ]
Lots of experience (3+ years)	[ ]	[ ]

3. What do you perceive to be the primary purpose for having your students develop e-portfolios?

	A. All Purposes (Check all that apply)	B. Primary Purpose (Check only one)
Learning (Reflection, documenting the learning process over time)	[ ]	[ ]
Assessment (Gathering information from student work samples to improve teaching and learning—for both students and teachers)	[ ]	[ ]
Planning (Personal Development Planning, setting academic goals)	[ ]	[ ]
Accountability/Evaluation (demonstrate achievement of required outcomes, goals or standards)	[ ]	[ ]
Showcase (Employment, Marketing, Personal Branding)	[ ]	[ ]
Other (indicate here:)	[ ]	[ ]

4. What tools are you using to create student electronic portfolios? (Check all that apply)

[ ] Common desktop computer tools (i.e., Word, PowerPoint, Acrobat, HyperStudio, iPhoto, other: _____)
[ ] Web authoring tools to create web page portfolios (i.e., Dreamweaver, FrontPage, Composer, iWeb, etc.)
[ ] A server that your school district owns (the xServe in your school)
[ ] Web 2.0 tools (blogs, wikis, Google Apps—Docs and Sites)
[ ] Other: _____

5. Are you currently using any of these Web 2.0 tools: (Check all that apply and indicate which one where indicated.)

[ ] Blogs: _____
[ ] Wikis: _____
[ ] Google Docs ([ ] Documents – [ ] Spreadsheets – [ ] Forms – [ ] Presentations)
[ ] Google Sites
[ ] Other: _____

6. What kind of training/support do you need to implement e-portfolios with your students? (Check all that apply.)

[ ] A. Model lessons for working with e-portfolios at my grade level
[ ] B. Examples of different e-portfolios from other schools or classrooms
[ ] C. Training on generic portfolio processes (**collection, selection, reflection, direction, presentation**)
[ ] D. Training on supporting student reflection about their learning and work samples/artifacts (**meta-cognition**)
[ ] E. Training on **Assessment FOR Learning** and how to use e-portfolios to improve student achievement
[ ] F. Training on **Level 1 e-portfolio technology skills** (digitizing and storing work electronically)
- Digitizing & storing text documents (student writing by hand or on computer)
- Digitizing & storing images (scanning, iPhoto, Photo Booth, digital cameras)
- Digitizing & storing audio (recording audio, podcasting, Audacity)
- Digitizing & storing video (recording, editing & publishing digital video, iMovie)
- Storing digitized work in folders on a server or online in a digital document storage service

[ ] G. Training on **Level 2 e-portfolio technology skills** (collecting and reflecting on work)
- Creating a class portfolio that shows the collective achievements of the class
- Helping students keep a journal/blog for regular reflection on learning, organized chronologically
- Hyperlinking to work samples/artifacts (or adding attachments) to journal/blog entries
- Providing teacher and peer feedback on day-to-day student work stored in journal/blog

[ ] H. Training on **Level 3 e-portfolio technology skills** (creating hyperlinked, thematically-organized e-portfolios)
- Selecting the best authoring software to construct a presentation portfolio (and learning how to use it)
- Helping students select the most appropriate evidence/artifacts to include in their presentation portfolios
- Helping students construct hyperlinked presentation portfolios around specific outcomes, goals or standards
- Helping students write reflections, evaluating their achievement of specific outcomes, goals or standards
- Helping students present or publish their e-portfolios for appropriate audiences

[ ] I. Access to more equipment or software (in this space, indicate name of additional software you need)
- Computers
- Digital still cameras
- Digital video cameras
- Microphones
- Flatbed scanners
- Faster Internet Connection

6. **Have you started implementing e-portfolios with your students?**

[ ] **No** – you have finished this survey. (Please indicate above the barriers you have for implementation)
Thank you for participating!

[ ] **Yes** – **Answer the following questions beginning with the statement: <u>Working with e-portfolios</u>…**
(Circle one SD=Strongly Disagree D= Disagree A= Agree SA=Strongly Agree)

Hartnell Young 2.0 Survey for Teachers:

1.	Has been fun for my students	SD D A SA
0.	Made my students more interested in their work than they were before	SD D A SA
0.	Has taken up too much of my class time	SD D A SA
0.	Has taken up too much of my time outside of classes	SD D A SA
0.	Is good to do with other teachers	SD D A SA
0.	Tells me about what my students are learning	SD D A SA
0.	Helps students think more about learning in general	SD D A SA
0.	Gives us all enough space to store material	SD D A SA

0.	Makes my students take more care with their work	SD D A SA
0.	Helps my students be better organized in their work	SD D A SA
0.	Helps my students to show others what they are really good at	SD D A SA
0.	Gives us all new ways of presenting our work using technology	SD D A SA
0.	Helps my students to be creative	SD D A SA
0.	Helps my students feel confident	SD D A SA
0.	Helps my students see where they need to improve	SD D A SA
0.	Helps me judge how my students have improved over time	SD D A SA
0.	Helps my students show their progress to other people	SD D A SA
0.	Has helped my students understand their school work better	SD D A SA
0.	Was a learning experience for me	SD D A SA
0.	Is something I will continue to do	SD D A SA
0.	Has helped my students' learning	SD D A SA
0.	Was easy for my students	SD D A SA
0.	Gave my students more responsibility for their learning	SD D A SA
0.	Has helped us all to give feedback on other's work	SD D A SA

Created by Dr Elizabeth Hartnell-Young, Learning Sciences Research Institute , University of Nottingham

Thank you for participating in this survey!

APPENDIX F

Rualo E-Portfolio Survey

Q1: Do E-portfolios affect student academic performance?

- I felt that student test scores improved in the exam after employing digital portfolios in the classroom.
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)

- Tells me about what my students are learning?
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)

- Ver2.0 #7 Helps students think more about learning in general
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)
  -

- Ver 2.0 #9 Makes my students take more care with their work
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)

- Ver 2.0#14 Helps my students feel confident?
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)

- Ver 2.0 #15 Helps my students see where they need to improve?
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)

- Ver 2.0 #16 Helps me judge how my students have improved over time?
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)

- Ver 2.0 #21 Has helped my students' learning?
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)

- Ver 2.0 #23 Gave my students more responsibility for their learning?
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)

- Did using a digital portfolio change how or how much our students have learned?
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)

- Do you think your student learned academic content standards differently through the use of digital portfolios?
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)

Q2: Does the tool improve student subject-matter efficacy?

- I received both positive feedback I received both positive and informative feedback on how I could help students improve their portfolio.
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)

- What do you perceive to be the primary purpose for having your students develop e-portfolios?

	A. All Purposes (Check all that apply)	B. Primary Purpose (Check only one)
Learning (Reflection, documenting the learning process over time)	[ ]	[ ]
Assessment (Gathering information from student work samples to improve teaching and learning—for both students and teachers)	[ ]	[ ]
Planning (Personal Development Planning, setting academic goals)	[ ]	[ ]
Accountability/Evaluation (demonstrate achievement of required outcomes, goals or standards)	[ ]	[ ]
Showcase (Employment, Marketing, Personal Branding)	[ ]	[ ]
Other (indicate here:)	[ ]	[ ]

- Made my students more interested in their work than Made my students more interested they were before (Strongly disagree 1 2 3 4 5 N/A Strongly agree)

- Tells me about what my students are learning?
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)

- Helps students think more about learning in general
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)

- Helps my students be better organized about their work
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)

- Helps my students see where they need to improve?
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)

- Has helped my students understand their school work better
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)

- Has helped my students' learning
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)

- Gave my students more responsibility for their learning
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)

- Did using a digital portfolio change how or how much our students have learned? (Strongly disagree 1 2 3 4 5 N/A Strongly agree)

- Do you think your student learned academic content standards differently through the use of digital portfolios?
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree

- Was using digital portfolios with your students important?
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)

Q3: Do technical skills have an impact on academic performance and curriculum pacing while using digital portfolios?

- I had numerous interactions with students during this class, which aided me in the process of creating a portfolio
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)
- The students replied to my questions in a timely fashion
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)
- When I began to teach this course, I felt confident that I would enjoy the process of teaching students oh how to create a portfolio.
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)
- During the process of students creating a portfolio, I had to contact the students with questions that arose.
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)
- I would recommend this process for all my courses.
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)
  -
- **Are you currently using any of these Web 2.0 tools:** (Check all that apply and indicate which one where indicated.)
  - [ ] Blogs: _____
  - [ ] Wikis: _____
  - [ ] Google Docs ([ ] Documents – [ ] Spreadsheets – [ ] Forms – [ ] Presentations)
  - [ ] Google Sites
  - [ ] Other: _____

- Has taken up too much of my class time
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)

- Has taken up too much of my time outside of classes
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)

- Is good to do with other teachers
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)

Gives us all enough space to store material
(Strongly disagree 1 2 3 4 5 N/A Strongly agree)

- Was a learning experience for me
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)

- Is something I will continue to do
  - (Strongly disagree 1 2 3 4 5 N/A Strongly agree)
  -

Ver 2.0 #22 Was easy for my students
(Strongly disagree 1 2 3 4 5 N/A Strongly agree)

-

Thank you for participating in this survey!

APPENDIX G

Pepperdine IRB Approval

Pepperdine University
24255 Pacific Coast Highway
Malibu, CA 90263
TEL: 310-506-4000

NOTICE OF APPROVAL FOR HUMAN RESEARCH

Date: September 21, 2021

Protocol Investigator Name: Dithmar Rualo

Protocol #: 20-11-1463

Project Title: Exploring Digital Portfolios And Their Effect On Test Scores

School: Graduate School of Education and Psychology

Dear Dithmar Rualo:

Thank you for submitting your application for exempt review to Pepperdine University's Institutional Review Board (IRB). We appreciate the work you have done on your proposal. The IRB has reviewed your submitted IRB application and all ancillary materials. Upon review, the IRB has determined that the above entitled project meets the requirements for exemption under the federal regulations 45 CFR 46.101 that govern the protections of human subjects.

Your research must be conducted according to the proposal that was submitted to the IRB. If changes to the approved protocol occur, a revised protocol must be reviewed and approved by the IRB before implementation. For any proposed changes in your research protocol, please submit an amendment to the IRB. Since your study falls under exemption, there is no requirement for continuing IRB review of your project. Please be aware that changes to your protocol may prevent the research from qualifying for exemption from 45 CFR 46.101 and require submission of a new IRB application or other materials to the IRB.

A goal of the IRB is to prevent negative occurrences during any research study. However, despite the best intent, unforeseen circumstances or events may arise during the research. If an unexpected situation or adverse event happens during your investigation, please notify the IRB as soon as possible. We will ask for a complete written explanation of the event and your written response. Other actions also may be required depending on the nature of the event. Details regarding the timeframe in which adverse events must be reported to the IRB and documenting the adverse event can be found in the *Pepperdine University Protection of Human Participants in Research: Policies and Procedures Manual* at community.pepperdine.edu/irb.

Please refer to the protocol number denoted above in all communication or correspondence related to your application and this approval. Should you have additional questions or require clarification of the contents of this letter, please contact the IRB Office. On behalf of the IRB, I wish you success in this scholarly pursuit.

Sincerely,

Judy Ho, Ph.D., IRB Chair

cc: Mrs. Katy Carr, Assistant Provost for Research

APPENDIX H

Permission to Use Portfolio

If you are willing to let us use your portfolio to help future students, please fill out and sign the consent form below. We will use the portfolio anonymously, not identifying you as its author. Also, if there are parts of the portfolio you would prefer us not to use (such as video clips of your students or other student work that is not yours) just specify in the comments section below.

Please detach this page from the rest of the survey when you turn both in, so your name won't be on the survey instrument.

(circle one)
I do / do not give consent for my work to be used to improve the electronic portfolio assignment, as described above, EXCEPT AS I HAVE NOTED BELOW. . I understand that whether or not I give my consent will not affect my grade in any way.

DO NOT use material as described below from my electronic portfolio:

Name Signature