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THE IMPACT OF DIGITAL PORTFOLIOS ON THE ECONOMICS END OF COURSE ASSESSMENT

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This dissertation has been read and approved as fulfilling the partial requirement for the Degree of Doctor of Education in Curriculum and Leadership.

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A Dissertation
Submitted in Partial Fulfillment of
the Requirements for
the Degree of Doctor of Education
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DEDICATION

I am thankful and grateful to the most magnificent, merciful, Almighty God for sustaining me and my family through this process. Thank you for bringing me to this expected end and steadying me for open doors and new beginnings. I dedicate this dissertation to my immediate family: my wife Omeka, my daughters Imani and Ilan, my mother Deborah Moorman-Williams, and especially my grandparents, Louis E. and Ruth A. Moorman. To my grandfather, who survived being a P.O.W. in World War II, then returning to the chaos of being a Black man in America. To my grandmother who overcame losing both of her parents by the age of 10, I salute both of you. You both boldly defied the Jim Crow South's oppressive culture and the up-South Midwest to raise our family through the 1950's, 1960's and 1970's with class and dignity. I dreamed of providing an opportunity to see me, your eldest grandchild, be the first in our family to achieve this milestone. However, the Lord saw fit to bring you to your heavenly homes before I finished. Thank you for your love and the values you instilled into our family.

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ABSTRACT

Digital Portfolios, also known as electronic portfolios, became more visible in the educational landscape. This study employs a causal comparative design to assess the impact of web-based digital portfolios on seniors' standardized economics assessment scores at a Metro Atlanta high school. The purpose of this study is to determine if students' use of digital portfolios caused differences in economics end-of-course (EOC) assessment scores (dependent variable) between different groups of high school students (independent variables) across two years of implementation. Using the first-generation activity theory as the theoretical framework, the researcher frames the study as an activity system where the groups of high school seniors (subjects), digital portfolios (tools), and the objective is earning proficient scores on the economics EOC assessment. Data was collected from the spring 2018 and spring 2019 Georgia Milestones economics assessments and analyzed with a factorial ANOVA. The researcher found statistically significant differences between the mean economics EOC assessment scores of students who used digital portfolios in their economics classes compared to students who did not. Of the students who used digital portfolios, the researcher also found statistically significant differences between students enrolled in AP economics courses compared to students enrolled in regular economics courses and statistically significant differences between gifted and non-gifted students. Implications from the study could initiate a paradigm shift in the approach to purposefully fusing technology into secondary classrooms, especially economics classrooms. Furthermore, the findings of this study could create a demand for more research or training of specific technological strategies to support student learning in economics, preparation for end-of-course tests, and other summative exams.

Keywords: digital portfolios, Georgia Milestones, high school economics, Economics End of course Assessment.

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CHAPTER I

INTRODUCTION

Background of the Problem

As educators have sought innovative approaches to increase student learning, a question has been raised as to which tools high school economics teachers should use to improve standardized test scores. Integrating technology through digital portfolios is an under-researched strategy that could potentially provide answers to that inquiry. Digital portfolios are tools that allow students to digitally store their work, as artifacts, and use those artifacts to reinforce learning and increase information retention (Shepherd & Skrabut, 2011). Teachers and students can access digital portfolios through third-party applications usually offered in the form of a free version with basic utility of features or a paid version with total access to all features. Teachers can post guidelines or instructions to complete tasks while students can respond to tasks by uploading documents, pdfs, pictures, and existing or user-created videos. In addition to these features, many digital portfolios allowed users to share Google drive links, use a drawing board, and screen-record.

Simmons and Williams (2012) claimed digital/e-portfolios gave post-secondary students opportunities to capture evidence of academic and personal growth throughout the progression of a degree program. Given the opportunity and appropriate resources, could high school students be afforded the same benefits of using digital portfolios? An insufficient amount of research has been conducted to explore their impact at the secondary level, specifically in high school economics courses. Digital portfolios offered students and teachers the ability to organize

assignments, give and receive written and verbal feedback, take notes, and communicate to parents or co-teachers.

The economics EOC assessment was a summative assessment administered to public high school seniors enrolled in the Georgia Standards of Excellence (GSE) Economics/Business Free Enterprise course and Advanced Placement (AP) Economics courses. Economics courses were the final social studies requirement for Georgia high school seniors enrolled in public schools. Students were required to earn a minimum grade of 70 in economics to earn credit for the course (GADOE, 2018). The economics EOC functioned as a standardized final exam measuring students' level of mastery of economics content as prescribed by Georgia standards. At the time, the EOC assessment results influenced 20% of students' final grades, a weight applying to all public-school students statewide. Students' scores on EOCs also affected teachers and administrators' annual evaluations including the school's overall rating on the College and Career Readiness Index (CCRPI), the accountability instrument that served as an aggregate snapshot of individual Georgia public schools' overall performance on indicators, i.e. school climate, student growth, graduation rates, just to name a few.

Statement of the Problem

A problem existed in the area of research for secondary education especially secondary economics education. Few quantitative studies examined the impact of digital portfolio use on secondary students' standardized assessment scores. After an exhaustive search, no studies were found that examined the impact of digital portfolio use by high school seniors in Georgia on the scores of the economics EOC assessment. Existing scholarship exclusive to Georgia investigated secondary economics discusses relationships between content-specific professional development and student achievement in economics education (Swinton et.al, 2010). In other states, teachers

who had more economics content training, completed multiple college economics classes, or earned an economics degree have a positive effect on high school students' Test for Economic Literacy scores (Walstad, Rebeck, & Butters, 2013). Scholars found digital portfolios had positive impacts on increasing elementary and middle school students' reading and research skills (Abrami, 2013; Demir & Kutlu, 2016). Qualitative studies described digital portfolios as tools to inspire more reflection, document learning milestones, and encourage student engagement through self-directed learning amongst undergraduate and graduate students in teacher preparation education programs (Burnett & Williams, 2009). Qualitative studies performed in primary and secondary settings have discussed artifacts of student work, student reflections, and students' perceptions of using digital portfolios (Kilbane & Milman, 2017). Additionally, digital portfolios were used depending on the goals of the teacher or organization. Notably, digital portfolios provided alternatives to traditional assessments by showcasing individualized snapshots of student work (Clancy & Gardner, 2017). However, the void of statistical data displaying how digital portfolios affected the learning high school economics students was unfilled. Many possible factors contributed to this problem such as the limitation of time to determine if digital portfolios promote deep learning, previous studies with more breadth than depth, or lack of diversity in data collection methods (Barrett, 2007). If this gap in research remained, stakeholders of secondary and economics education (teachers, students, parents, and communities) could have continued to miss opportunities to improve student achievement and proficiency of students' economic knowledge. The gap in the literature would be addressed by providing quantitative data assessing if the utility of digital portfolios caused a significant impact on the assessment results of secondary students. This study could provide not only economics educators, but also educators teaching various secondary contents with research to support

implementing digital portfolios into their curricula especially if students must complete a standardized test as a requirement to complete the course.

Purpose of the Study

The purpose of this study was to examine the impact of digital portfolios use on students' economics EOC assessment scores and if the use of digital portfolios affected AP students, general education students, gifted students and non-gifted students differently based upon their EOC scores. Historically, high school seniors at the participating high school in Metro Atlanta, GA struggled to meet minimum proficiency levels on the economics EOC assessment. School leaders employed economics teachers to develop creative ideas to increase students' performances. A potential solution to the problem was more purposeful technology integration to improve students' acquisition and retention of knowledge in economics courses. Digital portfolios could have potentially provided the support needed to ignite student growth towards achieving higher scores on the economics EOC assessment.

A causal-comparative design was implemented to investigate whether the use of digital portfolios had a statistically significant impact on the economics EOC assessment scores of high school seniors. Scores were measured against other high school seniors who completed the same Georgia Milestones Economics assessment at the same school, but whose teachers do not use digital portfolios. In addition to comparing scores between students did use and did not use digital portfolios, the researcher evaluated whether digital portfolio use caused differences in the scores between different designations of students; AP Economics students, regular-ed economics students, gifted students, and non-gifted students. All data for the current study was derived from the spring 2018 and spring 2019 Georgia Milestones Economics EOC assessments.

Research Questions and Hypotheses

What is the difference in end-of-course scores for economics between the students who participated in using digital portfolios and those students who did not participate in using digital portfolios across 2 years of implementation?

- H_0: There is not a statistically significant difference in end-of-course scores for economics between the students who participated in digital portfolios and those students who did not participate in using digital portfolios across 2 years of implementation.

H_a: There is a statistically significant difference in end-of-course scores for Economics between the students who participated in digital portfolios and those students who did not participate in using digital portfolios across 2 years of implementation. The following subset of research questions, null, and alternate hypothesis, were used to help answer the overarching research question:

- What is the difference in end-of-course scores for economics between gifted and non-gifted students who participated in digital portfolios across 2 years of implementation?
    - H_0: There is not a statistically significant difference in the end-of-course scores for economics between gifted and non-gifted students who participated in digital portfolios across 2 years of implementation.
    - H_a: There is a statistically significant difference in the end-of-course scores for economics between gifted and non-gifted students who participated in digital portfolios across two years of implementation
- What is the difference in end-of-course scores for economics between general education and advanced placement students who participated in digital portfolios across two years of implementation?

- $H2_0$: There is not a statistically significant difference in the end-of-course scores for economics between general education and advanced placement students who participated in digital portfolios across two years of implementation.
- $H2_a$: There is a statistically significant difference in the end-of-course scores for economics between general education and advanced placement students who participated in digital portfolios across two years of implementation

Theoretical Framework

First-generation Activity theory provided the most appropriate perspective for addressing the problem central to the current study. Activity theory (AT) comes from Lev Vygotsky's (1978) Social Development theory. Vygotsky's initial research analyzed how children's cognition was impacted by their social interactions. Later he developed what we know now as the first generation AT which explains how individuals use semiotic tools to interact with the world around them (Rambe, 2012). Artifacts were tools which helped individuals accomplish pre-determined goals/outcome. In other words, individuals use tools or aids to accomplish personal objectives. The relationship between a subject, (in this case the learner), an object (the expected outcome in which the activity is directed towards), and mediating artifacts (tools that assist the individual to achieve the object) creates the activity system, displayed in Figure 1.

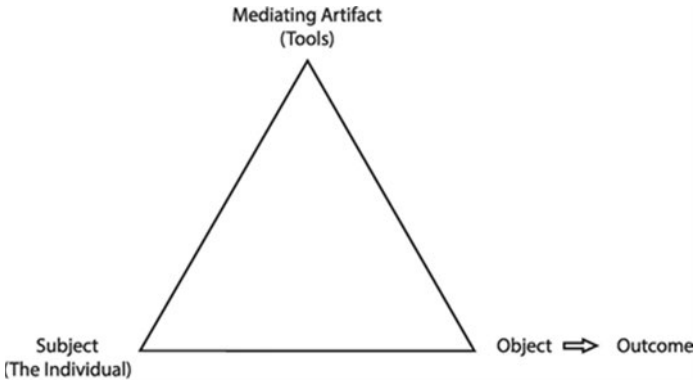

Figure 1. Vygotsky's First-Generation Activity Theory (Vygotsky, 1978).

The current study analyzed the activity system of high school seniors using digital portfolios to prepare for the economics EOC test. The nodes of the activity theory applied to this study included economics' students in the experimental group as subjects, artifacts/tools as digital/electronic portfolios, and the outcome is a proficient performance on the economics EOC assessment. The researcher believed Vygotsky's (1978) activity theory is best suited for analyzing the application of digital portfolios as the mediating tool between the student and passing the end of course test.

Methodology Overview

The researcher employed a quantitative, causal-comparative research design. A causal-comparative research design analyzes relationships between independent variables and the dependent variables after an action has already occurred (Salkind, 2010). The researcher believed this methodology was the most appropriate design because data from the 2017-2018 and 2018-2019 school years were analyzed, the timeframe when digital portfolios were implemented. The researcher determined whether implementation of digital portfolios had an impact on the students' economics EOC scores compared to students who did not. Independent variables were digital portfolio use (yes, no), and student designation (AP/gifted, AP/non-gifted, regular,co-taught). The dependent variable was the economics EOC scale score. The researcher had no control how students were assigned to course sections.

Population and Sampling

The population originated from a high school in Metro Atlanta, GA. The sample included seniors enrolled in AP economics course sections, including both gifted and non-gifted students and students enrolled in regular economics course sections including non-gifted and co-taught students (students with documented learning disabilities). Each participant of the sample

attended class for 50 minutes, five days per week. Each participant in the sample used three web-based portfolios. 'Padlet' was used as a platform for participants to post and access classroom materials digitally from the teacher instead of paper notes. Students accessed teacher's PowerPoints, handouts, instructional videos, homework and class activities. Participants in the sample used Padlet primarily during class while the instructor is teaching to annotate or post notes, post pictures of notes for other students, questions about the class lecture or class activity and post takeaways or seek clarity on topics from peers. Seesaw-The Learning Journal, was as the primary tool used for students to access assignments posted by the teacher, questions, or videos or worksheets where students can complete assignments, take pictures or videos and upload them into a folder for the teacher's feedback. Students also used Seesaw to access and submit assignments when the teacher was absent. Flipgrid was a video application where the teacher organized video boards by topic, and then required students respond by making short instructional videos to check for understanding and give structured feedback. Each participant in the sample used at least one of the three portfolios at least three to four times per week. Since only one economics teacher chose to implement digital portfolio technology, non-probability sampling was most appropriate, as the researcher's goal was to analyze the assessment results students used digital portfolios from the population of all seniors who completed economics EOC assessment.

Data Collection and Instrumentation

For this study, numerical interval data in the form of student test scores, were the key component in determining whether the digital portfolio is an effective technological learning tool. The data collection process included a concise chronological process of obtaining permission from the building leader and school district of the participating high school. Next,

approval to conduct the study was obtained from the Columbus State University IRB. When the IRB granted permission to proceed, the researcher ensured confidentiality and anonymity for all the participants as the study was completed. Electronic retrieval methods served as the instrument used to collect archival EOC assessment data from both spring 2018 and spring 2019 assessments.

Data Analysis

A factorial ANOVA was useful for examining whether multiple independent variables had an impact on the dependent variable. In this study, a factorial ANOVA was utilized to examine the impact of two independent variables: digital portfolio use (students who used digital portfolios and students who did not) and student designation (AP/gifted, AP/non-gifted, regular, co-taught) on student achievement in economics. The dependent variable, EOC scale score represented a summative measure of student achievement in economics. The economics EOC assessment had approximately 76 questions, which assessed all GSE economics standards. Test administration was separated into two parts where students were allowed at 70 minutes to complete each session. Each session was administered based upon each district's testing protocols. The assessment consisted of two types of questions, selected-response (multiple choice) and technology-enhanced questions. Technology-enhanced questions had two correct answers. The four levels of achievement were listed in Figure 2. The GA Milestones score interpretation guide provided concise information on how the economics EOC test scores were calculated and converted. According to the interpretation guide (2019), the purpose of the Georgia Milestone EOC test was to ensure that student learning which was a key component of Georgia's accountability measurements of schools reported on the CCRPI. Using the premise of

the theoretical framework, students who used digital portfolios accomplished the objective of the first-generation activity system if he or she earned the highest score possible.

Achievement levels and Score Conversion of Economics EOC Assessment			
Achievement Level 1 Beginning Learner	Achievement Level 2 Developing Learner	Achievement Level 3 Proficient Learner	Achievement Level 4 Distinguished Learner
Scale Score 140-474 Scale Conversion Grade 0-67	Scale Score 475-524 Scale Conversion Grade 68-79	Scale Score 525-609 Scale Conversion Grade 80-91	Scale Score 610-830 Scale Conversion Grade 92-100

Figure 2. Economics EOC assessment achievement levels and score conversion (GADOE, 2017).

Implications

According to Jacobs (2010), many teachers would like to become more knowledgeable in applying 21st century teaching and learning instruments. However, many had no idea where to start or what to do. The findings of this study could open a window of opportunity for secondary economics educators to begin the process of integrating digital portfolios into their teaching practice. Second, this study could potentially increase the demand for more research or teacher training to design specific strategies for incorporating digital portfolios in the classroom. The information and data from the study could influence scaling the use of digital portfolios to other grade levels and other subjects at the high school level. Moreover, it's possible the findings from this study could initiate a paradigm shift in the approach to fusing technology purposefully to address learning goals or gaps in student learning in economics.

Delimitations and Limitations

Limitations of this study were associated with a few different factors. Due to the ex post facto design, no random assignment of participants in sample groups occurred. The researcher

could not influence how students were organized into classes, whether students were deemed gifted or non-gifted, or whether students were placed in the AP or non-AP section of the economics course. The research was conducted after participants completed the Georgia Milestone assessments. Second, the researcher was not able to adequately determine the causal relationship between the independent and dependent variables (Cohen, Manion, & Morrison, 2007) due to possible extraneous variables. The reason for a student achieved at a proficient level or earned passing scores may not be totally attributed to the use of digital portfolios. Whether other economics teachers in the setting used specific technology other than digital portfolios, or no technology at all is not known. Last, the results may not be generalizable to other populations in different states, as the Georgia Milestones economics EOC assessment was only administered to students in Georgia. Other states used different assessment assessments which may not be comparable to the EOC assessment.

Delimitations of this study included the sample, setting, and choice of digital portfolios. The researcher chose all high school seniors who completed the economics EOC assessment at a large, rural-suburban county of Metro Atlanta. Examining the scores of students in other grade levels who do not take an economics course or who completed the economics EOC assessment at other schools was beyond the scope of the study. The students within the sample designated as "students who used digital portfolios" used Flipgrid, Seesaw, and Padlet, as digital portfolios to prepare for the EOC assessment. Each of the three portfolios had free web-based platforms where the students could use the features of each portfolio from mobile devices or personal computers. Students only used the three platforms mentioned above.

ER Services (2018) claimed improving test scores and student outcomes were a focal point of most education systems. The results of this study could impact how technology is used

by economics teachers. Although no one method has ever proven to work for every student. Digital portfolio integration could serve as means for teachers and students to find more purposeful uses of technology to help students master economic domains.

Definition of Terms

Beginning Learner is a performance descriptor of the EOC assessment. Beginning learners earn the equivalent of a failing score, from (0-67) on the assessment (GADOE, 2019).

Developing Learner is a performance descriptor of the EOC assessment. Developing learners earn the equivalent of a score, from (68-79) on the assessment (GADOE, 2019).

Digital/ePortfolios are collections of different forms of multimedia that represent students' understandings of academic content and give the viewer a snapshot of the student's academic experience. Digital portfolios are also collections of evidence in many forms, written, audio, video, internet, that display a student's skill and knowledge of one or many academic topics. (Niguidula, 2010).

Distinguished Learner is a performance descriptor of the EOC assessment. Distinguished learners earn the equivalent of a score from (92-100) on the assessment (GADOE, 2019).

Economics End of Course Test (EOC) is a Georgia Milestones assessment that functions as a final exam for seniors enrolled in Economics courses at public high schools in Georgia. The exam counts for 20% of the student's overall grade. In addition to a final exam, other purposes for the exam were to ensure student learning, provide data for schools, districts, and Georgia's accountability reports (GADOE, 2019).

Georgia Milestone is the assessment system created by the state of Georgia that creates summative tests for third through 12th grades. The assessment measures the mastery of state standards of core classes in the disciplines of math, social studies, language arts, and science.

Test results were used to inform instructional goals and students' college & career readiness (GADOE, 2018).

Proficient Learner is a performance descriptor of the EOC assessment. Proficient learners earn the equivalent of a score from (80-91) on the assessment (GADOE, 2019).

Significance of the Study

The results of this study could be valuable to many educational leaders and teachers. At the high school level, the body of research relating to the use and impact of electronic portfolios especially for an economics class was almost non-existent. The results of this study could bring awareness of digital portfolios as the technological option high school economics students and teachers can use to increase performances on economics EOC assessments. If digital portfolios had a statistically significant impact on academic achievement, more educators could explore web-based digital portfolios as part of their regular class routine to take notes, submit classwork, submit projects, and provide feedback and promote effective use of technology to improve student performance. Moreover, more school districts, particularly those in states where economics courses were required for graduation, could refer to this research as an entry point to find which technology innovations could best support economics teachers and students.

Summary

In Georgia, high school seniors in public schools had to pass the economics course to receive credit towards graduation. As a result, the economics end of course assessment counted as 20% of seniors' overall economics course grade (GADOE, 2018). Although studies discussing electronic or digital portfolios in higher education were more prevalent than in K-12 education, a limited amount of scholarly research analyzed use of digital portfolios in secondary settings especially for economics education. The purpose of this causal comparative study was to analyze

the differences in economics EOC assessment scores of different groups of high school seniors who used digital portfolios as a tool to earn a passing score. The first-generation Activity theory was chosen as the theoretical framework of the study conducted at a large rural-suburban high school in metro Atlanta. The sample included AP/gifted, AP/non-gifted students and regular (general education) and co-taught economics students. All students who used digital portfolios had the same economics teacher. The population included all high school seniors within the setting who completed the economics end of course assessment. Ultimately, the findings of this study contributed to filling the gap of digital portfolio research for secondary teaching and learning environments, especially for secondary economics education.

CHAPTER II

REVIEW OF LITERATURE

As mentioned in chapter 1, essentially no empirical literature was found regarding the impact of digital portfolios in high school economics courses. The most essential studies in the current literature review were centered on economics instruction and target the following attributes: studies conducted in K-12 or vocational settings, those that incorporated digital/electronic portfolios in an experimental group, studies in which student outcomes of the experimental and control groups were compared, and studies that employed quantitative methodology. The foundational literature essential to the current study was listed in Figure 3.

As a result of the limited amount of literature containing the attributes described above, the researcher discussed literature relating to core elements of the study including first generation Activity theory, digital portfolios, and the presence of economics as an academic discipline nationally and in Georgia, struggles in teaching and learning economics, and the documented practices and pedagogies recommended to improve teaching and learning of economics. Ultimately, the researcher explained how the current study could fill a gap in the research related to digital portfolios in high school economics education.

Theoretical Framework

Activity theory, also known as Cultural Historical Activity Theory, originates from Lev Vygotsky's (1978) Social Development theory. First-generation Activity Theory is Vygotsky's original iteration of the framework, in which he explained human behavior from a social and psychological perspective. His theory was grounded in the belief that the behavior of individuals and their interaction with the world around them is not direct but mediated through artifacts and

tools (physical or intellectual) such as language, text, and speech (Rambe, 2012). A simplified example could be one's understanding of organized crime culture through movies. If one's goal was to have a better understanding of a criminal's lifestyle, the subject would initiate activity through researching and analyzing movies or documentaries about crime or criminals to achieve that objective. Although movies can be loosely based in truth, as tools, they display visual accounts of criminal culture. As the individual watches more movies, he or she forms their understanding of criminal culture via the lens of the mediating artifact (movies). After Vygotsky's death in 1934, Leont'ev (1978), a student of Vygotsky's theory, sought to emphasize the importance of understanding the subject as he or she is embedded into larger systems. Leont'ev's introduction of second-generation activity theory shifted the focus from an individual activity to collective activity of an environment involving the community, rules, and the roles of each individual (division of labor) within the environment (Devane & Squire, 2012). For example, a student/learner whose goal was to earn an "A" on a project, would be impacted by the social interaction from the community more than the tools available to help students achieve a high score. The impact of the community, division of labor, rules of the classroom, standards, and other classmates possibly had an impact on the way the student completes the project.

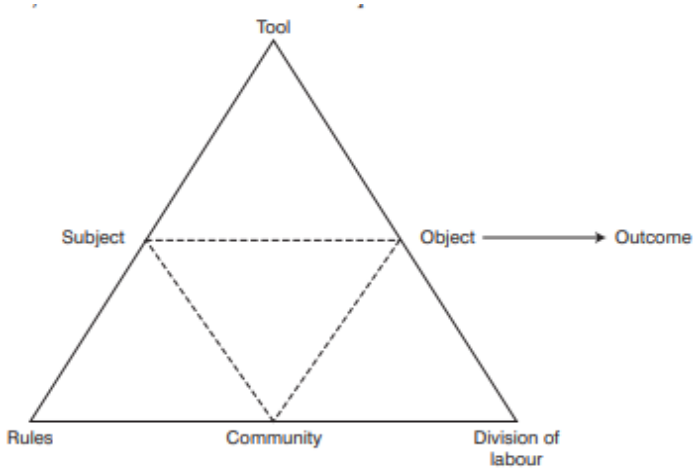

Figure 3. Engstrom's 2nd Generation Activity Theory, Engeström (1987, p.78).

In the third iteration of Activity Theory, Engeström (1987) declared the subject, tool, rules, community, and division of labor were dependent on one another to govern the activity system. Engeström (1999) continued to build the third generation AT by explaining that the objects from multiple activity systems (from different communities) simultaneously interact with one another to produce expansive learning. Expansive learning opened the possibility for activity systems to conceptualize the object to create a more dynamic approach identifying and correcting tensions and conflicts within an activity system (Engeström, 2001). Third generation AT is identified solutions for large scale reforms, departments, curricula or school procedures.

For the current study, Vygotsky's original theory explained the activity system used in this research the best. However, other variations of the AT framework have been used to frame many undergraduate educational studies related to technology. Flavin (2016) used AT in a qualitative study to analyze the use of disruptive technologies and its impact on social relations at universities. Through qualitative research, the author found disruptive technologies (e.g. twitter, Wikipedia, learning management systems) can "disrupt" traditional processes of teaching and learning. Given these online resources were simple to understand students would be more inclined to use them to support their learning. Depending on how the students (subjects) in higher education use these technologies (tools), Flavin (2016) believes that disruptive technologies could potentially threaten the role of lecture in higher education institutions by removing the stigma that it is the "gatekeeper of knowledge", empowering students to acquire knowledge in ways other than formal lecture and seat time in classes. The author recommended further research by reproducing the study with a larger sample. Lewin, Cranmer, and McNicol (2018) used AT to identify conflicts within a lesson-planning activity system for teachers in Europe after a new scenario-led digital pedagogy node was injected into the system. In this

qualitative study, the authors found limitations, such as, time and restrictions (curriculum, testing) from local and regional systems prevent teachers from implementing learning design lesson planning approaches. This disruption ultimately prevented teachers from developing digital pedagogy. The authors recommended more policies be implemented nationally to encourage teacher-led development of digital pedagogy. Morgan (2014) used AT in a qualitative study to synthesize how a group of seven teachers which spanned elementary, middle and high school, purposefully implement technology into their learning activities. The researcher found that teachers' learning design closely followed Engstrom's (1987) version of AT. Teachers connected technology (tools) to the appropriate community of learners (community) to help students satisfy learning goals (object). Based upon the teachers' responses to the interviews, the way technology was incorporated within their systems helped deepen learning and increase learning outcomes for students (outcome). Morgan (2014) recommended further research to determine whether there is a causal relationship between student-centered technology activities and the success of those activities.

The current study intends to apply the fundamental concept of Vygotsky's (1978) first generation activity theory. The object or the goal in this study is for the subjects to earn the highest score possible on the economics EOC assessment. The subjects within the sample were high school seniors at a rural-suburban Metro Atlanta school who used digital portfolios (tools). By assessing the differences between each student group's assessment scores, the researcher was able more clearly determine whether the interaction between students and their digital portfolios impacted their objective. Although activity theory is a common framework applied in education research, most studies were qualitative (Devane & Squire, 2012; Flavin, 2016; Lewin et al., 2018; Rambe, 2012) and were conducted in an undergraduate or graduate setting. Moreover,

none of the existing research cited above utilized Engstrom's (1987) version of the third-generation activity theory and did not address digital/electronic portfolios specifically. The current study sought to fill a gap in research by applying Vygotsky's (1978) original theory of activity within a quantitative study where digital/electronic portfolios were the tools used to accomplish the objective.

Digital Portfolios

A digital portfolio is an application that allows students to create, collect and store artifacts, media, pictures, or notes to provide evidence of accomplishing student learning outcomes. Digital portfolios can be utilized by teachers as a result of finding a web-based portfolio online or using a learning management system where access is usually provided by the school or district. Web-based portfolios usually offer a free version with basic features and paid versions with multiple cost-options based upon each teacher's needs. Both web-based portfolios and learning management systems allow teachers to develop and control a digital space for their students to store video, text, pictures, whiteboards, assignments, and voice notes. Both students and teachers can access and use the features of the portfolio on laptops, desktops, tablets, or cell phones. Teachers can provide feedback on artifacts, remove artifacts, or share artifacts with parents or other teachers. How teachers implemented digital portfolios in class and prompted students to use them varies (Cramer, 2009). Different types of digital portfolios included: assessment portfolios, course portfolios, and presentation portfolios. Course and presentation portfolios allowed teachers to assign students tasks in their portfolios to demonstrate understanding of concepts over time and keep curriculum organized. Typically, assessment portfolios could replace a traditional exam or standardized assessment. Assessment portfolios consisted of two popular methods, assessment of learning and assessment for learning.

Assessment of learning allowed teachers to assess the entire collection of artifacts that display understanding of a standard or topic measured by a rubric or standardized exemplar intended to compare what the student displayed against the requirements or expectations in a summative matter. Assessment for learning techniques required students to upload responses to essential questions or exit tickets as a form of formative assessment (Athanassios, 2012).

When integrated effectively, digital portfolios benefitted students and teachers regardless of the setting (Renwick, 2017). The Association of American Colleges and Universities describes the implementation of digital portfolios as a high impact practice (Watson et.al, 2016). As one of 11 identified high impact practices, digital portfolios were deemed as structurally designed by the institution to measure desired student outcomes in or outside of the classroom (Kuh, 2017). Digital portfolios were designated a high impact practice because they encouraged deeper learning especially for underserved students (Finley & McNair, 2013). For higher education institutions, Yancy (2016) encouraged a multi-leveled departmental implementation of digital portfolios, specifically recommending professors to embed digital portfolios as a significant aspect of the curriculum.

Digital Portfolios in Secondary and Vocational Settings

As a result of a two-year qualitative action research study, Barrett (2007) considered digital portfolios as a beneficial tool/artifact to enhance teaching and learning and found that students were encouraged to become more reflective of their learning. The study observed the effects of the TaskStream e-portfolio system within K-12 settings at 26 participating schools (including 23 high schools) in eight states and one school in Brazil. The overall goal of the study was to determine the impact of using digital portfolios in a secondary setting including as many schools, teachers, and content areas as possible (10% of participating contents were social

studies classes although specific courses, such as economics, were not explicitly stated). Barrett (2007) collected data by observing participants in scheduled site visits and collecting data for students and teachers through online surveys, journals, and focus groups. One of the key research questions from Barrett (2007) as it relates to the current study was determining how e-portfolios provide evidence of deep learning. The author stated it was "impossible" to answer such a complex question given the short period of two years and given the breadth of the study. Due to the many technological limitations between school districts, states and student access to technology outside of school, more time was needed to adequately answer the research questions. Consequently, two of the author's recommendations were to conduct a study for depth i.e., following one or two schools in the same state that use e-portfolios where the assessment requirements were the same, instead of multiple schools in multiple states or countries and conduct a study where secondary students are using different types of e-portfolios instead of one uniform portfolio.

A 2019 study found that creating a digital portfolio via mobile devices made the learning experience more convenient and enjoyable to carpentry students at a vocational institution (Hegerty & Thompson, 2019). This was a mixed-methods study where the participants were 15 vocational students from New Zealand who were earning their certificates in carpentry. The purpose of the study was to explore the lecturer's impact on students' as they developed a portfolio to assess carpentry skills using mobile devices. The participants used Facebook, Evernote or Google Plus to create a digital portfolio displaying the skills they had acquired from their teacher throughout the course. Data were collected during four action research cycles including pre and post surveys, observations, and focus groups. Qualitative data were analyzed by coding and thematic analysis and descriptive statistics were used to analyze survey

data. Some of the most outstanding findings from the study include: 69% of students believed creating the digital portfolio helped them learn, students who developed digital portfolios had retake assessments only a total of 20 times compared to students in other classes who had to retake tests a total of 80 times, and by providing immediate feedback, technical support, and a flexible structure, the role of the instructor was critical.

Other related literature pertaining to high schools discussed how researchers examined digital portfolios' effects on students with special needs, students' perceptions of learning, and professional development for pre-service teachers (Clancy & Gardner, 2017; Donnelly, 2010; Kilbane & Milman, 2017). As digital portfolios were piloted in a specialized private high school serving students with special needs, digital portfolios increased the quality students' work (Clancy & Gardner, 2017). The purpose of the study was to document the process and outcomes of digital portfolios during a three-year implementation process. The participants were administration and teachers at the school (although the quantity was not specifically stated). The digital portfolio system served as a replacement of the previous paper portfolio system due to its many limitations including managing enormous amounts of students' paper artifacts. The digital system was implemented as an alternative to traditional standardized testing. The overall goal of the new system was to assist teachers and students with creating artifacts that display students' mastery of learning domains. Some of the domains included vocational and social/emotional skills that standardized test scores and paper artifacts do not accurately capture.

Furthermore, paper portfolios limited the ability to provide snapshots of students' self-directed learning, engagement, and levels of independence. Because the school serves students with an array of special needs from physical disabilities to autism, the digital portfolio system was seen as an important tool for teachers, stakeholders, students and parents to provide and

assess work samples and artifacts to reflect the domains of a multisensory curriculum. In the study conducted by Clancy and Gardner (2017), one-third of all portfolio entries were service-related, meaning the artifacts captured evidence of students' growth or mastery of skills as a result of speech and occupational therapy as well as vocational and life skills. One of the most notable outcomes was a 31% increase in high quality-defined portfolio entries meeting requirements of report card rubric) student entries, between years 2 and 3. The recommendation was to move towards more digital portfolio integration for special needs environments. The authors believed that digital portfolios were a great tool for educators to conduct more thorough assessments of learning by enabling more student reflection, engagement, and technological integration.

Kilbane and Milman (2017) measured the impact of a digital portfolio on teaching and learning outcomes in a secondary setting. The purpose of the study was to explore the perceived impact of creating digital portfolios on teachers and students. Twenty-nine high school teachers (grades 9-12) participated in the study from 20 different school districts. A mixed methods approach was employed to analyze the results from the questionnaires. The findings suggest digital portfolios had a positive impact on both the teachers and students. Within the qualitative findings, teachers proclaimed that digital portfolios caused them to be more "intentional" in their lesson-development and create activities that more adequately address the requirements of standards. Mentions of increased student engagement and reflective practices recurred throughout the study. In the quantitative findings, 79% of the participating teachers believed the digital portfolio impacted "how or how much" students learned and 72% stated students learned academic content differently because of digital portfolios.

Although Kilbane and Milman (2017) highlighted some perceived benefits of using digital portfolios. Some of the study's limitations were the small number of pre-service participants, a lack of focus on specific content areas or disciplines, and the dominantly qualitative nature of the study which gave little context to any statistical significance of the influence of the digital portfolio. Therefore, the researcher believed the limitations of Kilbane and Milman's (2017) study further appropriated the need for a study to investigate whether digital portfolios can impact student achievement on the economics EOC assessment.

Donnelly (2010) conducted a qualitative study of 27 high school seniors to gain an understanding of students' experiences while creating and using digital portfolios to complete a senior project. One of the author's research questions, "Did creating or using the digital portfolio facilitate your learning?" relates most closely to the current study. After transcribing all of the interviews and analyzing the results, the author found discrepancies between students' thoughts of whether the digital portfolios facilitated their learning. Some students believed the learning was already complete prior to creating the digital portfolio and saw them as tools to organize their work. Other students believed creating and using digital portfolios helped clarify and firm their knowledge of topics in which they previously did not understand. Overall, the author believed digital portfolios had the potential to provide the structure to facilitate deep student learning although the results of his study found that students perceived digital portfolios had little impact on their learning for students. The author recommended future studies to highlight ways digital technologies can promote reflection and metacognition. To understand this possibility more clearly, the following section of literature describes teaching and learning practices within the academic practices of economics.

Digital Portfolios in the Primary and Middle Grades

Although a plethora of research discussed various uses of electronic/digital portfolios for undergraduate and graduate education (Finley &McNair, 2013; Kuh, 2017; Oehlman et.al, 2016; Watson et.al, 2016; Yancy, 2016), limited empirical research exists that examined the impact of digital portfolios in secondary education. Demir and Kutlu (2016) found digital portfolios were highly beneficial for middle school students as they refined their research skills. The purpose of the study was to determine if electronic portfolio applications had an impact on 64 sixth grade students' research skills. The data was collected in two phases, T-Tests were conducted on the pre and post-test data then qualitative data was analyzed. One of Demir and Kutlu's (2016) research questions that was relatable to the current study inquired "Is there a significant difference between the post-test scores of the experimental group, who used electronic portfolios and the control group who did not?"(p.230). According to the quantitative data of the exploratory mixed methods design, the experimental group significantly increased their research skill levels compared to the control who did not use electronic portfolio applications. The effect size calculated was .209, indicating the digital portfolio had a large impact on students' research skills. The qualitative results of the study concluded that the electronic portfolio portal enhanced sixth-grade students' research skills and their attitudes towards conducting research. The researchers recommended further studies on the impact of electronic portfolios on research skills or other cognitive skills at different grade levels.

Abrami et al., (2013) sought to determine if the ePearl digital portfolio caused a significant impact on reading and writing scores of 319 elementary school students on the Canadian Achievement Test (CAT-4). Multivariate analysis of covariance showed the experiment group, consisting of students who were motivated to use ePearl, had significant gains

on the constructed response portion of the CAT-4 assessment than the control group. Based on the study, the authors believe the consistent and well-planned implementation of a tool such as a digital portfolio can have an impact on student learning. Future research recommendations included studies to analyze whether ePearl helps sustain learning gains over time or with different subjects, i.e. math. Although ePearl was not the featured digital portfolio in the current study, it was significant to the current research as it was one of the only studies employing quantitative analysis to validate the impact of a digital portfolio on student learning.

Economics as an Academic Discipline

After WWII, the United States began to assess the value of economic education. At the time, elementary and secondary schools were not equipped to provide even the most basic education about economics or financial literacy. After the Council for Economic Education was created, it spearheaded the effort to develop curriculum tools to equip schools to begin to offer and teach economics courses. The history of economics included more topics related to teacher familiarity with economic content, teaching strategies, and student achievement in economics courses (CEE, 2018).

Economics Courses

In the early 1960s, the question was raised by many academic economists as to why pre-college students need formal economic education. At that time, the average American had no formal education in economics and high school students knew very little about economics (Walstad et.al, 1990). As time passed, the National Assessment for Educational Statistics believed economic literacy was extremely important for individuals and business entities to function in society. Once realized by economists and academics in the past, economic education was needed to equip Americans with knowledge to promote fiscal responsibility with the

economic growth that followed WWII. One of the goals of economic education to prepare young people to make sound decisions that positively impact their financial futures but benefit society (NAES, 2013). Economics courses were offered at both K12 and post-secondary levels. Readers could inquire of the differences between curriculum and the delivery of economics courses at the K12 level and higher education institutions. A key difference in K12 and higher education economics course offerings were the depth of content and structure of the course.

Although more prevalent at the postsecondary level, economics courses had a footprint in the K12 landscape. The Council of Economic Education reported 25 states required an economics course to be offered while 22 states required students to complete an economics course (CEE, 2018). The most comparable economics course offered by high schools to higher education economics courses "Intro to Economics" format where the subject matter delved into deeper concepts of microeconomics, macroeconomics and politics was the AP version of the course, divided into two courses, AP Macroeconomics, and AP Microeconomics. The Collegeboard (2019) organization defined both AP Economics courses as introductory college-level courses.

Secondary Economics Nationally and in Georgia

Georgia was one of only 16 states that require students to take a standardized economics assessment (CEE, 2018). Although Georgia counted its economics EOC assessment as 20% of students' final grade, the criteria explaining how the remaining 15 states incorporate an economics EOC assessment into their graduation requirements were not known. The economics course, as defined by the GADOE, was designed to help students develop a fundamental understanding of economics and free enterprise business concepts supported by the foundational principle of economics as the study of how scarce resources were allocated by individuals,

governments, and businesses (GADOE, 2019). Organized into five separate units, the economics/free enterprise course consisted of basic economics, macroeconomics, microeconomics, international economics and personal finance units (GADOE, 2019). Students who successfully passed the economics course and completed the economics EOC assessment earned a half-credit in social studies, a mandatory requirement for graduation GADOE, 2011).

Standardized Tests of Economics

Standardized testing was a strategy to emphasize the importance of economic education in secondary education (Walstad, 2001a) Figure 4 provided short descriptions of the most popular standardized economics test. The Test of Economic Understanding (TEU) was the first standardized test of economics for secondary students in 1964 (Walstad & Rebeck, 2001a). Through trial, error, and research, academic economists and the Joint Council of Economics Education (JCEE) carried out the tedious work of developing curriculum and testing instruments, determining how courses should be taught and how to prepare teachers. Students who graduated from high school have a fundamental knowledge of how the world works. At the time in the late 1980s, only 15 states offered a one-semester general course and one advanced course for college-bound students in their final year of high school (Becker et.al, 1990). Although there was no uniform determination as to how to what constitutes understanding economics, the TEU needed to be revised. In 1987 the test of economic literacy (TEL) was created by Soper and Walstad (1987) and the Joint Council for Economic Education as a progression from the TEU. The initial assessment was a multiple-choice assessment with 46 questions. The assessment provided an instrument to measure students' learning and inform future curriculum and teaching decisions. In one of the initial administrations of the TEL, 2,483 students earned an average of about 20 correct questions.

Assessment	Description	Citation
Advanced Placement (AP)	National standardized economics test for high-intellect and college-bound students. Students can earn college credit based on their scores.	Becker et.al (1990) Walstad (2001)
National Assessment for Educational Progress (NAEP)	National norm-referenced test serving as a national report card tracking levels of 12th grade students' understanding of economics.	Council for Economic Education (2018)
Test for Economic Literacy (TEL)	Started as the Test of Economic Understanding in 1961 and transformed into the first standardized test of economics. The first TEL was administered in 1987.	Becker et.al (1990) Walstad (2001)
Test Economic Understanding (TEU)	Very first norm-referenced standardized testing instrument for high school economics.	Walstad et.al (2013)
Test Understanding College Economics (TUCE)	A standardized test used to assess the knowledge of undergraduate economics students.	Allgood & Walstad (1999)

Figure 4. Descriptions of known standardized tests used for economics.

To provide context to the problem identified in this research, snapshots of student outcomes nationally and locally were documented to track students' performance. Since standardized economics tests were not federally mandated, student achievement in economics of high school seniors were measured through the National Assessment of Educational Progress (NAEP) Economics Assessment. The researcher decided to include literature referring to the NAEP assessments which provided insight as to how high school students' knowledge of economic education was measured via a national testing instrument. Since 1969, the NAEP

assessment has functioned as a common, national instrument to measure students' understanding of a variety of topics: math, science, reading, just to name a few. The economics assessment however, had only been administered two times, first in 2006 and 2012. The NAEP Economics assessment contained selected-response, open-ended, and constructed-response styled questions covering three primary domains on both assessments (i.e. national economy, market economy, and the international economy; National Center for Education Statistics, 2013). Students' results were reported as a three-digit score then interpreted as one of three achievement levels, "basic", "proficient", and "advanced", only 40% of high school students nationwide scored at a proficient level in 2012 and only 39% scored at a proficient level in 2006. Although the data were dated, the test was administered every six or seven years so new data has yet to be released.

EOC and NAEP Assessments Compared

In Georgia, high school seniors complete the Georgia Milestones economics EOC assessment. The economics EOC contains selected-response questions only, and covers five domains (i.e. fundamentals, microeconomics, macroeconomics, personal finance, and international economics). Table 1 presents a snapshot of the economics EOC assessment structure.

Table 1

Unit Structure and Content Weights for the Economics EOC Assessment

Reporting Category (Unit Topic)	Approximate Percent of the Test	Approximate Number of Points
Fundamental Economic Concepts	23%	14
International Economics	14%	8
Personal Finance Economics	19%	11
Macroeconomics Concepts	21%	13
Microeconomics Concepts	23%	14

Note: This table describes the percentage of questions represented from each unit on the economics EOC assessment (GADOE, 2019).

Like the NAEP assessment, students' scores were reported as a three-digit number, converted to a "grade-equivalent" score, then interpreted as "Beginning Learner", "Developing Learner", "Proficient Learner", "Distinguished Learner". Table 3, displays the scoring categories of the economics EOC (GADOE, 2016). According to the GADOE (2019), 36% of high school seniors in Georgia scored at the "Proficient Learner" level on economics EOC. Although distinct differences existed between the NAEP and EOC assessments, the data revealed opportunities to improve high school seniors' achievement levels on standardized economics tests.

Teaching and Learning Economics

Economists and economic educators were credited with creating guides to both secondary and primary curricula (Walstad & Watts, 2015). Well-trained and knowledgeable economics teachers were essential to students grasping economic concepts. Prior knowledge, experience, and formal training in economic concepts were strong indicators whether students would have success in the K12 Economics course (Watts & Walstad, 2011). Although economics courses and content became more visible over the years in secondary classrooms, the discipline of

economics and its academic teaching emanated from the post-secondary setting. As early as the late 1950s, began the era where society advocated for Economics teaching at all levels instead of exclusively at colleges and universities (Becker, 2000). Teaching economics courses at K12 and secondary levels has evolved. Hence this section of the literature review was necessary to highlight the influences (positive or negative) post-secondary economics pedagogy on K12 economic education.

Teaching Undergraduate Economics

Economics pedagogy depicted how economics courses were typically taught to undergraduates and pre-college students. Therefore, providing context to some of the teaching and learning challenges in undergraduate economics could potentially provide context to the challenges of K12 economics courses. Inadequacies of the traditional delivery of economics content in the classroom while comprising solutions that could provide a progressive impact on student engagement and promote more retention were discussed in multiple works (Becker, 2000: Walstad & Becker, 2010: Watts & Becker, 2008). Becker (2000) believed too many academic economists focused on economics models and theories instead of teaching delivery which has led to the traditional "chalk and talk" teaching method. Chalk and talk was described as a direct instruction method where the teacher/instructor advises students to come to class prepared to take notes while listening to lectures, copying graphs, and writing math formulas. Between the years of 1996-1999, organizations such as the American Economic Association and the Allied Social Science Association created multiple sessions at their conferences to address the needed shift in pedagogical approaches to teaching. As a result, Becker (2000) named (what we know now as) active learning and teaching using the internet as two of the top approaches to teaching economics for the future. Active learning gets students more involved in discussions,

creating games and the designing activities to keep students interested. As improved teaching pedagogies became more of a priority, Walstad and Becker (2010) were concerned about the lack of preparation graduate-level student instructors experienced before they were given teaching assignments. As more Ph.D. students begin showing interest in fulfilling teaching duties, potential issues, such as, lack of training, experience, and language barriers contribute to inferior teaching delivery. Based upon a survey given to 81 Ph.D.-granting economics departments that allowed graduate students to teach economics courses, only 47% of the institutions required graduate student-teachers to take a non-credit teaching course and 32% required graduate student-teachers to take a teaching course for credit as of 2008. Walstad and Becker (2010) believed teaching was challenging and mentorship was a key necessity to prepare graduate students to teach economics and required teaching courses have significant advantages to ensuring the quality of instruction. After conducting surveys over a period of ten years Watts and Becker (2008) found only a minimal improvement of professors incorporating strategies other than chalk and talk in at least four undergraduate economics courses. The first survey included 628 respondents, the second survey 591 respondents, and 477 respondents in the final survey. After analyzing the final survey, Watts and Becker (2008) reported 83% of instructors were still using chalk and talk style of direct instruction where chalkboards and textbooks were the primary tools. The authors recommended professors of economics analyze the long term costs of waning interest in economics courses and declining enrollment as factors in developing more effective teaching methods and hypothesized as older academic economists retire, younger professors could potentially usher in more of the pedagogical strategies noted by Becker (2000). However, many professors have "been challenged" by finding time to balance active learning and chalk and talk (Chiang & Vazquez, 2018). Although studies related to teaching economics to

high school students were atypically discovered, Watts and Schaur (2011) agreed that more student-centered approaches were necessary to teach economics using regardless of where economics classes were offered.

More studies extended Becker's (2000) recommendation of incorporating active learning. A total of 300 students spanning nine different sections of a principles of microeconomics course at Baylor University was the setting where the impact of active learning strategies was compared to chalk and talk on students' achievement. Emerson and Taylor (2004) compared the pre and posttest score of the students' Test of the Understanding of College Economics (TUCE). Of the participants, 59 students in the treatment group used active learning techniques such as simulations and experiments compared to 241 students in a control group who used traditional chalk and talk methods of lecture and notes. Of the qualitative findings, students in the experimental groups rated experiments as the most important course activity compared to homework and quizzes for students in the control group. Using regression analysis, the author reported students in the experimental group had significantly larger improvement by almost 2.9 questions on the TUCE assessment than the control group. Emerson and Taylor (2004) recommended replicating the study in the future to include multiple universities where the experimental strategy is employed in a variety of class sizes. Other studies from Dickie (2006), Lang (1983), and Robinson (2015) studies found similar results of experiential learning in Microeconomics courses.

Teaching Secondary Economics

Teaching economics at the secondary level has similar challenges as teaching economics at the undergraduate and graduate levels. Teacher preparation was one of the causes of lower student achievement (Bosshardt & Watts, 2005). In a previous study, Bosshardt and Watts

(2005) created a report based upon data from a previous longitudinal study detailing the amount of college economics courses completed by high school economics teachers. The authors found 32% of secondary teachers who were certified to teach social studies and 60% of teachers who were not certified to teach social studies had previously not taken an economics course. Their findings underscored the importance of teacher workshops to address teachers' content knowledge deficiencies. Later studies (Allgood &Walstad, 1999; Butters et.al, 2011) confirmed the level of student success in economics increased when economics teachers completed more in-service professional development. Allgood and Walstad (1999) collected assessment data of 24 teachers who participated in the Nebraska Fellows Institute, a three-year pre-service master's program in economics. During each year of the institute, each fellow was assessed by the "Test of Understanding College Economics" (TUCE) to monitor the progress of mastering economics concepts. The purpose of the study was to determine if teachers participation in the institute had an impact on their high school economics students' "Test for Economic Literacy scores. Ultimately, pre and post-test data from institute fellows' students (n=232) was analyzed using a regression analysis. According to the results, teachers' TUCE scores indicated a statistically significant impact on their students' learning. Each point earned on the TUCE assessment by teachers translated into a greater explanation of how their economics knowledge gained from the institute impacted their student's improvement from pre to post test. Although recommendations for future research were not stated, the authors believed if the teachers had not completed the all three years of the institute, they would have not gained enough knowledge to have a significant impact on their students' economic knowledge. According to the authors, most of the teachers' gains in economic knowledge occurred in the third year of the institute.

In many cases, teachers of K12 economics had not completed college economics courses in preparation to teach a high school economics course. Butters, Asarta, and Fischer (2011) established which qualifications an economics teacher should possess to have a significant impact on the student achievement of high school economics students. The study was an extension of Allgood and Walstad's (1999) study with a larger sample size. The data was collected from assessment scores of 942 students ranging from grades 9 through 12 of the Nebraska assessment of economic literacy and 23 teachers. Using regression analysis, Butters et.al, (2011) found the characteristics of post-graduate training in economics, economic knowledge and teaching experience had a significant impact on the outcomes of students. Teachers who had most post-graduate training and in-service teaching experience in economics taught the majority of students who earned higher economic literacy scores. No formal recommendations for future research were listed, however the authors believed teaching high school economics required a firm foundation from college teachers to be effective.

In the studies above, students who made the most improvement on standardized economics tests had teachers who completed a greater amount of college coursework in economics but what about students of teachers who completed professional development training instead of college courses? To test the effectiveness of face-to face workshops for high school economics teachers, Swinton et.al (2010) analyzed over 100,000 Georgia high school seniors' economics EOC scores over a period of five semesters. The results of a regression analysis showed students of teachers who completed at least three economics professional development training sessions by the Georgia Council of Economic Education had a statistically significant increase of almost two standard deviations on the economics EOC assessment scores. One of the limitations reported by the authors were the low percentage of teachers who actually attended

three meetings over the course of a school year. Scores for students whose teachers attended less than three training sessions had no significant improvement. Albeit this study shared the exact dependent variable, assessment results of Georgia economics EOC, as the current study, a gap in the literature existed for the following reasons; data from Swinton et al. (2010) was from the spring 2006 assessment, the economics EOC assessment had changed multiple times in format and weight. The results from Swinton et al. (2010) study further substantiated the need for the current study. The researcher aimed to provide more current research since more than 15 years passed since any research about student outcomes of the economics EOC was examined, post-changes in the curriculum, testing, and teacher standards.

Recommended Strategies for Teaching Economics

As time progressed towards the 21st century, Becker (2000) believed future students will be less likely to sit through a series of lectures only, adding pressure to economics professors to find ways of adopting more innovative teaching strategies. A major challenge to innovative teaching is the lack of training (Walstad & Becker, 2011). Training was important, without it, many economics professors could continue to rely solely on the "chalk and talk", neglecting other important teaching strategies. Consequently, Walstad and Becker (2011) recommended economics departments improve preparation for student teachers by requiring a teaching strategy enrichment course specifically related to economics before being given a teaching assignment.

Pedagogical Content Knowledge

Mentioned in the previous section, teachers were the first step to student success in the economics classroom. Developing pedagogical content knowledge, a construct merging an educators' content knowledge and pedagogy into an effective teaching model (Hiebert & Morris, 2012; Shulman, 1987), jump-starts effective teaching and learning of secondary economics

(Ayers, 2018). Using a qualitative methodology, observations of three distinguished, award-winning high school economics teachers their teaching practices. As a result, Ayers (2018) recommended developing sounder teacher pre-service experience for teaching secondary Economics by creating a PCK framework that could potentially lessen teachers' dependency upon trial-and-error teaching and develop more impactful teaching skills. Active learning strategies were one of the factors that will contribute to effective pedagogical content knowledge of secondary economics teachers (Ayers, 2018). Some of the components of effective teaching of secondary economics included limiting lecturing, implementing student-centered activities, and incorporating various forms of technology (Ayers, 2018).

Problem Based Economics Instruction

Problem Based Learning is an instructional practice that empowers students to assume more ownership of their learning through an inquiry-based, constructivist framework, which allows students to learn by solving "real world" problems (Duch, 1995; Massa, 2008). An alternative to teacher-dominant, chalk and talk economics instruction was problem-based learning (PBL). In a study conducted by the National Council of Economic Education and reported by the Department of Education, a curriculum was created using problem-based principles by the Buck Institute of Education called Problem-Based Economics (PBE).

Finkelstein et al. (2010) tested the impact of the PBE curriculum using the Test of Economic Literacy instrument (Walstad, Rebeck, & Butters, 2013). The researchers used a randomized controlled trial of which 3,921 students were randomly assigned to experimental groups where teachers delivered the curriculum using the PBE curriculum and control groups where a traditional curriculum was delivered. Students were given a pre assessment, teachers from both experimental and control groups administered the classes for two consecutive

semesters, students then completed a posttest. PBE did change students' economic knowledge to a statistically significant degree. The economics literacy scores students in the experimental group exceeded those in the control group. Finkelstein et.al (2010) recommended a replication of the study in the future emphasizing observation of classroom pedagogy.

Similarly, Singh and Bashir (2018) analyzed the effect of the PBL curriculum using a pre/posttest design involving 62 secondary school seniors at a high school in Malaysia. The experimental study was designed to determine the impact of PBL on students' critical thinking skills during an economics course. For 15 class sessions, half of the students were exposed to the PBL curriculum while the half-used conventional learning methods then all students were tested through the Group Test of Intelligence, an instrument selected by the researchers. Students' posttest scores in the experimental group were increased to a statistically significant degree compared to the students who received the conventional learning curriculum. Further study comparing PBL to another teaching strategy was recommended by Singh and Bashir (2018).

The results of both Finkelstein et al. (2010) and Singh and Bashir's (2018) studies were relatable to the current study. Both sets of researchers found PBL to have a statistically significant impact on different variables of students learning in economics. Finkelstein et al. (2010) study was conducted using participants from California and Arizona, where students must complete an economics course to graduate whereas Singh and Bashir's (2018) study used participants internationally. Finkelstein et al. (2010) results were measured using performance tasks via the TEL, a closed-response test, not comparable to the Georgia Milestones EOC test format, which was a limiting factor. Moreover, technology-use was not documented in Finkelstein et al. (2010)'s report whereas Singh and Bashir (2018) recommended school administrators should consider enhancing the curriculum through "technology-based" pedagogies

as an implication for further research. Given the age of Finkelstein et al. (2010) report presents an opportunity for a more comprehensive study measuring the impact of digital portfolios in economic education.

Other Active Learning Approaches

A study quasi-experimental study of secondary students in the Borno State of Nigeria conducted by Muhammad, Bala, and Ladu (2016) tested the effectiveness of lecture versus demonstration on student learning in economics. Interestingly, the objective of economics courses in this part of Nigeria was to prepare students to become self-employed. Of the two schools selected for the study, 104 students were randomly selected from both schools to participate in the study. An equal number of students were randomly assigned to both lecture (control group) and demonstration group (experimental group). Pre-tests of the WAEC-economics test were administered prior to participants in the control group receiving four weeks of instruction using the chalk and talk method which were daily notes, photos and graphs to copy into notebooks and the demonstration group created simulations and active learning techniques. Analysis of the pre and posttest data confirmed both lecture and demonstration were effective strategies for students in the Borno state. However, the group who received the demonstration method displayed a statistically significant increase in the performance at both schools over the lecture group. The researcher cited lack of classroom materials and class time as limitations of the study. Teachers could only use textbooks to deliver instruction and class times were only 40 minutes. Another possible limitation was the interest of the students and teachers in this study. The researcher stated each participant had a great interest in learning economics, which was not a norm in many instances. A work by Roncolato and Koh (2017) reviewed important literature confirming the connection of "body-engagement" to deep learning. Roncolato and Koh (2017)

provided detailed lesson plans to use for macro and microeconomic concepts. Although Roncolato and Koh (2017) targeted undergraduate economics classrooms, body-movement techniques from secondary economics teachers including dance, games, role-play and other activities where students have to move and participate as the primary form of instruction (Morgan, 2012). Using television shows like the Simpsons (Peck & Podemska-Mikluch, 2016) or flipped classrooms were examples of other active learning approaches to teaching economics (Milman, 2012).

Conducting classroom experiments was found as an effective strategy to increase the economic knowledge of secondary economics students. In this experiment, Grol et.al (2017) analyzed the post test scores of different groups of high school students to determine the impact of three different modes of instruction across a series of four different lessons. The first group of 44 students received instruction through classroom experiments, the second group of 49 students observed videos of the instruction received by the first sub-group as their primary vehicle of instruction. Lastly the control group of 41 students who received direct instruction. The results from ANCOVA showed dual findings; students in the experiment and video observation groups increased their economic knowledge significantly compared to the students in the control group but students in the experimental group showed more increases in economic knowledge compared to the video observation group. Grol et al. (2019) recommended research in the future use a delayed posttest or an exploratory model to gauge a greater understanding of the student-student and student-teacher interactions during the experiments.

Technology and Multimedia

Over time, recommendations of utilizing technology-based pedagogies to teach economics became more common amongst researchers, educators, and academics who study

economics pedagogy (Singh & Bashir, 2018). Considering all of the literature regarding active learning, the use of technology and multimedia was mentioned most as an important tool to maximize the potential of active learning strategies. As teachers begin to gain more clarity about the best practices of teaching economics, understanding ways to blend recommended uses of technology with active learning strategies has emerged as a prescribed practice to optimize student outcomes. Using multimedia in economics teaching promotes an opportunity for deeper learning for the student while saving time in class for the instructor (Ding & Li, 2011).

Kumarappan (2016) found students who completed online homework experiments had greater homework and assessment scores than when no online experiments were completed. Over the course of four semesters, 388 students from an entry-level microeconomics class participated in the study to determine whether online experiments improve understanding of economics. The online experiments came from various websites and applications specifically designed to practice economics concepts. During the four semesters of the study, the instructional delivery remained consistent with little to no variations, students completed an experimental set of homework problems where an online experiment was completed prior to attempting a cluster of homework problems and controlled problem sets that did not require an online experiment. Paired data were collected for each student comparing the scores of experimental versus the controlled problem sets. Students' scores were analyzed using paired t-tests and the Wilcoxson signed-rank test. The paired t-test analysis showed the online experiments caused a significant increase in students' understanding for 3 out of 4 semesters while the Wilcoxson test reported significant differences for all semesters. The authors cite large class sizes as a potential explanation as to why online experiments did not cause a significant increase in one semester.

Initializing a plan that enhances students' economic reasoning starts with the instructor (Swan & Hofer, 2011). Technological Pedagogical Content Knowledge, shown in Figure 5, is a general framework by Mishra and Koehler (2006) to add a technology domain to Shulman (1987)'s PCK framework. TPCK was needed by instructors to highlight intricacies of technology integration that didn't exist in the Eighties when Shulman (1987) published the PCK framework. Instructors exhibit TPACK when they can connect technology to a teaching strategy based upon the desired student outcomes. Swan and Hofer (2011) sought to determine if integrating podcasts added any value to effectively teaching economics. The authors conducted a qualitative study including eight high school economics teachers (from seven different schools), who responded to a request for participation sent to all economics teachers in the southern portion of the state. The data collection instruments included surveys, artifacts (lesson plans), interviews, and observations. The findings of the study were conflicting. Each participant successfully incorporated podcasting into their economics lessons within a standards-based environment. The participants determined that podcasting added value to the economics classroom by increasing students' motivation and providing an effective alternative assessment. Findings from the study also discuss podcasting, a specialized tool applicable to any content, not solely a tool specifically for economics. Future research could focus on determining whether podcasting has an impact on student learning.

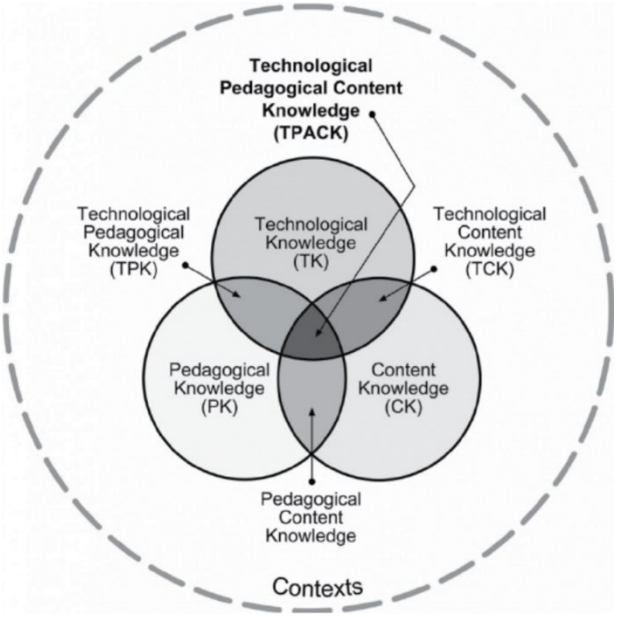

Figure 5. TPACK framework

Flipped Economics Classes with Technology

To provide the most organic experience for students in economics courses, the instructor should streamline the learning experience by strategically implementing the roles of technology, books, homework and active learning according to Chiang and Vazquez (2018). Using multimedia technology is most impactful if instructors created or provided students with videos to be viewed prior in-class lectures. Professors would first assign a pre-lecture video for students to watch outside of class, conduct an introductory activity at the beginning of class for students to recall content from pre-lecture videos. Then, professors implement active learning strategies and develop a constructivist environment during class. Finally, professors would assign challenging homework assignments to reinforce class activities students (Chiang & Vazquez, 2018).

Kumarappan (2016) found students who complete online homework experiments had greater homework and assessment scores than when no online experiments are completed. Over the course of four semesters, 388 students from an entry-level microeconomics class participated

in the study to determine whether online experiments improve understanding of economics. The online experiments came from various websites and applications specifically designed to practice economics concepts. During the four semesters of the study, the instructional delivery remained consistent with little to no variations, students completed an experimental set of homework problems where an online experiment was completed prior to attempting a cluster of homework problems and controlled problem sets that did not require an online experiment. Paired data were collected for each student comparing the scores of experimental versus the controlled problem sets. Students' scores were analyzed using paired t-tests and the Wilcoxson signed-rank test. The paired t-test analysis showed the online experiments caused a significant increase in students' understanding for 3 out of 4 semesters while the Wilcoxson test reported significant differences for all semesters. The authors cite large class sizes as a potential explanation as to why online experiments did not cause a significant increase in one semester.

Active learning and face-to-face activities preceded by video lectures was noted as a component of flipped learning (Abío et al., 2019; Balaban et al., 2016; Chiang & Vasquez, 2016). Multimedia was cited as a key tool to prepare students for college economics classes. Chiang and Vasquez (2016) organized a controlled clinical trial of 82 students who had not taken economics courses in high school or at a university. The participants were recruited and placed in an experimental group that read the pre-lecture modules prior to their upcoming class and a control group who only read the key concepts in a textbook. The researchers developed four, 17-minute video previews about the key concepts in the upcoming class session with embedded questions. Once the participants were assigned to groups, the study consisted of three class sessions where the sessions included instruction and assessments. A final session to test knowledge retention occurred two weeks after the final session where the participants completed

a multiple-choice assessment created by the researchers. The data was collected and analyzed using an Ordinary Least Squares regression. The multimedia group's scores far exceeded the control group to a statistically significant degree and their retention of the concepts also exceeded the control group with statistical significance. A key recommendation for future research was to organize clinical research analyzing the effects of visual stimuli and text together in highly structured economics courses. Chiang and Vasquez's (2016) illuminate the gap the current study provides the opportunity to fill. Digital portfolios enable students to control multi-media, text, pictures, and drawings in a highly structured course with a standardized testing instrument.

How do flipped methods combined with supplemental teaching methods impact students who had to retake courses in economic theory? Abío et al., (2019) determined by a mixed method study that a blended method of flipped teaching, small-group accountability, and frequent assessment enhanced college students' learning who initially failed their economics courses. A study at the University of Barcelona sought to determine if reteaching students in the Groups of Intensive Study program using alternate teaching strategies was more effective than the initial traditional instruction students received in the previous course. Over the course of three semesters, students retaking four different economics courses were placed in seven different groups of about 68 students per group (total=n=610). Each group was separated into three or four-person teams and redelivered the economics course using a blend of flipped learning, frequent assessments, and team-based learning. After given an option, 478 students decided to follow the frequent assessment track where they completed mandatory online modules and quizzes to be completed prior to class. In class, their groups discussed the gaps in their understanding based on the pre-class modules. The remainder of the students who chose the

single-test format, did not attempt pre-class modules and opted to take the final exam only at the end of the course. Although the data analysis was not explicitly listed, the number of students who passed the course rose 50% compared to the old traditional lecture and test format. According to the responses of questionnaires 68% of the participants preferred the blended method over the traditional method while 12% preferred a combination of both blended and traditional methods.

The impact of flipped learning techniques was measured in a study by Balaban et.al (2016) comparing the final exam results of a professor's introductory economics class taught in different semesters. The class format included a large lecture hall setting consisting of between 300 and 400 students' in-class sessions at the University of North Carolina at Chapel Hill. One set of participants received traditional instruction in the fall semester while the second set of students received the flipped learning modules the following fall semester when the course was offered again. The participants in Balaban et.al (2016) study participants averaged an age of 20 years in both treatment and non-treatment groups. Over 70% of students were non-economics majors fulfilling a class for a graduation requirement. Students who received the flipped learning treatment's final exam scores were almost seven percentage points greater (0.5 standard deviations improved) compared to the traditional lecture group. Although the impact is remarkable, we cannot be sure how flipped learning would impact high school seniors as compared to the characteristics of the participants. Again, the role of technology in flipped learning was used exclusively in the form of video lectures viewed by students to prepare for class.

Gaps in the Literature and Summary

Research of digital /electronic portfolios in secondary education is an emerging field of study. As such, literature pertaining to digital portfolios in secondary education, specifically economic education, was uncommon based on the lack of research currently available. After performing an exhaustive search, many studies discuss economics, secondary economics, digital portfolios, and student achievement exclusive of each other, but no studies were found related to digital portfolios, secondary education, and economics studied together. The foundational studies cited in this literature review were featured in the concept chart at the beginning of the chapter in Figure 2. These studies generally reviewed the utility of digital portfolios to improve a skill or environment in a secondary setting, student achievement in economics or improving student achievement in economics using a form of technology. In addition to the studies cited in this chapter, other essential studies that further validate the current study filling a gap in the literature were presented in Figure 7. Each of the studies in Figure 7 include one or two key elements in the current study but not all of the following: a quantitative methodology, a high school or K12 setting, participants-students in economics courses, the purpose of the study was to implement digital portfolios to enhance student achievement, groups were established to compare data from an economics assessment.

Additional Empirical Studies Supporting the Gaps in Literature for the Current Study.						
Study	**Discusses teaching, learning or student achievement in K12 subjects other than economics.**	**Discusses teaching, learning, or student achievement in secondary economics classes.**	**Purpose of the study incorporates a Digital Portfolio to enhance teaching or learning.**	**Quantitative**	**Analyzes differences in economics assessment performance between different groups of students.**	**Results or Recommendations for Future Research**
Karlin et.al (2016)	Study impacted middle through high school students in computer literacy and language arts classes.		Researchers explored participants' reflections of creating and implementing digital portfolios using Schoolology, Wix, and Google Sites.			Questionnaire data indicated teachers should continue to implement digital portfolios. Researcher recommended quantitative research to determine the impact of digital portfolios on students.
Sober (2017)		The researcher discusses the importance of using secondary economics courses to emphasize economic decision-making.				
Freund (2015)		The researcher discussed teacher preparedness to teach economics standards across all grade levels in Arkansas.		Multiple Regression, One-Way ANOVA, Factorial ANOVA, MANOVA		Only elementary teachers were adequately prepared to administer instruction of economics standards.

Lai et.al (2020)		The researchers examined the use of flipped instruction on student achievement and students' motivation		Mixed Methods, Pre and Posttest	Control group received direct instruction while the experimental group received small group flipped instruction	Researchers found participants in the experimental group outperformed the participants in the control group.
Deplazes (2014)		Researcher compared assessment scores of multiple sub-domains, i.e. economics, world history, and civics. blended into state standardized social studies exam		Analyzed students' achievement on the economics questions within a state, standardized government/ History exam.	Students were compared based upon grade level, demographics, and gender.	Middle school students scored higher on economics questions than high school students.
Ghany & Alzouebi (2019)	Study explored teachers' in the United Arab Emerites attitudes towards integrating digital portfolios to enhance 21st Century learning.			Mixed Methods		Participants in the study were optimistic towards using digital portfolios however they would need to complete extensive training.
Karami et.al (2018)	Study examined the impact of digital portfolios on Iranian students' English writing proficiency.			One-way ANOVA	Control group received traditional instruction for writing, experimental groups received eportfolio method for writing.	Portfolio assessment had a significant impact on students writing proficiency.

Figure 6. Gaps in the literature

After a critical reflection on the current literature presented in this review, chalk and talk-styled direct instruction is the most dominant style of teaching economics yet one of the least effective (Becker, 2000). Teachers of economics should consider improving pedagogy to improving student achievement. Based upon current literature, it is evident that content knowledge, teacher preparation, and teaching methods alternative to lecture have significantly impacted student achievement in economics. Providing content-specific training, project or problem-based learning activities, and demonstrations that engage the student more were found as effective ways to increase students' achievement (Allgood & Walstad, 1999; Balban et.al, 2016; Finkelstein et.al, 2010).

Finally, elements of digital portfolios such as multimedia, flipped instructional strategies, where a digital portfolio could enhance teaching during instruction, emerged as recurring recommendations to improve teaching economics, but not digital portfolios. As a technological resource, the reputation of digital portfolios were those of a favorable technological tool to provide a platform to organize student work, promote reflection, increase engagement and student-centered learning, document student growth (Barrett, 2007), provide an alternate means of assessment for students with special needs (Kilbane & Milman, 2017), and incorporate multiple multi-media features (which were known to increase student motivation and connect to standards-based curriculum). Furthermore, digital portfolios had positive impacts on student achievement for elementary and middle school students for reading and research (Damir & Kutlu, 2016). The researcher aspires to extend the body of empirical knowledge by analyzing differences in standardized economics assessment scores of seniors who used digital portfolios compared to students that did not. Furthermore, the researcher will determine if digital portfolio use caused differences in assessment scores between various groups of the students who used

digital portfolios to prepare for the economics EOC assessment. The current study is well-positioned to address the gap in empirical data discussing digital portfolios and student achievement in secondary economics.

Concept Chart of Essential Studies				
Study	**Purpose**	**Participants**	**Design/Analysis**	**Outcome**
Abrami et.al (2013)	Determine the impact of electronic portfolios on elementary students' reading, writing, and self-regulation	21 Elementary School teachers and 319 elementary students	Quantitative/Multivariate and Univariate Analysis.	Significant differences existed between the experimental group and control groups on the posttest for reading, writing, and self-regulation.
Balban et.al (2016)	Determine the effectiveness of using a flipped class teaching model on student performance in a college economics course.	836 undergraduate college students	Quantitative/Ordinary Least-Squares Regression	Students in the class where the flipped classroom approach had more positive impact on the final exam scores than students in the traditional class.
Barrett (2007)	Determine the impact of digital portfolios on student learning, motivation, and engagement in secondary schools	2400 students, 60 teachers from 26 schools (23 high schools) from eight different states and one school in Brazil.	Action Research/Qualitative	Students stated they liked how the e-portfolio helped them stay organized. No evidence of the e-portfolio causing deeper learning was found due to the short period of implementation and breadth of participants.
Demir & Kutlu (2016)	Examine the effect of using digital portfolio applications on 6th grade learners' research skills.	64 sixth-grade students	Case Study Qualitative Data: Mixed Methods Quantitative Data: Independent and Squared-Samples T-Test, Quasi-experimental design.	The experimental group who used digital portfolio applications had significantly increased research skills compared to the control group.
Hegarty & Thompson (2019)	To explore the lecturer's impact on students' as they developed a portfolio to assess carpentry skills using mobile devices. The participants used Facebook, Evernote or Google Plus to create a digital portfolio displaying the skills they had acquired from their teacher throughout the course.	15 Vocational students, lecturer	Participatory Action Research/Mixed Methods.	The lecturer was essential to student learning, 69% of students believed creating the digital portfolio helped them learn, students who developed digital portfolios had retake assessments only a total of 20 times compared to students in other classes who had to retake or sit for tests a total of 80 times

Figure 7. Concept Chart of Essential Studies

CHAPTER III

METHODOLOGY

The purpose of this research is to examine the impact of digital portfolios on the EOC assessment scores of high school economics students. Currently, existing research suggests digital portfolios could be a formidable tool in higher education and in K12 education, although very few studies discuss these benefits (Barrett 2007; Watson et al. 2016). The problem, established earlier in Ch.1, is that few quantitative studies examine the impact of digital portfolio use on secondary students' standardized assessment scores. Could digital portfolios be meaningful tools to enhance student achievement in high school economics? The rationale of identifying the problem was influenced by the need to improve students' performances in economics from the target population. Students from the target school have historically and consistently performed at the lowest levels of proficiency on the economics EOC assessment compared to other high schools within the district. Ironically, the researcher found a gap in literature related to the impact of digital portfolios on K12 economic education which further influenced the inquiry for this study.

The purpose of this study is to determine whether use of digital portfolios made a statistically significant difference in EOC assessment scores between students who used digital portfolios and students who did not. Furthermore sub questions were developed to determine if there were differences in the scores between gifted, non-gifted students, and between AP and regular education students who used digital portfolios. Digital portfolios are web-based applications that allow the user to store artifacts in the form of text, videos, voiceovers, etc. In this study, students who used digital portfolios used one or both web-based platforms Seesaw and or Padlet to take notes or create and submit projects/assignments. Seesaw is an online

platform where the teacher can register for a free or paid account. After creating an account, teachers can set up classes and invite students. Once students have responded to the teacher's invitation, students can begin adding artifacts to their individual portfolio. Teachers can monitor and control each portfolio. Students can't see each other's portfolios but they can upload pictures, videos from the internet, videos from a cell phone, pdf files, and google drive files of their own work samples. Seesaw also gives students the option to use a whiteboard to create drawings or use digital ink to draw over uploaded pictures and use the voice options to explain their work or thought process. The last option students have when using Seesaw is to add voice overs to any artifact. Padlet has similar features, but instead of students can upload pictures, pdfs, and google drives artifacts to their own pre-made folder, artifacts were uploaded to a shared class page where students and the teacher can see each post. Teacher has total control of security permissions and how each student can comment or contribute to the application.

Research Design

The researcher seeks to determine if using a digital portfolio made a statistically significant difference in the economics EOC scores between students who used the digital portfolio in their economics classes compared to students who did not. Moreover, did using the digital portfolio cause differences in the assessment scores between different classifications of students, over a period of two years. The objective of this chapter is to discuss the research design, role of the researcher, participants, instrumentation, data collection and analysis. A review of the research questions are below.

The primary research question guiding this study is: What is the difference in end-of-course scores for economics between the students who participated in digital portfolios and those students who did not participate in digital portfolios across 2 years of implementation? The

corresponding null and alternate hypothesis are:

- H_0: There is not a statistically significant difference in end-of-course scores for economics between the students who participated in digital portfolios and those students who did not participate in digital portfolios across 2 years of implementation.
- H_a: There is a statistically significant difference in end-of-course scores for Economics between the students who participated in digital portfolios and those students who did not participate in digital portfolios across 2 years of implementation.

The following subset of research questions, null and alternative hypotheses will assist the researcher in answering the overarching research question are:

- Sub RQ1: What is the difference in end-of-course scores for economics between gifted and non-gifted students who participated in digital portfolios across 2 years of implementation?
    - H_0: There is not a statistically significant difference in the end-of-course scores for economics between gifted and non-gifted students who participated in digital portfolios across 2 years of implementation.
    - H_a: There is a statistically significant difference in the end-of-course scores for economics between gifted and non-gifted students who participated in digital portfolios across two years of implementation
- Sub RQ2: What is the difference in end-of-course scores for economics between general education and Advanced Placement students who participated in digital portfolios across two years of implementation?

- $H2_0$: There is not a statistically significant difference in the end-of-course scores for economics between general education and advanced placement students who participated in digital portfolios across two years of implementation.
- $H2_a$: There is a statistically significant difference in the end-of-course scores for economics between general education and advanced placement students who participated in digital portfolios across two years of implementation.

The premise of quantitative research is to analyze numerical data to measure differences between variables. The answers to the research questions of the study were reliant upon analyzing pre-existing test data, therefore a quantitative methodology is necessary to accomplish the goals of this study. Compared to other quantitative designs, a causal-comparative design is most appropriate for this study because of its non-experimental nature. In this study students were not randomly assigned to control or experimental groups because they had already been assigned to class sections prior to the inception of this study. The researcher had no influence over the placement of students into economics course sections, assessment protocols/procedures, nor how other economics 'teachers chose to incorporate technological tools with students. Furthermore, analyzing a potential causal effect between groups is an additional reason to incorporate a causal comparative design. The researcher will compare the impact of two or more independent variables on a dependent variable from an activity which has already occurred (Creswell, 2009). The independent variables were digital portfolio integration (used or not used) and student classification (gifted, not-gifted, general education, AP) and the dependent variable is the economics EOC assessment scores. The researcher will analyze existing assessment data from the 2017-2018 and 2018-2019 economics EOC assessment to determine if the use of a digital portfolio caused a difference in the assessment scores of multiple groups. Additionally, the non-

experimental design absolves the possibility of ethical issues. Because archival data was collected, informed consent nor interaction with the teachers or students was necessary.

Participants

The setting of the current study is a rural/suburban high school in Metro Atlanta, Georgia with an average annual student enrollment of about 2,500 students (Governor's Office of Student Achievement, 2019). The target school's student demographics include 79% African American, 9% Caucasian, 8% Hispanic, 3% Multi-racial, and 1% Asian/Pacific Islander. The population of the current study consists of former high school seniors who completed the economics EOC assessment at the target school between the 2017-2018 and 2018-2019 school years, the main criteria for inclusion into the population. Students enrolled in ninth, tenth, and eleventh grades were not enrolled in economics sections at the time, did not take the economics EOC assessment, and therefore were not included in the population. The participants (n= 1,114) include approximately 555 students for year 2017-18 and 559 students for year 2018-2019. In year one (2017-18), the target school had a total of 23 sections of economics courses and 26 sections in year two (2018-19). Details of the sections taught were included in Table 2 below. The researcher is the teacher of record for six sections of economics courses in both school years the data from the study references. At the time, the researcher was one of only two teachers who taught economics during both school years at the target school. Other economics teachers either taught a different subject at the school prior to the 2017-18 or 2018-19 year then switched to economics, as first year in-service teachers during that time.

Table 2

Number of Economics Sections Taught by Teacher

	Teacher A*	Teacher B*	Teacher C	Teacher D*	Teacher E	Total
# of sections taught 2017-18	6	5	4	4	4	23
# of sections taught 2018-19	6	5	5	6	4	26

*teacher of these sections taught Economics within the target population in both years of the study.

Non-probability sampling was employed to extract samples of different student groups who completed the economics EOC assessment. Non-probability sampling was appropriate for this study for two main reasons; the researcher is analyzing archival data, therefore students did not actually participate in an experiment. Second, non-probability sampling allowed the researcher to identify course sections where students utilized digital portfolios. Sampling for the study included comparing subgroups of the population: students who used a digital portfolio, students who did not use a digital portfolio, students recognized as gifted, students considered "regular education" who were not recognized as gifted, students enrolled in the advanced placement economics, and students who were enrolled in the general education course. The general education economics course was referred to as the Georgia Standards of Excellence (GSE) Economics/Business Free Enterprise course. Figure 8 displays the criteria for students in Georgia to be considered gifted and receive services designed for gifted students. Students who were placed in the AP sections of the economics course were selected based upon criteria created by the school administration. Students within the target population were recommended for the Advanced Placement economics course either by their 11th grade social studies instructor, academic counselor, or automatically placed if students were members of the magnet program. AP Economics courses sections contained both gifted and non-gifted students.

The recommended sample size needed to conduct the study was generated using G-Power

analysis. G-Power mathematically estimates the strength of the relationship between independent and dependent variables. For a two-way analysis of variance, the power parameter of .80, recognized by Cohen (1992) and an acceptable power level, an alpha of .05, and a medium effect size measurement of .5, reduce the risk of committing a type II error. Based upon the parameters presented, the recommended amount of participants are 48 for each sample. Therefore the sample of 285 participants who used digital portfolio technology during economics classes over the course of the 2017-18 and 2018-19 schools years exceeds the number of participants recommended.

Category	Option A	Option B
	Student must have a qualifying score in the mental ability AND achievement categories.	**Student must qualify in <u>three of the four</u> categories.**
Mental Ability	➢ Grades K-2 99th% percentile composite score on a nationally age normed mental ability test ➢ Grades 3-12 ≥96th percentile composite score on a nationally age normed mental ability test	➢ Grades K- 12 ≥ 96th percentile composite OR appropriate component score on a nationally age normed mental ability tests
Achievement	➢ Grades K-12 ≥ 90th percentile Total Reading, Total Math, or Complete Battery on a nationally normed achievement test	➢ Grades K-12 ≥ 90th percentile Total Reading, Total Math, or Complete Battery on a nationally normed achievement test ➢ Grades K – 12 Superior product/performance with a score ≥ 90 on a scale of 1-100, as evaluated by a panel of three or more qualified evaluators
Creativity	➢ Evaluation data required	➢ Grades K-12 ≥ 90th percentile on composite score on a nationally normed creativity test ➢ Grades K-12 Rating scales used to qualify student creativity must equate to the 90th percentile ➢ Grades K-12 Superior product/performance with a score ≥ 90 on a scale of 1-100, as evaluated by a panel of three or more qualified evaluators
Motivation	➢ Evaluation data required	➢ Grades 6-12 Two-year average of a 3.5 GPA on a 4.0 scale in regular core subject of mathematics, English/language arts, social studies, science, and full year world languages. (See pg. 32-33 for additional information) ➢ Grades K-12 Rating scales used to qualify student motivation must equate to the 90th percentile ➢ Grades K – 12 Superior product/performance/structured observation with a score ≥ 90 on a scale of 1-100, as evaluated by a panel of three or more qualified evaluators

Figure 8. Criteria for Identifying Gifted Students (GADOE, 2020)

Instrumentation

Once permission is granted, the researcher will use Illuminate, the school district's electronic data management system, as the instrument to collect the Georgia Milestones economics EOC assessment data. The Illuminate Education platform is used to house data from all schools in the district's benchmark, summative, and state assessment data. The Georgia

Milestones assessment in economics serves as a standardized summative assessment to assess the student knowledge of the Georgia standards in economics. To ensure validity and reliability of the economics EOC and other Georgia milestones assessments, the Georgia Department of Education continually aligns its Georgia Milestones assessment systems with testing standards established by the American Psychological Association (APA), American Educational Research Association (AREA), and National Council on Measurement in Education (NCME) (GADOE, 2019). In theory, validity for the economics EOC assessments were established via the process of identifying a clear purpose for state assessments and developing the assessments. Georgia milestones assessments were required by state law under code (O.C.G.A. 20-2-281) for the purpose of measuring the acquisition of identified skills in math, English language arts (ELA), science, and social studies for students in grades three through twelve. Assessment results inform students and parents where opportunities exist for academic improvement, inform stakeholders of progress towards meeting state learning standards, federal accountability requirements, and provides an aggregate snapshot of the quality of education. The second method of establishing validity is through constructing assessments which reflect standards and learning goals from the GSE for each content. The GADOE (2019b) includes educators from districts throughout the state in the assessment development process to ensure what will be assessed, and how it will be assessed matches the learning domains from the state standards. Methods and content for each assessment including standard domains, assessment weights, sample questions, and DOK levels were published in the Georgia Milestones Assessment Guides and made available to the public. Once this process is complete, the remainder of the process includes committee reviews to filter tests for bias, trial runs, and revisions. Assessment questions considered to be "field tested" were not counted against their scores. Overall, as a Georgia Milestone test, the economics EOC

assessment displayed a high level of validity because it serves the purpose of its original intent, which is to measure student knowledge of state economics standards.

Reliability of the Georgia Milestones assessments were contingent upon the consistency and stability of the assessment results when different groups of students complete the assessment over time. For example, the economics EOC assessment was considered a reliable test because students who completed the assessment in the spring of 2019 were scored using the same methods, weights, domains and received the same score results as students who completed the exam in the spring of 2018. The validity and reliability of Georgia Milestones social studies assessments are maintained by the GADOE. Another way the GADOE establishes internal reliability is through the Cronbach alpha coefficient. The average reliability for the economics EOC assessment was 0.91(GADOE, 2019b).

Data Collection

Data collection process will include the following steps.

- Obtain authorization to collect archival data from the principal of the target school.
- Once authorization is formally granted, complete a formal request for permission to conduct research within the county.
- Submit the dissertation proposal to Columbus State University including all documents to satisfy Internal Review Board (IRB) requirements.
- Upon successful defense of the dissertation proposal and consent of the Columbus State University IRB, the next step is to collect the 2017-18 and 2018-19 demographic archival data from the school records clerk. This data would be extracted electronically from the school's Infinite Campus (student information system) files and would include:
    - Number economics course sections taught by each teacher.

- Rosters of students, (using unique identifiers) organized by the teacher of record that were labeled gifted, not-gifted, which students were in general education economics sections, and students who were in AP class sections. The use of unique identifiers protects the identities of students and their assessments results.

- Collect archival economics EOC data from 2017-18 and 2018-19 assessment. Students used digital portfolios with only one teacher, therefore those students will be identified and organized in a spreadsheet. The number of students who used digital portfolios are in Table 3 below.

Table 3

Number of Students who Used Digital Portfolios from 2017-2018 and 2018-2019

	2017-2018	2018-2019	Total for Two Years
# of Gifted Students (enrolled in AP sections)	28	33	61
# of Non-gifted Students (enrolled in AP sections)	71	61	132
# of Students in General Economics class	48	44	92
Totals (*N=285*)	147	138	285

The spreadsheet will have four columns: student ID, digital portfolio integration, student label, and EOC score. The independent variable, digital portfolio integration, has two levels (used digital portfolios = 1, did not use digital portfolios =2). The independent variable student classification will have four levels: gifted = 1, regular education/not gifted = 2, general economics section = 3, AP Economics section=4.) Finally, the last column EOC score will include a number from 0-100 in each cell. This data will be stored into an external hard-drive for security where only the researcher can access the files.

Data Analysis

After collection, data was transferred into SPSS via Microsoft Excel spreadsheet and

analyzed using a factorial ANOVA design. Factorial designs were implemented to measure the interaction (if any) of multiple independent variables (with multiple levels) upon a single dependent variable (Salkind, 2010). In other words, do the independent variables combine to impact the dependent variable? This study has two independent variables (digital portfolio integration and student classification) and one dependent variable (economics EOC assessment scores) therefore this would constitute a two-way ANOVA. Assumptions for data analysis designs determine whether the data is appropriate for the selected design. Assumptions for factorial ANOVA include independence of observations, scale, homogeneity of variance, outliers, and normality. The assumption of scales and independence of observations, were met as the dependent variable is continuous data (numbers 0-100) and the independent variables were categorical. Independence of observation refers to participants belonging to one group only. Normality was checked by the Shapiro-Wilks test. Whether the remaining assumptions were met were determined after the analysis of the factorial ANOVA.

Summary

The current study will analyze whether digital portfolio use caused differences in the economics EOC assessment scores of high school seniors. To implement the study, the researcher will use a causal-comparative (ex post facto) quantitative design to analyze archival data of seniors from a Metro Atlanta high school who completed the economics EOC assessment in the 2017-18 and 2018-19 school years. The reliability and validity of the research instrument were discussed as well as assumptions for the data analysis. Since archival data was analyzed and the study has a non-experimental nature, the researcher does not anticipate any ethical issues arising as a result. Data would be collected from the participating school district electronically and stored securely with the researcher. Using SPSS, the researcher used a two-way factorial

ANOVA to analyze the interaction between the two independent variables (digital portfolio integration and student designation) on the dependent variable (assessment scores).

CHAPTER IV

RESULTS

Currently, limited research exists on whether digital portfolio use has a statistically significant impact on economics EOC assessment scores. The purpose of this study was to analyze whether digital portfolios were an effective tool to increase student achievement on the end- of -course assessment for students who used digital portfolios compared to students who did not. Moreover, the researcher inquires whether using digital portfolios impacted AP students, students in general education class sections, gifted students, and non-gifted students differently based upon their EOC scores. In this chapter, the researcher provides information about the demographics and number of participants as well provide more information about their participation. The researcher will review the data analysis techniques, report results from tested assumptions, report and summarize the results of descriptive statistics, interpret the data based upon the findings of each research question, and reject or fail to reject each null hypothesis. Finally, the researcher will summarize the analyses of each research question.

Participants

Participants for the study consist of former high school seniors who completed the economics EOC assessment at the target school between the 2017-2018 and 2018-2019 school years at a target high school in Metro Atlanta, Georgia. The total number of participants (n= 861) included gifted (n=56) and non-gifted (n=123) students enrolled in AP Economics sections also non-gifted students who were enrolled in regular (n=609) and co-taught (n=73) sections of the economics course. Some students within the sample participated in digital portfolio use (n=260) throughout the school year, while other students did not participate at all (n=601) as shown

below in Table 4. The second column (SPSS Code) in Table 4 represents the numeric coding used in SPSS to identify the levels within each independent variable. The independent variables were Digital Portfolio and Student Designation. For the independent variable Digital Portfolio, "1" = yes student used a digital portfolio, "2" = no, did not use digital portfolios. For Student Designation, "1" = student was gifted and enrolled in an AP class section, "2"= student was not gifted and was enrolled in an AP section, "3" student was not gifted and enrolled in a regular education section of economics, "4" student was in a regular education section of economics where a co-teacher was present to serve students with disabilities. Students who used digital portfolios in course sections taught by the same teacher of record.

Table 4

Participants Between-Subjects Factors

	SPSS Code	Value Label	N
Digital Portfolio	1	Yes	260
	2	No	601
Student Designation	1	AP/Gifted	56
	2	AP/Not Gifted	123
	3	Regular	609
	4	Co-Taught	73

Findings

The purpose of this study was to determine the effectiveness of using digital portfolios by analyzing the differences in students' economics EOC assessment scores between students who used the digital portfolio compared to the students who did not. In addition to comparing the performance of students who did or did not use digital portfolios, the researcher desired to analyze the differences in the economics assessment scores of students who used digital portfolios based upon the academic designation of gifted, not gifted, AP, regular, or co-taught.

To achieve the data analysis, the researcher decided to use a two-way factorial ANOVA to analyze the data of this sample. A factorial ANOVA is appropriate when a researcher is attempting to determine the joint impact of at least two independent factors with multiple levels on one dependent variable. Factorial ANOVA analysis compares the differences in means between different groups that have been separated by at least two different factors (independent variables). In this study, a factorial ANOVA was used to understand the impact of independent variables digital portfolio use of two levels: Yes-did use a digital portfolio, and No- did not use a digital portfolio–and student academic designation level as being identified AP & Gifted, AP & Not gifted, Regular education students, and Co-Taught students, resulting in a 2x4 factorial ANOVA. In essence, the selected analysis will compare the means between the each of the aforementioned groups according to each research question. The means are reported in the descriptive statistics in Table 5

Table 5

Descriptive Statistics- Dependent Variable: EOC Scale Score

Digital Portfolio	Student Designation	Mean	Std. Deviation	N
Yes	AP/Gifted	586.68	55.092	56
	AP/Not Gifted	555.25	47.156	123
	Regular	505.39	48.613	71
	Co-Taught	452.30	41.849	10
	Total	544.45	59.821	260
No	Regular	494.07	46.679	538
	Co-Taught	439.65	37.771	63
	Total	488.36	48.743	601
Total	AP/Gifted	586.68	55.092	56
	AP/Not Gifted	555.25	47.156	123
	Regular	495.39	47.008	609
	Co-Taught	441.38	38.296	73
	Total	505.30	58.302	861

Assumptions

Assumptions were examined prior to the analysis of the factorial ANOVA to determine if the data were appropriate to be analyzed using the factorial ANOVA design. The assumptions for a factorial ANOVA checked the independence of observations, dependent variable, independent variables (all considered while the researcher was designing the study), significant outliers, normality, and homogeneity of variance (examined through SPSS analysis). Within the design, it was expected that data met independence of observations (groups were independent of each other); two or more independent variables that are categorical in nature; the dependent variable is measured at a continuous level. Assumptions measured by SPSS were outliers, normality, and homogeneity of variances. Outliers-extreme values that deviate from the mean, was normally observed through a box and whisker plot. Typically no significant outliers should be present in the dependent variable data to use a factorial ANOVA. Normality (the sample should be normally distributed) is measured in SPSS using the Shapiro Wilk test. Visually, the bell curve should follow a normal shape on a histogram. Homogeneity of variances, variability between means should be similar. The appropriate measurement of variables where dependent variable should be categorical and the dependent variables must be continuous or of interval/ratio data.

First, data were analyzed for outliers. According to the box and whisker plot in Figure 9, outliers existed within the data. After re-examining the data, each outlier represented a test score that was extremely high or extremely low score compared to the other scores from the student group. Outliers for this study were not surprising; due to the large sample of EOC assessment data were analyzed with the inclusion of a diversity of student demographics. The researcher chose not to remove outliers from this data because it would diminish the authenticity of how the

scores represent the performance of each student on the day of the assessment. Considering the grand mean, which is the mean of all 861 scores, of the EOC assessment scores (M = 505, SE = 3.1), the high score range of extreme values (693-767) outliers in the data set represent high-ability students who were placed in classes that did not adequately challenge the student or where mean student performance is low. The range low score outliers (380-387) represent the reality that some students lack motivation to give a minimal effort or have limited academic ability.

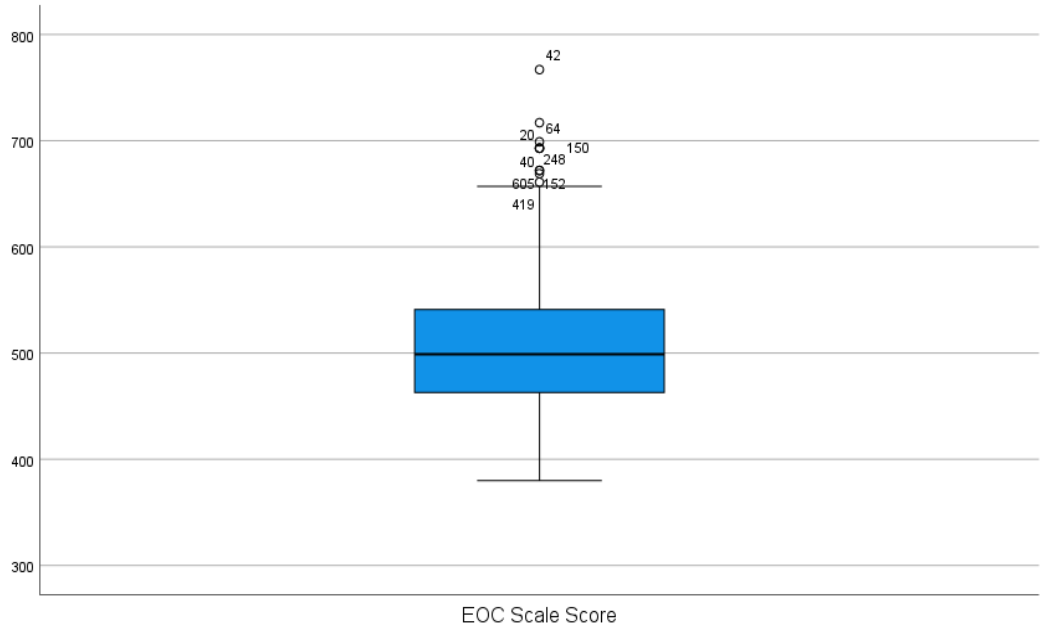

Figure 9. EOC Scale Score Box and Whisker Plot

Normality

When testing normality in SPSS, the Kolmogrov-Smirnov and Shapiro-Wilk tests are used to check the normality of the dependent variable, EOC Scale Score. The dependent variable was normally distributed when the p-value is greater than .05 (p > .05). The assumption of normality for this data set was not met according to Table 6, F (861) =.98, p = <.001. When a variable is normally distributed, the curve follows a normal shape as displayed in the example in

Figure 9. For this study, the apex of a normally distributed bell curve represents the grand mean of all scores (M = 505). The dependent variable did not follow a normal distribution as seen in Figure 10. The curve appears to be positively skewed, where the apex of the curve is to the left instead of the middle. Skewness to the left represents a high number of scores were clustered below the grand mean. Of the six total groups represented in this study, three of the groups mean scores were below the grand mean: co-taught students who used digital portfolios (n = 10, M = 452), regular and co-taught students who did not use digital portfolios (n = 601, M = 488). Typically, if a data set violates the assumption of normality, transforming the data using a log, square root, or reciprocal transformation were options to change a data set to follow a normal bell curve shape. Using a non-parametric test is also an option to assess the normality of the variable. However, according to Kao and Green (2008), factorial ANOVA analyses are robust to violations of normality. In other words, the assumption of normality could be violated slightly, yet could still yield accurate results. In this case, altering the shape of the bell curve to a normal shape does not represent the authenticity of the scores earned by the participants.

Table 6

Test of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
EOC Scale Score	.048	861	.000	.981	861	.000

a. Lilliefors Significance Correction

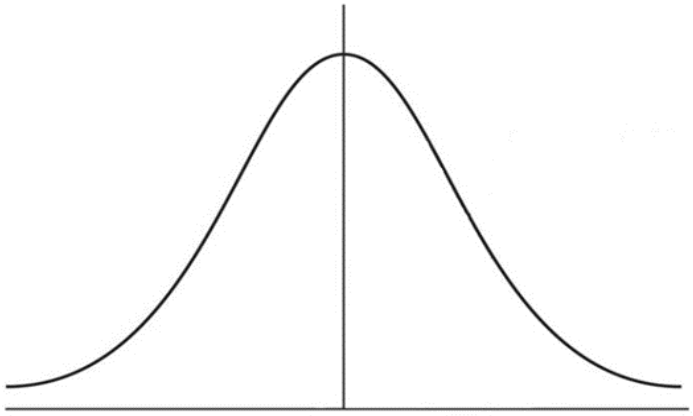

Figure 10. Normally Distributed Bell Curve Shape

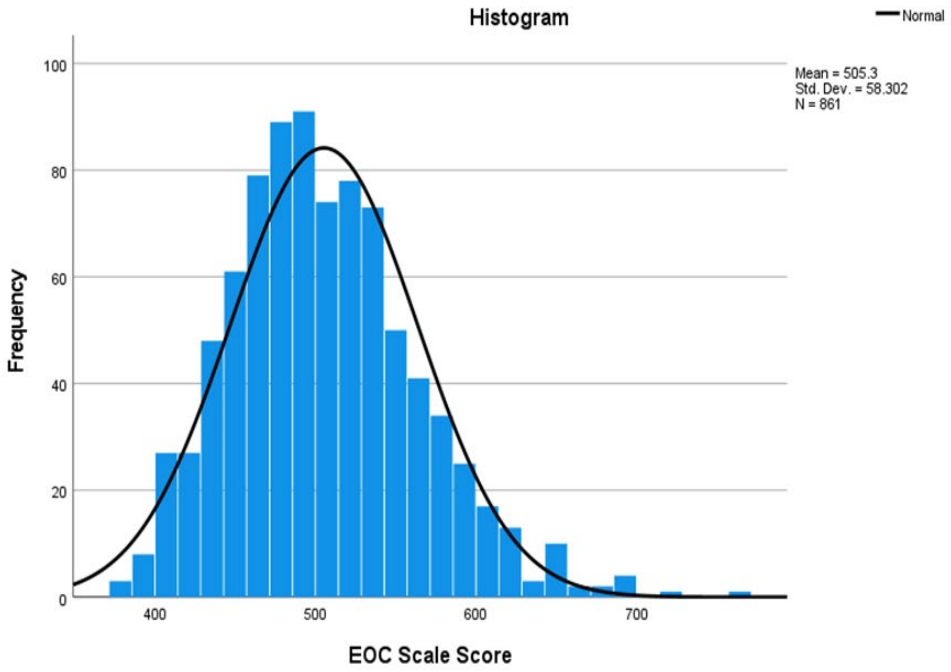

Figure 11. EOC Scale Score Histogram

When a data set is larger than 300 as these data were an appropriate secondary approach to test normality was to check the absolute skewness and Kurtosis. If absolute skewness values were between +2 and -2 or kurtosis between -7 and +7, data are considered to normally distributed for samples greater than 300 (Kim, 2013) . Table 7 references the skewness and kurtosis for the variables in this study. Due to the size of the sample in this study (n = 861), the

absolute skewness for each variable falling between -2 and +2 and the absolute kurtosis falling between -7 and +7, the data for this study are considered to be normally distributed.

Table 7

Descriptive Statistics Skewness and Kurtosis

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Student Designation	861	2.81	.673	-1.042	.083	1.574	.166
Digital Portfolio	861	1.70	.459	-.864	.083	-1.256	.166
EOC Scale Score	861	505.30	58.302	.576	.083	.581	.166
Valid N (listwise)	861						

Table 8 displays Levene's test in SPSS, which measures the assumption of homogeneity of variances. Essentially, the Levene's test assesses whether the variances were equal across the groups of the dependent variable. All significance values for the dependent variable were greater than .05 ($p > .05$), which indicate that the values have equal variances for EOC Scale Score. In other words, the mean scores from each group in the sample was assumed to have an equal or similar distance from the mean of 505. This would ensure that the results produced by the ANOVA had a higher probability of accuracy

Table 8

Levene Statistic

		Levene Statistic	df1	df2	Sig.
EOC Scale Score	Based on Mean	.942	5	855	.453
	Based on Median	.953	5	855	.446
	Based on Median and with adjusted df	.953	5	819.537	.446
	Based on trimmed mean	.908	5	855	.475

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.
a. Dependent variable: EOC Scale Score
b. Design: Intercept + DPUse + designation + DPUse * designation

Hypothesis Testing

In SPSS, a factorial ANOVA was conducted to assess the influence of the first independent variables, digital portfolio use (DPUse) and student designation (Designation) on the dependent variable, economics EOC assessment scores (EOC Scale Score). The means for each research variable were calculated and reported using descriptive statistics in Table 5. The test of between subjects' effects in Table 9, display the results of whether the independent variables, digital portfolio use and student designation, have an overall statistically significant impact individually and collectively on the dependent variable (EOC Scale Score). When the impact of both independent variables are measured collectively on the dependent variable is called the interaction effect. The null hypothesis for a research question is rejected if the significance value is less than .05, (p <.05), meaning the probability that the outcome described in each hypothesis happened by chance is less than 5%. In other words, the researcher is hypothesizing that students who used digital portfolios performed better on the economics EOC assessment than students who did not, was not by chance.

Table 9

Test of Between-Subject Effects

Dependent Variable: EOC Scale Score

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	1045263.920[a]	5	209052.784	95.179	.000
Intercept	96376650.193	1	96376650.193	43878.988	.000
DPUse	4361.223	1	4361.223	1.986	.159
Designation	256057.243	3	85352.414	38.860	.000
DPUse * designation	13.254	1	13.254	.006	.938
Error	1877938.368	855	2196.419		
Total	222759374.000	861			
Corrected Total	2923202.288	860			

a. R Squared = .358 (Adjusted R Squared = .354)

Digital Portfolio Use (RQ1)

What is the difference in end-of-course scores for economics between the students who participated in using digital portfolios and those students who did not participate in using digital portfolios across 2 years of implementation?

- H_0: There is not a statistically significant difference in end-of-course scores for economics between the students who participated in digital portfolios and those who did not participate in using digital portfolios across 2 years of implementation.
- H_a: There is a statistically significant difference in end-of-course scores for Economics between the students who participated in digital portfolios and those who did not participate in using digital portfolios across 2 years of implementation.

The research question above inquired of the differences between the scores of students who used digital portfolios and students who did not. Using the "Tests of between-subjects effects" (Table 5) the test of main effect for (DPUse) was not significant ($F = 1.98$, $p = .159$). Although the

Between Subjects test revealed the main effect of digital portfolios alone did not influence student achievement on economics EOC scores, it did not provide specific data relating to whether a statistically significant difference existed between students the group of students who used digital portfolios (DPUse = Yes) and students who did not (DPUse = No). After reviewing the descriptive statistics in Table 2, the total mean of the digital portfolio group (M = 525, SE=4.4) and the total mean students who did not use digital portfolios (M = 488, SE= 3.1). The pairwise comparison in Table 10 displays a mean difference of 58.05 between the group of students who used digital portfolios and those who did not. After comparing the mean scores using the Georgia Milestones EOC Score Interpretation Guide (2016), the difference between the EOC scale scores could translate to a difference in achievement by at least one level. With this in mind, the researcher continued to investigate by using the Post Hoc analysis to assess the specific difference between the mean scores of each group and whether the difference was statistically significant. Therefore the null hypothesis of the overarching research question must be rejected, and the alternate hypothesis accepted because the p- value (p = .000) indicates the mean difference of 58.05 scale score points is significant. From this, it was inferred that digital portfolio use, along with the pedagogy used for its implementation, helped students perform better on the economics EOC assessment than students who did not use digital portfolios. This inference was further supported when analyzing Figure 12. Regardless of student designation, students who used digital portfolios (left column) performed better on the economics EOC assessment than students who did not.

Table 10

Pairwise Comparisons

(I) Digital Portfolio	(J) Digital Portfolio	Mean Difference (I-J)	Std. Error	Sig.[d]	95% Confidence Interval for Difference[d] Lower Bound	Upper Bound
Yes	No	58.047*,[b]	5.382	.000	47.484	68.611
No	Yes	-58.047*,[c]	5.382	.000	-68.611	-47.484

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. An estimate of the modified population marginal mean (J).

c. An estimate of the modified population marginal mean (I).

d. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

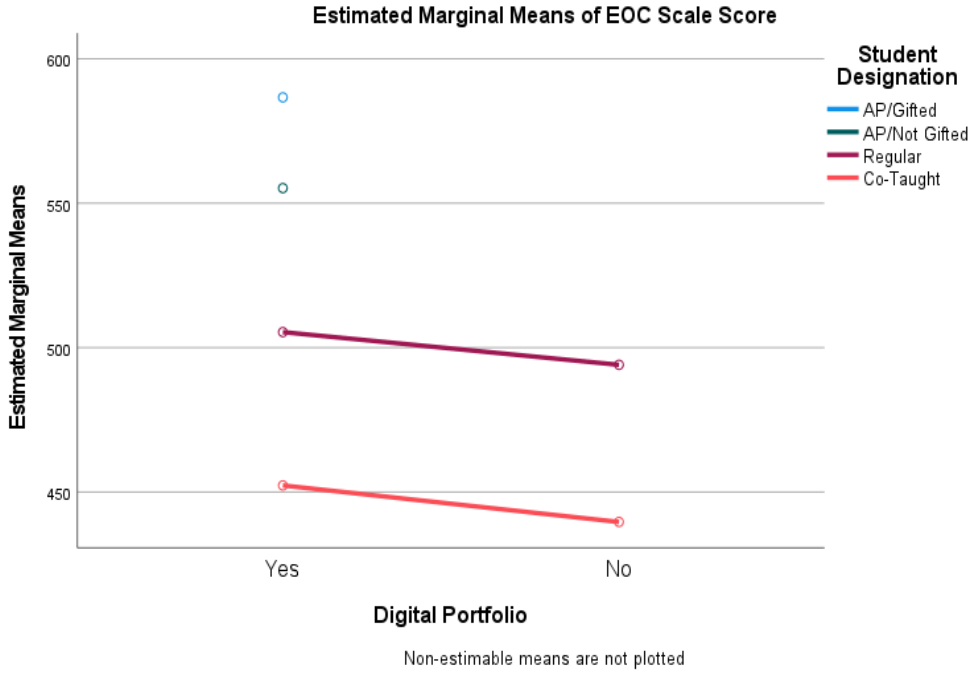

Figure 12. Estimated Marginal Means of EOC Scale Score

Student Designation (Sub RQ1)

What is the difference in end-of-course scores for economics between gifted and non-gifted students who participated in using digital portfolios across 2 years of implementation?

- H_0: There is not a statistically significant difference in the end-of-course scores for economics between gifted and non-gifted students who participated in using digital portfolios across 2 years of implementation.
- H_a: There is a statistically significant difference in the end-of-course scores for economics between gifted and non-gifted students who participated in using digital portfolios across two years of implementation.

Sub-research question 1 assessed the main effect of student academic designation (Designation). Using the "test of between-subject effects' in Table 9, the test of main effect for (Designation) was significant ($F = 38.860$, $p = .000$). In other words, the main effect of student designation alone did influence the economics EOC scores. The term student designation refers to participant groupings based upon ability level and course description (AP Economics/Gifted, AP Economics Non-gifted, and Regular Economics, Co-Taught participants in Regular Economics). Although the p- value from the ANOVA indicated that a student's overall academic designation influences the EOC assessment was not by chance, the purpose of the hypothesis is to analyze how different the mean scores were between the two groups. The Pairwise comparison analysis in Table 10 provides more detail of the actual differences in mean scores between the various groups within the variable Designation. A difference of 31.42. The EOC Scale score means for AP/Gifted students ($M = 587$, $SE = 6.2$) and AP/Non-Gifted students ($M = 555$, $SE = 4.2$). The p- value assessing the difference in the mean scores between AP/Gifted and AP/Not Gifted each group is less than .05 ($p = .000$), confirming a statistically significant difference. Therefore, the null

hypothesis of Sub RQ1 was rejected, and the alternate hypothesis is accepted that a significant difference in scores exists between gifted and non-gifted students who used digital portfolios. The researcher can infer that even though gifted students were more likely to perform well on standardized tests, digital portfolio use and the pedagogy used to incorporate digital portfolios in AP Economics combined with their natural ability to test well, contributed to gifted students outperforming non-gifted students enrolled in AP Economics by such a large margin of 31-scaled points.

Table 11

Pairwise Comparisons: AP Gifted

(I) Student Designation	(J) Student Designation	Mean Difference (I-J)	Std. Error	Sig.[d]	95% Confidence Interval for Difference[d] Lower Bound	Upper Bound
AP/Gifted	AP/Not Gifted	31.427[*,b,c]	7.555	.000	16.598	46.255
	Regular	86.948[*,b]	6.926	.000	73.353	100.543
	Co-Taught	140.703[*,b]	10.141	.000	120.798	160.608

Based on estimated marginal means
*. The mean difference is significant at the .05 level.
b. An estimate of the modified population marginal mean (I).
c. An estimate of the modified population marginal mean (J).
d. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Student Designation Sub (RQ2)

What is the difference in end-of-course scores for economics between general education and Advanced Placement students who participated in using digital portfolios across two years of implementation?

- $H2_0$: There is not a statistically significant difference in the end-of-course scores for economics between general education and advanced placement students who participated in using digital portfolios across two years of implementation.
- $H2_a$: There is a statistically significant difference in the end-of-course scores for economics between general education and advanced placement students who participated in using digital portfolios across two years of implementation

The research question assessed the main effect of student academic designation (Designation). Using the "test of between-subject effects' in Table 9, the test of main effect for (Designation) was significant ($F = 38.860$, $p = .000$). In other words, the main effect of student designation alone did influence the outcome of economics EOC scores. The term student designation refers to participant groupings based upon ability level and course description (AP Economics/Gifted, AP Economics Non-gifted, and Regular Economics, Co-Taught participants in Regular Economics). The pairwise comparison analysis in Table 12 provides more detail of the specific differences in mean scores between the Regular Education and AP student groups who used digital portfolios within the variable Designation. The p values assessing the differences between each group are both less than .05 ($p = .000$). From the previous research question, the researcher found that students' overall academic designation influenced performance EOC assessment. Students in AP classes tend to learn in an academically rigorous environment and were typically

more motivated to perform at a high level academically (Cooney et al., 2013). The ability to measure participants' levels of motivation was not analyzed in this study. Based on the data analysis, the researcher could assert that the combination of digital portfolio use, pedagogy used to incorporate digital portfolios, and the motivation or aptitude usually displayed by students in AP classes, contributed to their ability to outperform students from regular economics classes who also used digital portfolios by such a large margin. AP/gifted students' (M = 586, SD = 55) mean scores were higher than the mean scores of Regular students by 86.9 points and higher than the mean scores of Co-Taught students by 140.7 points. The p values assessing the mean differences between both groups is less than .05 (p = .000). AP/non-Gifted students' mean scores (M = 555, SD = 47) are higher than the mean scores of regular students by 55.5 and higher than the mean scores of Co-Taught students by 109.2 points. Therefore, the null hypothesis of Sub RQ2 was rejected, and the alternate hypothesis is accepted that a significant difference in scores exists between AP students and regular students who used digital portfolios.

Table 12

Pairwise Comparison: AP/Gifted and AP/Not Gifted

(I) Student Designation	(J) Student Designation	Mean Difference (I-J)	Std. Error	Sig.[d]
AP/Gifted	AP/Not Gifted	31.427[*,b,c]	7.555	.000
	Regular	86.948[*,b]	6.926	.000
	Co-Taught	140.703[*,b]	10.141	.000
AP/Not Gifted	AP/Gifted	-31.427[*,b,c]	7.555	.000
	Regular	55.521[*,b]	5.159	.000
	Co-Taught	109.277[*,b]	9.027	.000

Summary

First, a brief description of the participants of the sample was provided. A description of the analysis followed along with the findings of the research. A factorial ANOVA was conducted

to assess the influence of digital portfolios and student designation on economics EOC assessment scores of former high school seniors. The results of the between- subjects test displayed the main effect of digital portfolio alone on assessment scores was not significant. In addition, the interaction between digital portfolio use and student designation was not significant ($F = .006$, $p = .938$). Interpreting the Adjusted R, squared, digital portfolios and student designation explain 35.4% of the influence on economics EOC assessment scores. The main effect of student designation was a statistically significant factor of EOC assessment scores. However, the goal of this research was to determine the effectiveness of digital portfolios as stated in the research questions. After analyzing the data, students who were in economics course sections who participated in digital portfolios achieved higher scores to a statistically significant degree than students who did not use digital portfolios. It was also found that there were statistically significant differences between groups (gifted /non-gifted and AP/Regular) of students who used digital portfolios. In Chapter 5, the researcher will discuss the key findings, limitations; make recommendations for future research related to this topic, and the implications this study could have for digital portfolio use in secondary and economics education.

CHAPTER V

DISCUSSION

Summary of the Study

Currently, limited research exists regarding whether digital portfolio use has a statistically significant impact on economics EOC assessment scores. The purpose of this study was to address a current gap in scholarly literature related to digital portfolio use in secondary economics and economics courses in general. In this chapter, the researcher provides an overview of the findings, limitation of the study, recommendations for future research, and potential implications. The researcher utilized a quantitative methodology to analyze former high school seniors' assessment data to determine if digital portfolios were an effective tool in increasing student achievement on the economics End of Course assessment for students who used digital portfolios compared to students who did not. In Chapter IV, the researcher used a factorial ANOVA design to test the hypotheses of one overarching research question and two sub-research questions.

Analysis of the Findings

The overarching research question inquired about the differences in economics EOC assessment scores of students who used digital portfolios as a learning tool throughout the school compared to students who did not use digital portfolios in their economics classes. The researcher found digital portfolio use alone does not influence student achievement as the p-value for the main effect of digital portfolio use was greater than .05, ($F = 1.98$, $p = .159$). Although the main effect was not significant, the mean differences were too different not to pursue more in depth analysis. In this case, the mean EOC Scale scores of students who used digital portfolios were 58.5 higher than the group of students who did not use digital portfolios.

Tsu (1996) called it "unfortunate" to refer to a post hoc analysis only after a significant result. According the pairwise comparison in Table 12, the 58.5-point difference between the mean scores of two groups was statistically significant. It could be argued that gifted and AP students-whose classes used digital portfolios and earned the highest mean averages on the assessment-were the main reason for the difference between the two groups. However, because of the archival data collected, the researcher had no control over which class sessions students were placed in or why other economics instructors chose not to implement digital portfolios. Figure 12 further underscores the digital portfolio's impact as the regular and co-taught groups within independent variable digital portfolios earned a higher mean average than each group who did not use digital portfolios.

Sub-Research Question 1

The first sub-research question analyzed the research hypothesis of whether there was a significant difference in the economics EOC assessment scores of gifted students and non-gifted students who used digital portfolios. In this study, gifted students were enrolled in AP economics sections only, and non-gifted students were enrolled in AP, regular, and co-taught economics sections. The independent variable, student designation, described whether a student who used digital portfolios was gifted, not gifted, took an AP section, regular section, or co-taught section of economics. After analyzing the factorial ANOVA results, the main effect of a student's academic designation did influence the achievement on the EOC assessment. Gifted students outperformed non-gifted students to a statistically significant degree even compared to non-gifted students who also were enrolled in AP economics. Therefore the researcher inferred that some aspects of digital portfolio use enhanced the natural ability gifted students already

possessed. Future research could determine how to use digital portfolios to benefit gifted or high achieving students.

Sub-Research Question 2

The second sub-research question also tested the main effect of the 'student designation'. This research question analyzed the research hypothesis of whether there was a significant difference between the scores of students enrolled in AP economics compared to students in regular economics classes who all participated in digital portfolios. After conducting the factorial analysis, it was found that digital portfolio users who were enrolled in AP economics compared to digital portfolio users in regular or co-taught economics courses. Regardless of the students 'academic designation, the researcher could infer digital portfolio use enhanced the classroom experience for learners. Even though results affirm that students' academic ability was the largest factor in their success on the economics EOC assessment, digital portfolios' role cannot be ignored. Other factors such as course rigor and student motivation could also be factors that cause the difference in the achievement levels. The researcher had no control over students' academic designation or how students were placed in course sections. As a result of its design, the current study did not include a control group.

When analyzing the impact of digital portfolios in this study, the results aligned with the researcher's original expectation that digital portfolio use was an impactful tool to assist students' acquisition of economic content. Although no previous research was found recommending an investigation into the impact of digital portfolio use in the secondary economics setting itself, previous studies discussed the implications of digital portfolios in other academic levels and subject areas. The researcher will analyze the findings from this study according to the literature highlighted in Chapter 2.

Initially, no scholarly literature was found related to the impact of digital portfolio use on student achievement for secondary economics education. Therefore, the purpose of this study was to attempt to fill a gap in the literature related to digital portfolio use in secondary economics. Karlin et al. (2016) recommended a quantitative study to analyze digital portfolios' impact on students although the grade level and content were not specified. The current study is a quantitative study that extends Karlin et al.'s (2016) by displaying that digital portfolios profoundly impacted the students who used them. Becker's (2000) claims that economics instruction should be more active and teachers should use more internet-based strategies were substantiated by this study's findings, as the digital portfolio operates on an internet-based platform. Digital portfolio's use improved students' performance on the economics EOC assessment at the target school compared to students who did not. It can be assumed that the internet was a common tool used by teachers of students who did not use digital portfolios, but the digital portfolio gave students who used it an advantage to some degree. If digital portfolios can increase students' performance in economics, why didn't more economics teachers use them at the target school? It is not known why only one economics teacher required students to use digital portfolios in this study. Nevertheless, a potential cause for this could be supported by findings in the Chiang and Vazquez (2018) study where time limitations of balancing lecture and technology were factors in the decision to use other means of technology instead of a digital portfolio. Future studies could reproduce this study and explore what specific technological strategies were used by teachers who don't use a digital portfolio.

Donnelly (2010) inquired whether digital portfolios has facilitated deeper learning. The outcome of this study strengthened the argument that digital portfolio use was a factor in facilitating more depth of learning economics concepts. Some participants in Donnelly's study

claimed digital portfolio use helped them improve their understanding of topics that were previously not clear, in contrast others claimed digital portfolios merely helped them organize work but not deepen learning. Although the current study's design relies on the interpretation of archival data solely, the researcher can deduce that participants who used digital portfolios benefited from the organizational components and or, other features from the digital portfolio to improve comprehension of specific domains in economics. Even though the current study's design is causal-comparative, the findings were similar to findings by Abrami et al. (2013), Demir and Kutlu (2016), and Hegarty and Thompson (2019). Each group of researchers conducted studies containing experimental groups of students that utilized a digital portfolio. In each of the three studies, the group that used digital portfolios exhibited a statistically significant difference compared to the group that did not. Demir and Kutlu (2016) found digital portfolios effective in developing research skills and recommended future studies assess digital portfolios' impact on other cognitive skills at all grade levels. Based upon the Demir and Kutlu (2016) recommendation, the researcher can conclude that digital portfolios were effective for students to hone cognitive skills needed for secondary economics assessments. Even though the researcher could not identify causation due to the study's design, this study's findings support Hegarty & Thompson (2019)'s findings. The researcher concluded that digital portfolio's use increased levels of engagement by the participants, resulting in higher levels of achievement.

Findings from the current study confirm the compatibility of the activity theory framework (Vygotsky, 1978) with the implementation of digital portfolios in classes where economics is taught. The use of this framework influenced this study by providing the reader with a clear purpose for using the digital portfolio-a tool (artifact) to assist students with learning economics standards and preparing for the economics EOC assessment. As 'mediating artifacts',

digital portfolios contributed to students-'subjects' desired outcome-'object' to exhibit mastery of standards on the economics EOC assessment. While it's not known how each student's score on the economics EOC assessment impacted their overall class grade in the course, digital portfolio users' grades, generally, more positively impacted than students who did not use digital portfolios. Vygotsky believed that the use of tools influenced humans' understanding of the unknown. Devane and Squire (2012) describe this thought by using an axe example to alter the way we understand or potentially interact with trees. Keeping the axe example in mind, for the purpose of this study, the first generation activity theory allowed the researcher to view the digital portfolio as a tool that provided students an opportunity to experience the economics curriculum differently than students who did not. Within this framework, as tools, digital portfolios were not the sole influence on the assessment of learning for those students who used them as other factors could have contributed to each student's test-day performance. However, each student may have had a unique approach to utilizing the digital portfolio, from a simple use of submitting assignments to more in-depth use invoking creativity to display understanding. In either situation, the digital portfolio's use gave students options of how they used it to enhance their knowledge of economics. Whether it provided a unique platform for students to organize information or create artifacts to display their content knowledge, the result of this study affirm Devane and Squire's (2012) belief that learning technologies, in this case digital portfolios, are not teaching systems. Still, they are tools that act as support systems to facilitate teaching and learning economics (object).

Limitations

There were several limitations resulting from conducting this study including the setting, design, and the assumptions of the factorial ANOVA. The study was conducted at one school

only and focused solely on students from the classes of 2018 and 2019 who, at the time, were taking the economics EOC assessment. Every high school has its unique structure and program offerings. Therefore results may or may not be generalizable to other schools that have similar demographics. The sample was also not a pure sample which made the analysis more complex. Both gifted and non-gifted students were enrolled in each AP economics course section instead of sections for gifted students separate from advanced, non-gifted students. Such scheduling decisions were made by school leadership, presumably to maintain funding, align to state guidelines or address the school's needs according to the available resources at the time. Such information was not available to the researcher. Only one teacher taught AP and gifted students; therefore there was not another group of AP or gifted students whose instructor did not incorporate digital portfolios to compare assessment results. This study could not address student motivation, which could have been a factor for students who were potentially competing to outperform other students. The researcher collected archival data and had no control of such variables. The design of the study was also limiting because the researcher could only estimate the sample size of the study until the participating district released the data under the conditions of the IRB. In the case, the actual sample was smaller than initially estimated which could have slightly lessened the statistical power. Due to the collection of archival data, the researcher can merely confirm whether a significant difference existed instead of absolutely confirm the causal relationship between variables. The last noted limitations include the outliers, normality, and complex nature of a 2x4 ANOVA. This data set included a couple of extreme outliers which were not removed. The researcher believed such a large data set (n = 861) exam scores would yield at least a few extreme outliers and would ultimately not significantly impact on the outcome of the study. The outliers were not removed because the researcher also maintained that

all data sets's scores represent the students' most authentic performance. Initially, the normality of the assumption of Shapiro-Wilk test was also violated. The sample was actually normally distributed due to the large number of observations validated by the skewness and kurtosis of the dependent variable. A normally distributed data set was important because it confirmed the accuracy of the factorial ANOVA.

Recommendations for Further Research

This study is unique as it could be the first to discuss the impact of digital portfolio use on high school standardized economics assessment. Furthermore, the need for more research as study merely scratches the surface of scholarly research related to digital portfolio use in secondary economic education. Recommendations for further research on this topic include but are not limited to:

1. One recommendation is to replicate the study where the researcher utilizes a different design, establishing a control group and treatment group of digital portfolio users with equal or similar sample sizes.
2. The current study was limited to one high school. Therefore, future research could compare outcomes on a standardized economics assessment, i.e., an AP exam or district benchmark, from students who used digital portfolios at two different schools within the same district. A study where two schools within the same district, with similar demographics could provide a more comprehensive view of the impact of digital portfolio use.
3. A mixed-methods approach investigating how digital portfolios improve other facets of student learning such as organization, parent communication, or student discipline may also provide more diverse perspectives of digital portfolio use. Mishra and

Koehler (2006) considered TPACK to be exhibited when a teacher connects the use of technologies to a subject area while understanding the desired outcome. The qualitative aspect of mixed methodology could illuminate how specific aspects of TPACK or features of the digital portfolio could influence the teaching and learning process.

Overall, the researcher believes the increase of knowledge related to this subject is necessary as digital learning tools emerge more into educational environments.

Implications

Prior research mentions digital portfolios as a high-impact practice for colleges and universities (Watson et.al, 2016), but can the same claim be made for secondary economics education? The researcher found every student group that used digital portfolios earned a higher mean average on the economics EOC assessment than students who did not for the current study. The results of this study may potentially be a determining factor whether K12 teachers of economics and teachers invest resources needed to explore the potential benefits of implementing digital portfolio systems in schools, individual classrooms, or departments and encourage meaningful content-based professional development. Archival assessment data from the current study provides teachers and teacher leaders with concrete quantitative results to encourage more research on this topic and to seek a greater understanding of how digital portfolio use influenced students' achievement measured by a standardized assessment. Presumably, factors such as technological pedagogical knowledge (TPACK) combined with the organizational benefits (Barret, 2007) and user-created multimedia options supported by digital portfolios (Kilbane & Milman, 2017) influenced students' mastery of economic standards.

Consequently, the findings of the study may encourage more research on this topic to understand how the digital portfolio was effective to improve student achievement in economics.

Conclusion

Why is the current study relevant to economics teachers at all levels, especially at the secondary level? The researcher is confident this study's results fill a gap in empirical research while also providing an entry point into technology-based solutions and research for educators to improve students' performances in economics. Prior research provided a broad perspective of digital portfolios as affable tools in higher education and some instances in K12 education. Opportunities remained to extend the research on digital portfolios by pinpointing their secondary economics education use. The current study revealed that former seniors from the classes of 2018 and 2019 at a Metro Atlanta high school, utilized digital portfolios as a part of their classroom routine earned higher mean averages on the economics EOC assessment than students who do not use digital portfolios. The results also indicated statistically significant differences in the EOC assessment scores based on a student's academic designation or ability.

Consequently, economics EOC assessment scores between gifted and non-gifted students were significantly different, and scores between AP, regular, and co-taught students, all of which used digital portfolios. For students who used digital portfolios, differences in assessment results according to ability level may not be unexpected. However, in this instance, the mean average scores for digital portfolio use were higher at every ability level than those who did not use digital portfolios. These findings were important as they provide a basis for economics educators to conclude that digital portfolios do promote opportunities to improve student achievement in secondary economics settings. Regardless of the current study's limitations, the researcher's goal was to encourage the reader to question whether implementing a digital portfolio could address

learning economics challenges within their local learning environments. The researcher plans to share the results from this study with the principal and instructional coaches at the target school, also with the district social studies, technology, and research coordinators. The findings of this study could spark awareness of, and interest in digital portfolios as a tool to combat teaching and learning challenges affecting teachers and students at all schools in the district. Multiple investigations to explore best practices of digital portfolio implementation in high school economics courses could address: closing learning gaps of struggling students, student self-efficacy in virtual settings, a comparison to determine whether digital portfolio use increased student performance year by year, and test preparation for AP exams or other summative assessments. Each of the aforementioned, could be follow up studies of interest to the participating school and district or other schools and districts with similar challenges.

The data from this study represented a pre-Covid face-to-face educational environment. As the K12 educational space continues to evolve, it would be irresponsible to abandon some of the technological practices educators were forced to acquire amid the pandemic. In the foreseeable future, it is conceivable that local education agencies will require teachers to be proficient in utilizing digital tools, such as digital portfolios, to ensure high quality teaching and learning practices. In the future, further research regarding digital portfolio technology should continue and educators of all disciplines should be encouraged to implement best practices in digital portfolio use.

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Appendices

Appendix A: Principal's Consent

October 14, 2020

To whom it may concern,

Marcus Williams is a teacher at [Redacted]. He is currently pursuing his Ed.D at Columbus State University. He has my full support and permission to complete research for his dissertation entitled, *The Impact of Digital Portfolios on the Economics EOC Assessment,* at [Redacted] High School.

Thank you,
[Redacted]
Principal
[Redacted]
[Redacted]

Appendix B: Letter of Confidentiality

COLUMBUS STATE UNIVERSITY

Department of Teacher Education, Leadership, and Counseling
College of Education and Health Professions

[Redacted]

October 15, 2020

[Redacted],

I am writing to you on behalf of Columbus State University regarding Marcus Williams's dissertation research. It is my understanding that [Redacted] requires a statement of confidentiality regarding the collection, analysis, and reporting of data in conjunction with the dissertation process. At no time will any data Mr. Williams collects for research purposes be shared with anyone outside of his dissertation committee, which includes myself, Dr. Chris Garretson, and Dr. Saoussan Maarouf, nor will any identifying information (e.g. names of teachers, students, schools, etc.) be included in the final published dissertation. Additionally, Mr. Williams has outlined the process he will follow for collecting, storing, and disposing of all collected raw data. This plan is available for your review from Mr. Williams upon request.

If you need further information about the study Mr. Williams plans to conduct, I can be reached at [Redacted].

Sincerely,

Anna Hart

Dr. Anna Hart
Assistant Professor of Teacher Leadership
Coordinator, Teacher Leadership MEd and Endorsement Programs
Director of EPP Assessment, College of Education and Health Professions

Appendix C: Approval to Conduct Research

October 23, 2020
Columbus State University
Frank Brown Hall 3307
Columbus, GA 31901

Dr. Hart:
Marcus Williams is authorized to conduct a research study in the [Redacted] School District. He has permission to examine students' use of digital portfolios and achievement on economics assessments using an ex-post facto research design. Mr. Williams will work with district personnel to gather data for this study.
The documents and data collected during this study will be identified only by an assigned coded number to protect the identity of individuals. At no time will individual names or schools be associated with the results of the research. At the end of the research, results obtained from the analysis of data will be published without any identifying information of the participating district or schools. The identity of the school as well as educational district will not be published in relation to the research.
Confidentiality requirements of the [Redacted] School System and the university's Institutional Review Board must be followed.
If you have any questions, please contact me at [Redacted].
Sincerely,
[Redacted]
Director of Testing, Research and Evaluation