DIGITAL COMPETENCE OF STUDENTS WITH DISABILITIES USING A MOBILE DEVICE IN A POST-SECONDARY TRANSITION PROGRAM FOR POTENTIAL EMPLOYMENT

by

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A DISSERTATION

Submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy in the
Department of Educational Leadership,
Policy, and Technology Studies
in the Graduate School of
The University of Alabama

TUSCALOOSA, ALABAMA

2021

ABSTRACT

With the continued development of technology, teaching with a mobile device has been applied to special education. The ability to use technology, which is digital competence, is an essential skill preparing students with intellectual disabilities (ID) not only for academic achievement but also for future careers. The purpose of this research was to assess the impact of students' digital competence in using mobile devices in the CrossingPoints program, a post-secondary transition program, specifically when seeking employment. This study used the Digital Competence Framework for Citizens called DigComp 2.1 (Carretero, Vuorikari, & Punie, 2017) to assess students' digital competence for employment. The framework includes five digital competence areas: (a) information and data literacy, (b) communication and collaboration, (c) digital content creation, (d) safety, and (e) problem solving. This current research focused only on the first competence, information and data literacy (IDL), because of its importance for students with disability and limited research time. Participants took the Technology Workshop class for 9 weeks with an iPad and took a test at the end of each class. For this research, a multiple baseline across subjects, which is a type of single case study (Gast et al., 2014), was used to determine the efficacy of the technology class intervention for improving digital competence for students with ID. The visual analysis was used to evaluate level, trend, and stability of the IDL skills within baseline and intervention phases. To analyze the effect-size of the digital competence of each phase, the Improvement Rate Difference (IRD) was used in this research. All participants increased filtering skills of IDL competence based on the results of visual analysis of graphed data. Also, they showed significant improvements on the percentage

of IDL scores to the intervention based on the results of and the IRD analysis. In conclusion, a class using a mobile device can improve students' IDL competence for employment and learning motivation.

DEDICATION

To my wife, daughter, and my parents

ACKNOWLEDGMENTS

Firstly, I would like to express my thanks to my advisor Dr. Vivian H. Wright for guidance, patience, and encouragement. It is her academic support and kind help that have made my study. I will never forget the moment we met in front of the Graves education building for the rest of my life. Besides my advisor, I would like to thank the rest of my committee: Dr. Mary Givens, Dr. Kagendo Mutua, Dr. John Myrick, and Dr. Margaret Rice. Without their intellectual, emotional, and financial support, I this accomplishment would not have been possible.

I would like to thank my family who loved and encouraged me all along this journey. Thanks to my father who is my hero and mentor, my mother who believes in me, my wife who turned my life into a journey of love and happiness, and my daughter who has become my reason to live. Thanks to all my friends and colleagues in the CrossingPoints program for their support and encouragement and taking the time to listen to my concerns. I especially would like to thank the participants of this study and the other students in the CrossingPoints program for giving me a chance to learn about the importance of living in the present moment.

It was a long journey with my VIPs. I will treasure all the valuable memories.

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CHAPTER 1: INTRODUCTION

With the continued development of technology, our lives have changed dramatically in various ways, and technology has become a core, indispensable element of society across many fields. In education, technology facilitates teaching in innovative, new ways. For example, over 6 million students took at least one distance education course in the Fall semester of 2016 (Seaman, Allen, & Seaman, 2018). In special education particularly, use of tablet devices plays an essential role in engaging students with diverse disabilities and assisting them to achieve academic success (Burke & Hughes, 2018). For instance, prior research has tested the use of an iPad for teaching life skills (Ayres, Mechling, & Sansosti, 2013) and literacy skills (Spooner, Kemp-Inman, Ahlgrim-Delzell, Wood, & Davis, 2015) for students with intellectual disability. By learning to navigate the Internet more capably, students with intellectual disabilities can not only locate valuable educational materials but can also find information about potential jobs. Therefore, the ability to use technology is an essential skill in preparing students with intellectual disabilities for future careers and richer, more well-rounded lives.

Statement of the Problem

In the last decade, higher education institutions have seen an increase in the enrollment of students with disabilities. The reasons for this influx vary, but it is clear that completing a college education can allow these students to secure better jobs and live more independently (Office of Educational Technology, 2017). However, there are many challenges for students with disabilities in regard to completing higher education, namely a low level of technology skills. Using technology in higher education is now routine, so students' technology skills typically

have a significant impact on academic achievement in college-level classes (Parker & Banerjee, 2007). Digital competence in higher education is essential in taking a class as well as improving the quality of life of students with disabilities (Alper & Goggin, 2017).

Due to the importance of technology skills, prior studies have used a mobile device to improve technology skills for young and adolescent students with intellectual disability (Cihak, McMahon, Smith, Wright, & Gibbons, 2015; Gunderson, Higgins, Morgan, Tandy, & Brown, 2017; Stephenson, 2015). However, there is limited research on digital competence and the impact it has on the college experience of and career implications for students with intellectual disabilities. Therefore, research is required to determine the impact digital competence may have on the abilities of these students to achieve the milestones of a successful life taken for granted by others.

Statement of Purpose

The purpose of this research was to assess the impact of students' digital competence in using mobile devices in CrossingPoints program, a post-secondary transition program, specifically when seeking employment. This study first measured digital competence of current students, aged between 18 and 21 years, with intellectual disabilities by examining their technical skills of information and digital literacy. It then examined strategies needed to improve digital competence with mobile devices. Last, this research determined progression to improve the digital literacy skills of students with intellectual disabilities. In order to do this, the study measured the effect of a technology class focusing on information and data literacy (IDL) on the digital competence for students with intellectual disabilities.

Significance of the Problem

Prior research (Dobransky & Hargittai, 2006) addressed the importance of digital equality between people with and without disabilities for Internet use, but there is still a lack of specific programs, support, and research for digital competence that addresses technology skills. In a modern digital society, digital competence is essential in securing work (Office of Educational Technology, 2017). Nevertheless, there is a lack of research into the capability of students with disabilities in postsecondary education to increase their digital competence. To support the future employment of students with intellectual disabilities, research is required to study how best to achieve digital competence as well as to identify differences in technical abilities. Also, research on learning strategies and the acquisition of digital competence is essential to determine if these skills indeed have a positive impact on the employment rate of students with intellectual disabilities.

Conceptual Framework

This study used the Digital Competence Framework for Citizens (DigComp 2.1) (Carretero, Vuorikari, & Punie, 2017). It was designed to assess digital competence for general student employment in Europe. Digital Competence was developed by synthesizing various prior frameworks such as Technology, Pedagogy, and Content Knowledge (TPACK), UNESCO Information and Communication Technology Competency Framework for Teachers (UNESCO ICT CFT), International Society for Technology in Education's Standards for Teachers (ISTE Standards-T), and Mentoring Technology Enhances Pedagogy (MENTEP).

The Digital Competence Framework for Citizens, DigComp 2.1, includes five detailed areas: (a) information and data literacy, (b) communication and collaboration, (c) digital content creation, (d) safety, and (e) problem solving (see Figure 1). The framework also includes

different stages of proficiency, with four levels: foundation, intermediate, advanced, and highly specialized. Each level has two specific sub-levels, so the framework has a total of eight proficiency levels.

Figure 1. Five key areas of DigComp.

Research Questions

The following questions guided this study.

1. What is the level of digital competence of students with disabilities in the information and data literacy areas prior to an intervention that teaches use of a mobile device?

2. What is the progression of digital competence in the information and data literacy areas for students with intellectual disabilities during a technology class using a mobile device?

Assumptions of the Study

An assumption in this study was that students with disabilities manipulate their mobile device independently. It was also assumed that no other device is used during the study period. Additionally, it was assumed that data automatically stored on the device accurately represented usage, including length of time device was used, search history, and independent use of applications.

Limitations of the Study

There were few limitations in this study. In this study, participants were young adults with intellectual disability. Thus, students of different ages may be expected to have different outcomes. In addition, this study targeted students with specific intellectual disabilities based on the disability criteria of the American Psychiatric Association. The level of development of digital competence among students with other disabilities may be different. Last, the study used iPad usage data to measure students' digital competence. In an educational environment using other mobile devices or computers, the size of the screen, the ease of operation of the device, and the operating system of the device may affect the students' digital competence.

Operational Definition of Terms

The following section presents brief definition of key terms used in this study. These terms are defined in full within the Chapter 2.

Digital competence. For this current study, the digital competence of students with disabilities referred to their ability to search, select, and save information on a mobile device to utilize the information on the Internet.

Mobile learning. "Mobile learning is any educational provision where the sole or dominant technologies are handheld or palmtop devices" (Traxler, 2005, p. 262).

Assistive technology. Assistive Technology (AT) is a variety of devices (and services related to their use) aimed at helping persons with disabilities and special education or rehabilitation needs to function better within their daily context and achieve a higher quality of life (Lancioni, Sigafoos, O'Reilly, & Singh, 2012, p. 1)

Intellectual disability. "Intellectual disability is characterized by significant limitations both in intellectual functioning and in adaptive behavior as expressed in conceptual, social, and practical adaptive skills. This disability originates before age 18" (Luckasson et al., 2002, p. 1).

Summary

Chapter 1 gives an overview of this study that introduces the study, the necessity of this research, research questions, conceptual framework, and definitions of key terms.

Chapter 2 presents a review of related literature describing more specifically the prior studies related to this study. There are five subtitles: Evolution of Inclusion, Transition Programs, Employment and Students with Disability, Technology and Special Education, and Digital Competence.

Chapter 3 provides the research methods used to address the research problems in this study. This chapter contains detailed descriptions of the research design, participants, and data collection and analysis.

Chapter 4 includes the results of the Improvement Rate Difference analysis, visual analysis of participants digital competence, and survey.

Chapter 5 provides the summary of the study, discussion of the findings, implications for practice, recommendations for future research, and conclusion.

CHAPTER 2: REVIEW OF LITERATURE

This literature review introduces the role of technology in special education and how technology-based education can help students with disabilities. It also introduces the definition of digital competence, the central concept in this study. Prior research about the employment of students with disabilities using mobile devices is lacking. This literature review synthesizes the advantages of technology for students with disabilities.

Evolution of Inclusion

According to a report by the American Psychiatric Association (2015), the definition of intellectual disability is "a disorder with onset during the developmental period that includes both intellectual and adaptive functioning deficits in conceptual, social, and practical domains (p. 34)." There are four severity states of intellectual disability: Mild, Moderate, Severe, and Profound. The following is specific diagnostic criteria of intellectual disability from the American Psychiatric Association.

1. Deficits in intellectual functions, such as reasoning, problem solving, planning, abstract thinking, judgment, academic learning, and learning from experience, confirmed by both clinical assessment and individualized, standardized intelligence testing.

2. Deficits in adaptive functioning that result in failure to meet developmental and sociocultural standards for personal independence and social responsibility. Without ongoing support, the adaptive deficits limit functioning in one or more activities of daily life, such as communication, social participation, and independent living, across multiple environments, such as home, school, work, and community.

3. Onset of intellectual and adaptive deficits during the developmental period.

Students with disabilities' right to access an education has long been emphasized by various laws. The Department of Justice enacted the Americans with Disabilities Act in 1990. This law ensured that postsecondary educational institutions, such as colleges and universities, provide programs that are accessible by students with disabilities. More recently, since the enactment of the Individuals With Disabilities Education Act (IDEA) in 2004, the importance of transition services has been emphasized in order to help students with disabilities, including intellectual disability, move from school to adult life. However, according to the Think College program report, as of 2018, only 266 university options existed for students with disabilities. There are not many postsecondary education options for students with disabilities, and they have potential difficulties with day-to-day living compared to their peers.

Transition Programs

It is clear that transition or postsecondary programs are also helpful for students with and without disabilities seeking a job. Moore and Schelling (2015) found that postsecondary inclusion helps students with intellectual disability find a job position. The Higher Education Opportunity Act Amendments (HEOA) of 2008 in the United States defined "comprehensive transition and postsecondary programs for students with intellectual disabilities" as a degree, certificate, or nondegree program which is (a) offered by an institution of higher education; (b) designed to support students with intellectual disabilities (ID) who are seeking to continue academic, career and technical, and independent living instruction in order to prepare for gainful employment; (c) includes an advising and curriculum structure; and (d) requires students with intellectual disabilities to participate on not less than a half-time basis with nondisabled students.

The National Longitudinal Transition Study-2 (NLTS2) report categorized three types of postsecondary institutions: 2-year or community colleges; postsecondary vocational, business, or technical schools; and 4-year colleges. For young adults with disabilities, 2-year or community college has a higher enrollment rate (37%) compared to postsecondary vocational, business, or technical schools (28%) and 4-year colleges or universities (15%). Studies using data from the National Longitudinal Transition Study-2 (NLTS-2) also found that postsecondary education (PSE) was found to be a future goal for more than 80% of secondary students with transition plans, yet only 8% of youth with ID participated in PSE after exiting high school (Cameto, Marder, Wagner, & Cardoso, 2003; Wagner, Newman, Cameto, Garza, & Levine, 2005).

More recently reports from ThinkCollege (Grigal, Hart, Smith, Domin, & Sulewski, 2013; Grigal et al. 2014, 2015; Grigal, Hard, Smith, Domin, & Weir, 2016), a national organization for developing, expanding, and improving inclusive higher education opportunities for people with intellectual disabilities, clearly show the progression of transition programs in the US. ThinkCollege released an annual report for Cohort 1 from 2010 to 2015. They received a grant from the Office of Postsecondary Education, US Department of Education, that provides support, coordination, training. and evaluation services for Transition and Postsecondary Education Programs for Students with Intellectual Disabilities (TPSIDs) and all other programs for students with intellectual disabilities nationwide. According to the reports, increasing numbers of students with intellectual disabilities participated in transition and postsecondary education programs between 2010 and 2015. The total number of students who attended TPSIDs programs rose from 460 to 883 over the 5 years. The reports furthermore revealed that the number of students who were in postsecondary education and had paid jobs increased during that same time period. For example, 124 students (27%) had paid jobs in 2010-11, 236 students

(30%) in 2011-12, 298 students (36%) in 2012-13, 347 students (39%) in 2013-14, and 345 students (39%) in 2014-15.

Transition programs for students with disabilities have tried using technology for vocational education. According to a review study (Walsh, Holloway, McCoy, & Lydon, 2017), there are two types of research related to improving vocational education for students with disabilities: using technology to teach specific job skills and using technology to teach more generic skills needed in all jobs. However, after graduating from transition programs, students with disabilities need the ability to get a job on their own. Typically developing peers can find information online about what kind of jobs are available, how to prepare for a particular job, and what educational programs or subjects they should study to improve skills required to secure a particular job. It is important to take advantage of technology to improve career outcomes for students with disabilities in postsecondary education because they have less career success than their peers without disabilities (Burgstahler, 2003).

Before postsecondary education, there is a vocational education program for students with disabilities in the last year of high school to provide work experience called “Project Research” (Cannella-Malone & Schaefer, 2017). According to the U.S. Department of Education, National Center for Education Statistics report (McFarland et al., 2018), 78% of young adults were found to be employed, and those who completed postsecondary education had a higher rate of employment. In 2007-08, 10.9% of students with disabilities were enrolled in a postsecondary education, and in 2011-12, 11.1% were enrolled in higher education. These facts show that enrolling in and graduating from higher education play an important role in securing employment (Grigal & Hart, 2013), but that students with disabilities still have a low rate of enrollment in postsecondary education.

The CrossingPoints transition program at The University of Alabama is an inclusive, comprehensive transition and postsecondary education for students, ages 18-21 years, with intellectual disabilities. In 2015, the CrossingPoints program received a grant from the United States Department of Education, Office of Postsecondary Education to increase postsecondary opportunities for students with intellectual disabilities. The CrossingPoints transition program model was developed to improve students' skills focusing on five essential elements of transition which are defined in the Individuals with Disabilities Education Act, IDEA (IDEA, 2004): (a) integrated employment, (b) postsecondary education, (c) community access and participation, (d) leisure/recreation, and (e) independent living.

The CrossingPoints program currently operates two types of specific programs called Tier 1 and 2. The Tier 1 program is for college-age students who are still receiving services under IDEA but are of college age, between 18 and 21. The Tier 2 program, Summer Bridge Program, focuses on students wanting to pursue postsecondary education. Tier 1 operates during the academic year and offers inclusive employment internships, and inclusive recreation, leisure, and social activities across the University of Alabama (UA) campus with typical college peers. Mentors who were similarly enrolled in undergraduate programs at UA support the Tier 1 participants by participating with them in employment internships, academic and independent living classes, and leisure/recreation activities. After graduating from the program, students will receive diplomas conferred by the President, the same as all the other graduates.

The Tier 2 program operates over 9 weeks during the summer semester on the UA campus. This program, unlike the Tier 1 program, was intended for adult students aged 19 and over without age limit as defined by the Diagnostic and Statistical Manual of Mental Disorders, DSM-5 (Nuckols, & Nuckols, 2013). The purpose of the Tier 2 program, Summer Bridge, is to

increase students' self-advocacy and self-determination skills for social integration, independent living, employment, and academics in a postsecondary education. Participants in this program live in a residence hall on the UA campus. The Tier 2 program provides students an opportunity to attend college and technology classes that were selected based on their individual needs, preferences, interests, taking their strengths into consideration. Also, students have an opportunity for inclusive employment internships across the UA campus.

Employment of Students With Disabilities

In the past, postsecondary education was not a requirement for a workforce, but now additional education after exiting high school, or at least acquisition of a specific set of skills, is required in new job types and industries (Office of Educational Technology, 2017). Employment is an essential part of life, not only for people without disabilities but also those with them. However, the employment rate of individuals with disabilities is still relatively low. According to the 2016 Disability Statistics Annual Report, the percentage of people with disabilities employed was 34.9%, compared to 76% of people without disabilities (Kraus, 2017).

Learning basic digital skills is an important factor in getting a job. Computer and technology technologies, including the Internet, potentially promote positive achievement in a post-secondary education and vocation for people with disabilities (Burgstahler, 2003; Kim-Rupnow & Burgstahler, 2004). For example, maintaining email correspondence is one of the most basic functions of having a social life as well as a job, as it allows for convenient digital communication and sustaining contact with friends and colleagues alike (Cihak et al., 2015).

Assistive Technology can also improve the job skills of employees with intellectual disabilities. Previous studies revealed that assistive technology helped employees with intellectual disabilities to complete office-related tasks, which are copying, scanning, and faxing,

independently and accurately (Collins, Ryan, Katsiyannis, Yell, & Barrett, 2014) and to improve employment-related outcomes in real work and simulated work settings (Damianidou, Foggett, Arthur-Kelly, Lyons, & Wehmeyer, 2018). The common types of instruction using Assistive Technology are prompting, reinforcement, shaping, and changing to teach learning and job skills to students with intellectual disabilities (Collins, Ryan, Katsiyannis, Yell, & Barrett, 2014). Digital competence, or IT literacy, is an important skill in preparing for future employment (Lombardi et al., 2017). However, research on vocational education for disabled students using technology such as the Internet has, so far, been limited. In particular, prior research focusing on the use of technology by students with disabilities in real work settings has been limited, and more research is needed (Damianidou et al., 2018). There is also a lack of research regarding the improvement of students' technological abilities in regard to seeking and securing employment.

Technology and Special Education

The development of technology has also had a significant impact in special education. Thanks to today's ever-changing digital technologies, students can access information via mobile devices anytime, anywhere. The role of technology in special education, then, has two levels (Ayres et al., 2013). The first is that technology helps students directly. This is known as assistive technology (AT), and it supports individuals in completing tasks. The second aspect is instructional technology (IT), which is used to teach technology skills. Other researchers have defined AT as a broader concept which includes physical activities and services (Owuor, Larkan, & MacLachlan, 2017). This study focused on IT that helps to increase the digital competence of students with disabilities, specifically intellectual disability.

Research on mobile technology for students with disabilities has been conducted in a variety of ways for educational purposes. Disability education using mobile devices has

advantages for each academic skill, specifically scheduling (Stephenson, 2015), living skills (Ramdoss et al., 2012), science (Miller, Krockover, & Doughty, 2013), independent living (Ayres et al., 2013), writing (Straub & Vasquez, 2015), and navigation skills (McMahon, Smith, Cihak, Wright, & Gibbons, 2015). The effectiveness of mobile devices for each academic skill means that mobile devices have potential benefits in disability education (Nguyen, Barton, & Nguyen, 2015).

There are technological advantages for students with disabilities, depending on the type of content, such as educational applications (Agree, 2014), instant video feedback (Suhrheinrich & Chan, 2017), and images for memos (Chan, Lamdin, Graham, Fragale, & Davis, 2014). The mobile learning environment, which is a kind of online learning, is valuable for creating personalized learning environments to support students with disabilities (Basham, Hall, Carter, & Stahl, 2016). Additionally, mobile learning environments allow students to participate in and integrate formal and informal learning to create a learning environment that can support individual learners through real-time study in a ubiquitous environment (Kinshuk, Chen, Cheng, & Chew, 2016).

To maximize the advantage of technology enhanced learning for students with disabilities, teachers, instructors, and parents have to support their students' learning process. This is because using an Internet-connected device has advantages as well as disadvantages (Chadwick, Quinn, & Fullwood, 2017). Prior research (Dixon, Verenikina, Costley, & Pryor, 2015) revealed that parents who have students with disabilities were concerned that students used their iPad only for entertainment purposes at home. Teachers, instructors, and parents have to support their students' learning process to prevent spending so much time on entertainment apps.

People with disabilities prefer to use the Internet to access health and government service information far more frequently than people without disabilities (Dobransky & Hargittai, 2006). However, the rate of those using the Internet for job search purposes is significantly lower than for people without disabilities (Dobransky & Hargittai, 2006). To live in the modern digital age, people need to be able to access and use information through the Internet in a manner that makes their lives better. But the opportunity to access the Internet is not equal for everyone. Dobransky and Hargittai (2016) revealed that the factors of the digital divide include the sociocultural, socioeconomic, social, and digital characteristics of each individual. This digital divide does not mean a barrier to physical access to the Internet. Instead, the notion of the digital divide has changed from a physical approach to competency and the usage of information (van Dijk, 2006).

Digital Competence

The definition of digital literacy has changed in many ways (Alexander, Becker, Cummins, & Giesinger, 2017). Improving students' digital literacy increases the possibility that they can quickly adapt to any device they might use for learning. The Digital Competence Framework for Citizens, named DigComp 2.1, was designed to better understand the capabilities of digital competence for general student employment in Europe (Carretero et al., 2017). The DigComp framework has been used for a variety of educational purposes, environments, and different target groups (Kluzer & Pujol Priego, 2018). The DigComp framework has a variety of practices used for setting educational goals, strategy design, the development of education and training programs in various educational domains such as formal education and training, life-long learning, and employment. For example, the rubric provided by the DigComp framework was used to measure the five areas of digital competence of secondary education teachers before and after teacher training (Napal, Peñalva, & Mendióroz, 2018). The framework includes five

digital competence areas: (a) information and data literacy, (b) communication and collaboration, (c) digital content creation, (d) safety, and (e) problem solving. Table 1 shows the five competences and sub-competence areas of digital competency. The competence of information and data literacy has three sub-dimensions that include browsing, searching, filtering, evaluating, and managing data & information and digital content. The following Table 2 shows a detailed explanation of the sub-dimensions of information and data literacy. DigComp also includes eight proficiency levels of digital competency related to the complexity of the tasks. The tasks in each level of digital competency were used as a checklist to evaluate students' performance in a test.

Table 1

The Dimensions of Five Digital Competence Areas

Competence Area Dimension 1	**Dimension 2**
1. Information and data literacy	1.1 Browsing, searching, filtering data, information, and digital content 1.2 Evaluating data, information, and digital content 1.3 Managing data, information, and digital content
2. Communication and collaboration	2.1 Interacting through digital technologies 2.2 Sharing through digital technologies 2.3 Engaging in citizenship through digital technologies 2.4 Collaborating through digital technologies 2.5 Netiquette 2.6 Managing digital identity
3. Digital content creation	3.1 Developing digital content 3.2 Integrating and re-elaborating digital content 3.3 Copyright and licenses 3.4 Programming
4. Safety	4.1 Protecting devices 4.2 Protecting personal data and privacy 4.3 Protecting health and well-being 4.4 Protecting the environment
5. Problem solving	5.1 Solving technical problems 5.2 Identifying needs and technological responses 5.3 Creatively using digital technologies 5.4 Identifying digital competence gaps

This current research focused only on the first competence, information and data literacy, for the following two reasons: First, information and data literacy, the first dimension of five digital competence areas, is the most basic competence and connected with all the other competences. If students are at a low level of information and data literacy, they are also at a low level of other competence areas. The other reason is the limited class time to cover all five competence areas. The second research question measured the progression of students' digital competence based on repeated data collection. For that reason, it was necessary to repeatedly teach students one learning topic over the whole research period. One hour of class time is not enough to explain all five areas of content to students.

Table 2

The Definition of Information and Data Literacy

Sub-Dimension	Definition
1.1 Browsing, searching and filtering data, information, and digital content	To articulate information needs; to search for data, information, and content in digital environments; to access them and to navigate between them. To create and update personal search strategies.
1.2 Evaluating data, information, and digital content	To analyze, compare, and critically evaluate the credibility and reliability of sources of data, information, and digital content. To analyze, interpret, and critically evaluate the data, information, and digital content.
1.3 Managing data, information, and digital content	To organize, store, and retrieve data, information, and content in digital environments. To organize and process them in a structured environment

Summary

The importance of postsecondary education for students with disabilities has increased to ensure the educational opportunities of those students since the reauthorization of the IDEA in 2004. Regarding the development of technology, digital competence is an important skill for preparing future careers for students both with and without disabilities. However, there is a lack of research into how to support the employment of students with intellectual disabilities and how they can improve their digital competence. The purpose of this research was to assess the impact of students' digital competence in using mobile devices in post-secondary transition programs, specifically when seeking employment. This study explored the progression of digital competence for students with disabilities focusing on the first area of digital competence, specifically information and data literacy.

CHAPTER 3: METHODS

This chapter describes the methods used to conduct this research. The current chapter consists of the following sections: (a) research design, (b) participants, (c) setting, (d) variables, (e) experimental procedure, (f) instrumentation, (g) data collection, (h) data analysis, (i) ethical procedures, and (j) threats to validity. The purpose of this research was to assess the impact of using mobile devices in a postsecondary transition program on students' digital competence in preparing for employment. While the importance of digital competence has increased both within society at large and within the field of education, there is a lack of research on the capability of students with disabilities in postsecondary education to increase their digital competence. For the purpose of this study, the research questions were the following:

1. What are the effects of a technology class that teaches use of a mobile device on the information and data literacy skills in digital competence of students with intellectual disabilities?

2. What is the progression of digital competence in the information and data literacy areas for students with intellectual disabilities during a technology class using a mobile device?

Research Design

Single-subject research is scientific methodology to conduct evidence-based practice in special education (Horner et al., 2005). This study used a multiple baseline across participants design (Gast, Lloyd, & Ledford, 2014) with three students with intellectual disabilities to examine the effect of using a mobile device in a technology class on their digital competence. The purpose of a multiple baseline design is to compare the differences of the values between the

baseline and the intervention phases (Gast et al., 2014). The multiple baseline design starts with baseline phase and after that moves on to the intervention phase. In this research, there are the baseline and intervention phases but no the return to the baseline phase after the intervention because it is unnecessary to demonstrate the effect of treatment during the intervention phase (Cooper, Heron, & Heward, 2007). There are three primary ways to use the multiple baseline design: (a) the multiple baseline across behaviors design to investigate multiple behaviors of the same individual, (b) the multiple baseline across setting design to examine an individual's behavior in the different settings and situations, and (c) the multiple baseline across subjects design to figure out the same behavior within multiple individuals (Cooper, Heron, & Heward, 2007). The multiple baseline across participants design is a common research design to assess treatment effectiveness of participants who are in the similar medical and behavioral symptoms (Gast, Lloyd, & Ledford, 2014) and to conduct a study in the classroom context (Neuman & McCormick, 2016). The multiple baseline across participants design was suitable because all the participants in this research had an intellectual disability and they were in an educational, the CrossingPoints program.

Participants

The students participating in this study were enrolled in the CrossingPoints Tier 1 program on the UA campus in the Fall of 2019. The program was for students with intellectual disabilities between the age of 18 and 21 years to improve their job skills and independent living skills after graduation. All the participants were 18 years old. The students were enrolled in a high school under either the Tuscaloosa City School System or Tuscaloosa County School System. All students with intellectual disabilities in both school systems have the opportunity to apply for the program with application documents, medical documents, and a recommendation

from their teacher in the school system. The program takes new eligible students after conducting an individual interview with them and their parents. There were 11 students in the Tier 1 Program of CrossingPoints in the 2019-2020 academic year. They took a Technology Workshop class during the Fall 2019 semester. The participants were selected from among the new students in the Tier 1 Program who agreed to participate in this study and met all inclusion criteria.

There were 11 new students enrolled in the Tier 1 Program of CrossingPoints Fall 2019, but to be eligible, participants must have met the following criteria. First, eligible students had a diagnosis of intellectual disability. For the purposes of this research, students who had different types of disabilities were excluded. Second, eligible students had to be able to handle their iPad independently. In this research, students were required to have the physical ability to type and take a screen shot by clicking the home button and power button simultaneously. One of the students was limited in taking a screen shot on the iPad because of difficulty in controlling her left hand. Third, included students needed to have at least basic reading and writing skills so that they could read information on the Internet and type search keywords on the Internet searching bar. Two of the students could not correctly spell the searching keywords. The fourth criterion was mobile technology skills. The students in the CrossingPoints program had various levels of mobile skills because of their prior experiences with mobile technology. There were students who had a mobile device, used it at home, and already knew the technology skills that would be taught in this research. The last criterion was attendance. Three students who missed more than two classes were excluded from this study because two missed data points meant they did not have the required total of nine data points. After considering the preceding criteria, three students finally participated in this research.

Teacher and Mentors. In the CrossingPoints program (CPP), there are two special education teachers from the Tuscaloosa City School System and Tuscaloosa County System who lead CPP classes during the academic year. They majored in Special Education and have experience teaching students with intellectual disabilities. For this study, one teacher was in charge of conducting the class and evaluating students' tests, and the other teacher participated only in the evaluation. The main teacher, who taught the class, is a veteran educator of over 20 years. Most of her years in education were primarily in Elementary Education serving students from Pre-K to 8th grade as a certified General Education teacher in a midwestern state. She worked as a para-educator in CPP serving students with significant intellectual disabilities. Upon completion of her master's in special education, she worked for 2 years as a Collaborative Special Education teacher in Tuscaloosa, Alabama. Currently, she is a Certified Clinical Instructor for Tuscaloosa City Schools (TCS) at CrossingPoints Program. The other teacher has a Class B teaching certification for K-12 special education in Alabama. She is a teacher for the Tuscaloosa County School System (TCSS) at CPP. Both teachers had sufficient technology knowledge to teach the content of technology classes.

During the technology workshop class, there were one or two mentors who attended each session to help the students learn technology skills and solve technical issues during the class. Before participating in the class, mentors who were not freshmen or majoring in Special Education were required to watch videos "Peer Mentor Training" represented by Think College (Peer Mentor Training, 2019), which is a national organization for developing, expanding, and improving inclusive higher education options for students with intellectual disabilities. These videos for peer mentor training include four topics related to providing academic support to students with disabilities: classroom conduct, task analysis and academic mentoring, adapting to

individual student needs, and writing papers. Teachers and mentors were required to have a meeting that discussed their roles and responsibilities during the program period. They also discussed teaching materials and students' information.

Setting

Technology class. The students attended a total of nine technology classes to improve their information and data literacy skills. Technology classes were held every Thursday from 1:45 pm to 2:30 pm for 45 minutes during the fall semester. The study was conducted in a university classroom in the College of Education building at the University of Alabama campus. The classroom had desks, chairs, a computer, a projector, a big screen, and sound system for presentation purposes. The teacher used the screen to show PowerPoint slides each week that included teaching content and test questions. When the teacher was demonstrating iPad functions, the teacher's iPad was shared on the big screen to help students follow the specific steps when using their iPads.

The class was led by the teacher of CPP. The researcher participated in the class all 9 weeks and acted as a mentor to help students solve network problems and offer assistance when they could not complete certain learning steps. Before each class, the teacher and the researcher held an hour-long meeting about the process of the class and the learning content for the week. The purpose of the meeting was to increase the effectiveness of the class, and there were three main objectives. The first was to double check the contents of each week's lesson. The second was to search for a quiz of the week in advance and to check its results. Finally, the sentences in the presentation slides were checked to make words easy to understand and clear for students with disabilities.

The learning goal of the technology workshop class was for students to use an Internet mobile device to browse, search, filter, evaluate, and manage information. The total class schedule was 9 weeks, including an orientation class. The content of the class was developed based on information and data literacy, one of DigComp's competencies (Carretero et al., 2017), with the goal of improving students' technological skills. The information and data literacy competence has three sub-factors, as shown in Table 3, below.

Table 3

Sub-Components of Information and Data Literacy

Browsing, searching and filtering data, information and digital content	To articulate information needs, to search for data, information and content in digital environments, to access them and to navigate between them. To create and update personal search strategies.
Evaluating data, information and digital content	To analyze, compare and critically evaluate the credibility and reliability of sources of data, information and digital content. To analyze, interpret and critically evaluate the data, information and digital content.
Managing data, information and digital content	To organize, store and retrieve data, information and content in digital environments. To organize and process them in a structured environment

Students learned how to browse the Internet, search with a keyword, filter by searching options, evaluate the searching results, and manage the search results in each class during the 9 weeks. The meaning of browsing in this study was that students checked the Wi-Fi connection of the iPad through the Wi-Fi icon in the upper right of the screen in order to access the Internet from their mobile devices, and ran the Safari app, a web browser application. Searching means that students typed keywords that were relevant to their purpose for searching. Students used Google’s search engine during the technology class. There were two ways to search. Students

could access a Google webpage by typing a Google address in the Safari Internet address bar, and then typing a keyword in the search bar. Second, when students entered a keyword directly into the address bar and pressed the return key, the default Google search engine was automatically launched. Filtering means that students had the ability to change search results by data format and period to suit the purpose of their search. The Google search engine has a search tab where users can set the type of search results they want. Basically, it is set to display all types of search results, and users can set the type of search results such as images, maps, videos, news, and shopping. Also, through a menu called Tools, the user can adjust the search period and whether to use the keyword verbatim. When the user changed the search period, the Google search engine presented different search results accordingly. The basic search period was the entire period. Evaluating means that students could visit reliable websites based on judging the website's URL. Before students clicked on a search result, they needed to check whether the webpages were reliable by checking the domain suffix, such as .org, .edu, or .com. Also, the meaning of evaluating was an ability to compare search results to find the most reliable information by scrolling and navigating among thousands of searching results.

The meaning of managing was that students could save a web page containing useful information to the favorites in the Safari application. In addition, students could take screenshots and keep part of the web page with the information they wanted. Students could create folders to manage added favorites. Students created a folder named Technology Class to store all web pages they saved during the class. Basically, when a user presses the Favorites button on the iPad, it is saved in the default folder of favorites. If students wanted, they could save the webpage by changing the storage location to another folder or editing the storage location of the already saved webpage.

The technology workshop class ran for a total of 45 minutes, including 5 minutes of beginning, 30 minutes of main learning, and 10 minutes of testing. The following table (Table 4) summarizes the activities in the sessions.

Table 4

Time Schedule of the Technology Class

Time	**Session**	**Check Point**
5 Minutes (1:45-1:50)	Beginning - Check Wi-Fi connection - Check Google Account login - Review the last class topic - Reopen webpage in the last class topic	-Check students can re-open a website that they added in the last class
15 Minutes (1:50-2:05)	Main Learning: Teaching technology skills - Information and Digital Literacy skills - Demonstrate the skills	- Check students can follow the direction and each step of searching
15 Minutes (2:05-2:20)	Main Learning: Practice time - Practice Information and Digital Literacy skills with supporting, discussion, and asking	- Check students can complete each step of searching with/without supporting.
10 Minutes (2:20-2:30)	Test time - Take a test in each class - No supporting, discussion, asking	-Evaluation Test

Beginning session. At the beginning of each class, all students checked their Internet connection status by looking at the Wi-Fi icon in the right corner of the screen. After that, students checked to see if they were logged in to their Google account in the Safari application. When students had confirmed that all their devices were operating normally, they briefly reviewed the learning contents of the last class. During the beginning session, students took a test to see if they could reopen the web page that they added to their favorites in the Safari application during class the previous week.

Main learning. After the beginning session, students had 30 minutes for the main learning session. The main learning session followed three teaching steps for Internet searching based on the information searching model developed by Sanchiz, Chevalier, and Amadieu (2017). The information searching model involves three stages: planning and formulating the query, evaluating and selecting relevant information retrieved by the search engine, and information processing. Following are more details about each stage.

Stage 1: Planning and formulating the query. Users elaborate a coherent representation of their information need, produce keywords that are relevant to their objective, and phrase them into a query.

Stage 2: Evaluating and selecting relevant information retrieved by the search engine. Users process and evaluate the relevance of the search engine results and compare them with their information need and the query they produced. If the search engine results do not satisfy the users' information need, then users have to reformulate their query and go back to Stage 1. Stage 2 may be iterative as long as users do not find the relevant results they are searching for.

Stage 3: Information processing. When the search engine results are satisfying and relevant to the users' objectives, users can select one or several results to open up and process the webpage selected in deeper detail.

The first step was to teach how to select appropriate keywords. During the first step, the teacher asked the students questions about which keywords were appropriate for searching for various objectives. Second, the teacher explained judgment criteria regarding which information was useful to access from among a large volume of search results. The teacher gave the students the opportunity to evaluate which search results were most suitable. And third, the teacher taught students how to store webpages that contain useful information in their iPad using screen shot and bookmark functions. The teacher demonstrated how to take a screen shot and bookmark a webpage in the web browser and reopen it later. The demonstration by the teacher is a useful teaching strategy for students with disabilities and encourages those who lack technology skills to use mobile devices (Ayres et al., 2013). The teacher presented the iPad screen on a large screen so that all students could see what was on the iPad screen.

The teacher tried to give the students time to fully follow each Internet searching step and observed whether the students completed each step perfectly with real-time feedback to those who did not follow the steps. The way to give feedback was that the teacher first asked the students indirectly to induce them to find the correct answer on their own. If that didn't work, the teacher gave feedback to the students through a demonstration. The teacher had to make sure that the student completed each step correctly. The mentors who were part of the class also supported students when they operated their iPad after the teacher's demonstration.

Test session. After the main learning session, students took a test for 10 minutes to assess their learning achievement. The test had mainly two questions: (a) reopen the webpage that you

found in the last class and (b) find the best webpage to answer the job-related questions and general questions. Students started the test after activating the screen record function on their iPad, and when the test was over, the screen recording function ended. The teacher told the students to not get help from peers or mentors during the test and cautioned them not to ask questions.

The test topics were different each week. For the first 3 weeks, the test topics included general questions to make student more focused on learning operational skills. After 3 weeks, the topics were completely related to job seeking. As each week passed, the students learned to find information related to their professions, such as searching for jobs to which they could apply and the qualifications for each position. Table 5 provides a summary of the learning and test topics over the 9 weeks. Appendix A shows specific questions used in each class.

Table 5

The Teaching and Test Topic of Each Class

Week	Topic	Test Topic
1	Orientation	Your dream job
2	Browsing: Safari App	Thanksgiving recipe
3	Searching: Keyword	Halloween food and events
4	Filtering: Different menu taps	Job skills
5	Evaluating: Reliable website by domain	Job in Tuscaloosa
6	Evaluating: Reliable website by contents	Job interview skills
7	Managing: Bookmark	Definition/example of Curriculum Vitae
8	Managing: Create new folder in favorite	Job skill videos
9	Summary of all the contents they learned	Online job application website

Variables

Independent Variables

During the 9 weeks, students were expected to take the technology workshop class for 45 minutes with an iPad connected to the Internet. Students received their feedback from a teacher in the class when they learned strategies to increase their digital competence. Students were asked to practice technological skills of information and data literacy competence and take an evaluation test in each class.

Dependent Variables

The dependent variable was the percentage of information and data literacy scores. More specifically, there were five sub-dependent variables of the information and data literacy which were browsing, searching, filtering, evaluating, and managing. To measure the dependent variables, teachers evaluated students' sub-skill of information and data literacy with the grading sheet based on student's screen record videos, webpage history, and bookmarked webpages in the Safari application on their iPads.

Screen record videos. The screen record videos recorded the entire process of the student's test using the iPad's screen recording feature which is one of the IOS software features. As teachers watched this video, they investigated students' activities in detail, and measured students' information and data literacy skills.

Webpage history. The Safari application has a function to automatically save the webpages that students visited and the keywords they use to search. Through this function, the teacher analyzed the data and evaluated their information and data literacy skills.

Bookmarked webpages. Safari applications have a feature that allows users to save and manage the web pages they want. Through this function, the teacher judged whether the web

pages saved by the students were suitable for the test questions, and evaluated their information and data literacy skills, especially managing skills.

Experimental Procedure

Baseline

The baseline sessions including the orientation class were conducted for 3 weeks. During the session, students learned basic functions and features of iPad, browsing, and searching skills. According to the DigComp framework, there are five sub-components of the information and digital literacy component, the research only focuses on evaluating, managing part. All the students have known how to open a web browser to access the Internet and type the keyword correctly because they were all new students in CrossingPoints program, but they already started to use an iPad in the other class and activities during the program. Baseline was decided by the students' low scores at least three times consistently. In this period, teachers judged students' digital competence for filtering, evaluating, and managing based on the test scores. The test time was 10 minutes so that if students did not complete the task, the teachers determined they were not able to complete the task.

Intervention

The intervention phase was conducted in the technology class where the teacher taught filtering, evaluating, and managing skills for 30 minutes. During this phase, the teacher made students practice each skill repeatedly, but particular skills were emphasized each week. For example, students learned how to do filtering, evaluating, and managing on their iPad but each week had a specific learning topic emphasized. Mentors who were undergraduate students in special education were in the class during this phase. The main role of the mentor was to encourage students to follow the directions and solve the technical issues immediately. They

gave this support only in the main teaching time for 30 minutes. They did not provide any support during the last 10 minutes, the test time.

Instrumentation

Mobile Device

The device used in this study was the iPad Air (2014). The iPad has a screen size of 9.7 inches and 2048 by 1536 screen resolution. The iPad has a storage capacity of 16 gigabytes and is a model that can access the Internet only through Wi-Fi. Students connected to the university's campus Wi-Fi to access the Internet. The iPads used version 12 of iOS, the Apple mobile operating system. The mobile application to be used for this study was the Safari Internet browser, which was installed on devices running iOS 12. Students used the iPad's built-in applications. They could not install their own applications for any purposes other than educational purposes. Teachers and mentors made sure that students always used the iPad for educational purposes during the study period. Three functions of iOS 12 were used in this study: Screen Time, Activity Reports, and Screenshot.

Demographic Survey

Students and their parents took a survey before starting the semester that included demographic information. The contents of the questionnaire included age, gender, type of disability, severity state of intellectual disabilities, Internet access, and usage of mobile device (see Appendix B). This study focused on students with intellectual disabilities who were aged between 18 and 21 years. The participants and their parents were required to attend an orientation before the beginning of the program and then asked to sign consent forms indicating their assent to participation in the study.

Grading Sheet

This study evaluated the search data stored on the students' mobile devices according to the proficiency level presented by DigComp 2.1 (Carretero et al., 2017). The participating teachers assessed students' performance based on the Digital Competence Grading Sheet (see Appendix C) containing three questions based on the information and data literacy competence areas of DigComp. The grading sheet was developed based on the DigComp framework. There are five different components of DigComp but for this research only the first component, information and digital literacy, was selected to investigate the students' digital competence. In the first component, there are five detail sub-factors: browsing, searching, filtering, evaluating, and managing. Based on those factors, grading criteria was developed.

Post Survey

Each participant was asked to complete a survey after completing the technology workshop class. The purpose of the survey was to analyze their opinions of the learning experiences during the class. The survey includes eight questions regarding the advantage of using an iPad for learning Internet searching skills (Appendix D).

Data Collection

Test

The students in the CrossingPoints Tier 1 program took a total of nine classes with tests during the Fall Semester 2019. Two teachers in the special education field graded the students' test performances in each class using the Digital Competence Grading Sheet (see Appendix C).

To describe students' characteristics, a demographic survey collected personal information, such as age, gender, type of disability, severity of intellectual disability, Internet access, and usage of mobile devices. Table 6 summarizes all the data collected for this research.

Table 6

Data List

Data	Description	Type
Age	Age	Descriptive
Gender	Male/Female	
Type of ID	Students' intellectual disability information	
Level of ID	Four severity levels of intellectual disability (1. Mild, 2. Moderate, 3. Severe, and 4. Profound)	
Internet Access	Accessibility of the Internet at home	
Frequency of Internet usages	Students' prior experience and Internet use time on mobile devices in a day (1. Less than an hour, 2. 1-2 hours, 3. 2-3 hours, 4. 3-4 hours, and 5. over 4 hours)	
Time Points	The number of times taking a test during the classroom (1-9 times)	Ordinal variable
Digital Competence	Students' proficiency levels of sub-competency of information and data literacy.	

Grading

Two teachers who are in the CrossingPoints program participated in grading and evaluated the students' test performances in each class using the Digital Competence Grading Sheet (see Appendix C). One of the teachers taught the technology class and the other teacher did not teach in the technology class but taught other classes in the program. The teachers assessed the students' performance based on the three items of screen records, keywords, and webpage history, that were automatically stored, and bookmarked items stored by students. The

screen record function recorded all the screen information that included clicking, scrolling, typing, and navigating. Web browser applications, such as Safari on the iPad, have the function of storing searched keywords automatically as well as previously visited webpage information. The digital competence grading criteria is provided in Appendix E. The teachers assessed the students' performance based on a total of eight items of the digital competence grading sheet related to browsing, searching, filtering, evaluating, and managing.

The meaning of browsing in this study is that students checked the Wi-Fi connection of the iPad and ran the Safari app, a web browser application. One evaluation item was used to confirm the student's browsing ability in the digital competence grading sheet. Searching means that students could type keywords that were relevant to their purpose for searching. One evaluation item was used to confirm the student's searching skill in the digital competence grading sheet. Filtering means that students had the ability to change search results by data format and period to suit the purpose of their search. One evaluation item was used to assess the student's browsing ability in the digital competence grading sheet. Evaluating means that students could visit reliable websites based on their assessment of the website’s URL. Two evaluation items were used to check the student's evaluating ability in the digital competence grading sheet. Managing means that students could save the web page containing useful information to the favorites of the Safari application. Three evaluation items were used to detect the student's evaluating ability in the digital competence grading sheet. If the student actually completed the practice, one point was awarded; otherwise, zero points were awarded for each item in the digital competence grading sheet. The formula for calculating the percentage of information and data literacy skills was:

> Percentage of information and data literacy skills = sum of scores from grader 1 + sum of scores from grader 2/Total # of graders/Total # of items x 100

To establish interrater reliability for the grading sheet, the teachers independently graded each test and compared the results by interrater agreement. The formula for the interrater agreement was (Fleiss, Levin, & Paik, 1981):

Percent Agreement = Agreement/Agreement + Disagreement X 100

Data Analysis

Single case study is useful for conducting an evidence-based practice for investigating the effectiveness of an intervention on a particular case. For this research, a multiple baseline across subjects, which is a type of single case study, was used to determine the efficacy of the technology class intervention for improving digital competence for students with ID (Gast et al., 2014).

In this research, visual analysis was used to evaluate level, trend, and stability of the information and data literacy skills within baseline and intervention phases. Traditionally, visual analysis of graphed data has been used for assessing treatment effects in single case design (Lobo, Moeyaert, Cunha, & Babik, 2017) including multiple baseline across subjects. The Improvement Rate Difference (IRD) was used to analyze the effect-size of the digital competence of each phase (Parker, Vannest, & Brown, 2009).

Ethical Procedures

Ethical procedures help to keep participants safe from harm (Creswell, 2012). Before collecting data, the researcher obtained Institutional Review Board (IRB) consent from The University of Alabama (Appendix F). Also, participants and their parents signed on the consent and assent form that introduced the purpose and detailed information of this research. Appendix F is the approval form from the IRB office at UA and Appendices G and H are the consent and assent forms, respectively, for the research.

All the documents such as the consent/assent form, demographic survey, students' personal information documents were stored in a desk cabinet in a secure office. The electronic data during analysis were only stored on the cloud storage system operated by UA (UA Box) to protect privacy and security of the data for the research.

Threats to Validity

Internal Validity

Campbell and Stanley (2015) identified eight potential threats to internal validity in an experimental research: history, maturation, testing, instrumentation, statistical regression, selection, experimental mortality, and interactions between any of these various threats (p. 5). To decrease internal validity, this research tried to control history and testing effects. A multiple baseline across participants decreased the threat of history because in order to conduct intervention phase, participants had to show a stable baseline on at least three points (Christ, 2007). In this study, all three participates were required to get at least three low level scores of digital competence during the baseline phase to move on the next phase.

External Validity

Establishing external validity in multiple baseline across participants was needed to control for the small number of participants (Ledford & Gast, 2018). To decrease external validity in a single subject research, it was required to consider the repetition of the effects across different participants, conditions, and/or measures of the dependent variable (Horner et al., 2005). In this study, the dependent variable which was digital competence was measured repeatedly for external validity. Measurements were repeated a total of nine times and with at least three stable measurement points made during the baseline phase. Also, this research

compared participants' performance during the baseline phase and contrasted it with performance under an intervention phase.

Summary

Chapter 3 provides the research methods used to solve the research problems in this study. This chapter contains detailed descriptions of (a) research design, (b) participants, (c) setting, (d) variables, (e) experimental procedure, (f) instrumentation, (g) data collection, (h) data analysis, (i) ethical procedures, and (j) threats to validity.

CHAPTER 4: RESULTS

This chapter describes the results of this research. This chapter presents the results of three participants with intellectual disability developing their digital competence. The purpose of this study was to assess the impact of students' digital competence in using mobile devices in a post-secondary transition program, specifically when seeking employment. In order to do this, the study measured the effect the technology class focusing on the Information and Data Literacy (IDL) had on the percentile of IDL skills for students with intellectual disabilities. A multiple baseline across participants was used to analyze the results of the test in each of the weekly technology classes. The results suggested that all the participants had a positive increase in IDL skills for the Internet searching of their future career. The following questions guided this study.

1. What is the level of digital competence of students with disabilities in the information and data literacy areas prior to an intervention that teaches use of a mobile device?

2. What is the progression of digital competence in the information and data literacy areas for students with intellectual disabilities during a technology class using a mobile device?

Descriptive Results

The students participating in this study were enrolled in CrossingPoints Tier 1 program in Fall 2019 on the University of Alabama (UA) campus. There were three participants for data analysis in this study. All three of the participants had cognitive impairments. Before participating in the study, students answered a questionnaire for descriptive information. They

took the Technology Workshop class for 9 weeks during the Fall 2019 semester with an iPad connected to the Internet.

General Information

Student 1 (S1) is a 19-year-old student diagnosed with intellectual disability and speech/language impairment. S1 is an African American female. She was a new student in the CrossingPoints program. Her most recent assessment results indicated she had a score of 81 on the parental assessment and a score of 89 from her teacher, based on results from the Adaptive Behavior Assessment System--3rd Edition, ABAS-3 (Harrison & Oakland, 2015).

Student 2 (S2) is a 19-year-old student diagnosed with autism. S2 is a White male. Fall 2019 was his 1st year in the program. His most recent assessment results indicated that he had a standard score of 72, based on results from the Wechsler Adult Intelligence Scale--4th Edition ,WAIS-IV (Wechsler, 2008).

Student 3 (S3) is a 19-year-old student diagnosed with intellectual disability and seizure. S3 is an African American male. He was a new student in the program. His most recent assessment results indicated that he had a standard score of 57, based on results from the WAIS-IV (Wechsler, 2008). Table 7 is a summary of descriptive information for all participants.

Table 7

Descriptive Information for all Participants

	Student 1	**Student 2**	**Student 3**
Age	19	19	19
Gender	Female	Male	Male
Ethnicity	African American	White	African American
Type of Disability	Intellectual Disability, Speech or Language Impairment	Intellectual Disability, Autism	Intellectual Disability, Seizure disorder
Severity Level of the Disability	Adaptive Behavior Assessment System (Third Edition) Teacher: 89 Parents: 81	Wechsler Adult Intelligence Scale – 4th Edition (WAIS- IV) Standard Scores (Total): 72	Wechsler Adult Intelligence Scale – 4th Edition (WAIS-IV) Standard Scores (Total): 57

Internet and mobile device information. S1 could access the Internet at home with her tablet and cell phone device. Her average time of daily Internet usage was 4 hours. She has used news, social networking, music, and weather apps on the cell phone. S2 could access the Internet at home with his PC and cell phone device. His average time of daily Internet usage was 2 hours. He has used entertainment, social networking, games, music, weather, and shopping apps on the cell phone. S3 could access the Internet at home with his parents' cell phone device but does not have his own cell phone for Internet access. His average time of daily Internet usage was 2 hours. Table 8 is descriptive information of the participants' Internet and mobile device.

Table 8

Descriptive Information of Participants' Internet and Mobile Device

	Student 1	**Student 2**	**Student 3**
Internet Access at Home	Yes	Yes	Yes
Internet Device	Tablet, Cell Phone	PC, Cell Phone	Parents' cell phone
Internet daily usage time	4 hours	2 hours	2 hours
Own Mobile Device	Yes	Yes	No
Mobile App	News, Social Networking, Music, Weather	Entertainment, Social Networking, Games, Music, Weather, Shopping	N/A

Digital Competence Results

The percentage of information and data literacy score was used to identify students' digital competence on the tests. Two teachers graded the test results with the digital competence grading sheet watching the screen record, keywords, and history of webpages. The overall percentage of inter-observer agreement for information and data literacy score was approximately 91%, which was sufficiently reliable. In order to analyze the students' learning outcomes in detail, the grading results of information and data literacy skills were divided into five elements of information and data literacy; browsing, searching, filtering, evaluating, and managing.

This study conducted visual analysis to evaluate individual factors. All three students performed 100% on browsing and searching skills during the entire baseline and the intervention phases. This result was due to the participants' prior learning experience in other classes of the

CPP where they had already learned to access the Internet search site, which is a key function of browsing, and enter keywords, which is the main skill of searching ability. Therefore, students' filtering, evaluating, and managing abilities were examined through visual analysis to assess their IDL.

Filtering. Filtering means an ability to modify search results by changing data format and period for the purpose of their search. S1 did not use filtering skills during the baseline phases. She learned filtering skills at the first session of the intervention phase and used the skills until the end of the session. Figure 2 shows S1's learning process of filtering skills.

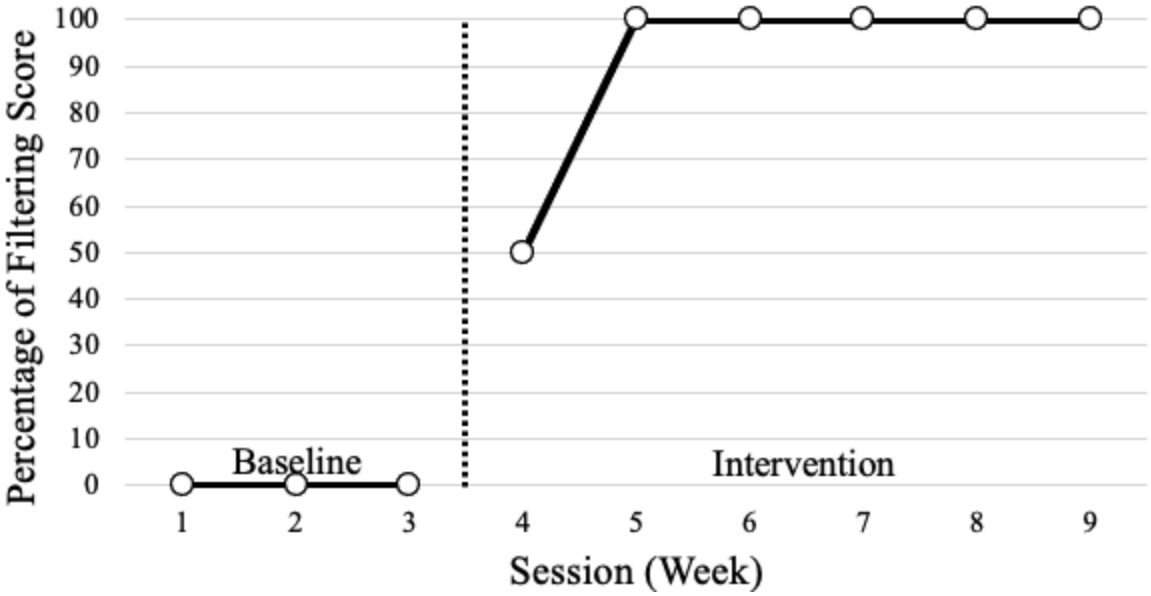

Figure 2. A visual analysis of the percentage of Student 1's filtering scores.

S2 also did not use any filtering functions at the baseline phase. In the intervention, he could not use the filtering function until Week 6, and from Week 7 on, he fully used the filtering function. Figure 3 represents his process of learning filtering skills.

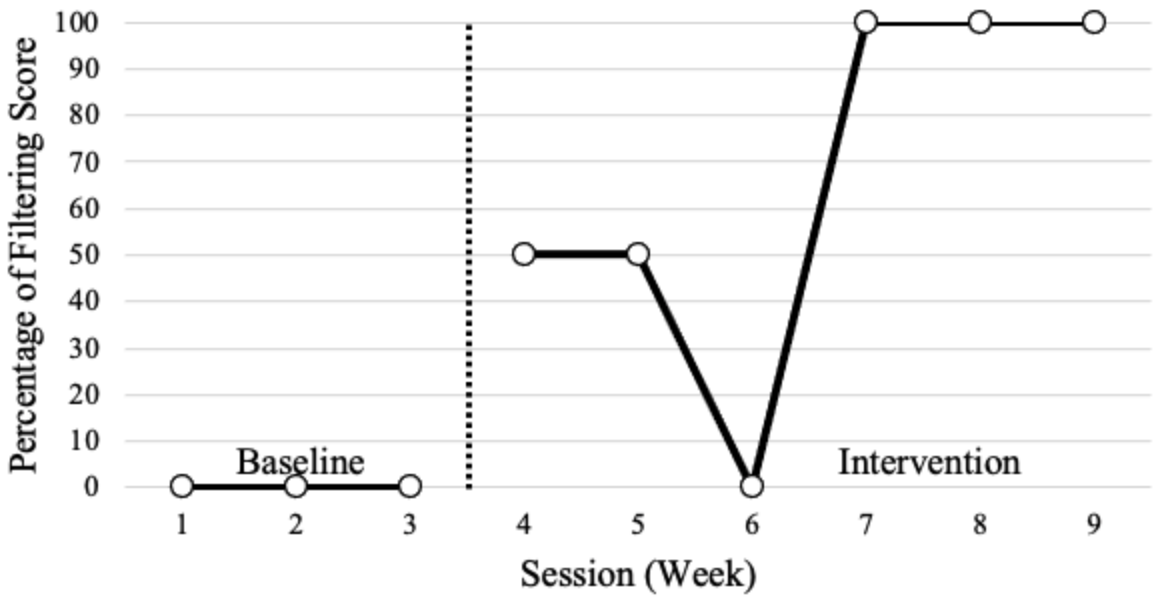

Figure 3. A visual analysis of the percentage of Student 2's filtering scores.

S3 did not use filtering skills during the baseline phases. He rarely used the filtering skills until Week 6, and from Week 7 on, he fully used the filtering function. Figure 4 shows his performance of filtering skills.

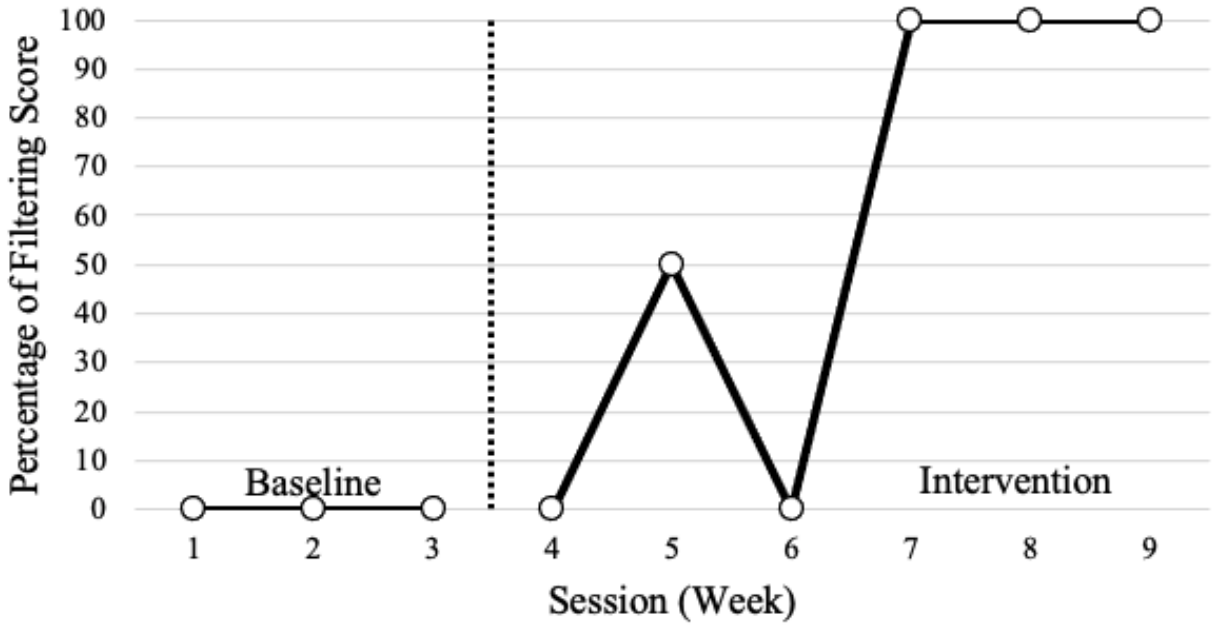

Figure 4. A visual analysis of the percentage of Student 3's filtering scores.

Evaluating. Evaluating means an ability to visit reliable websites based on the user's judgment of the website's address and to compare the search results for the searching purpose. Figure 5 shows that S1 did not complete evaluating skills during the entire session.

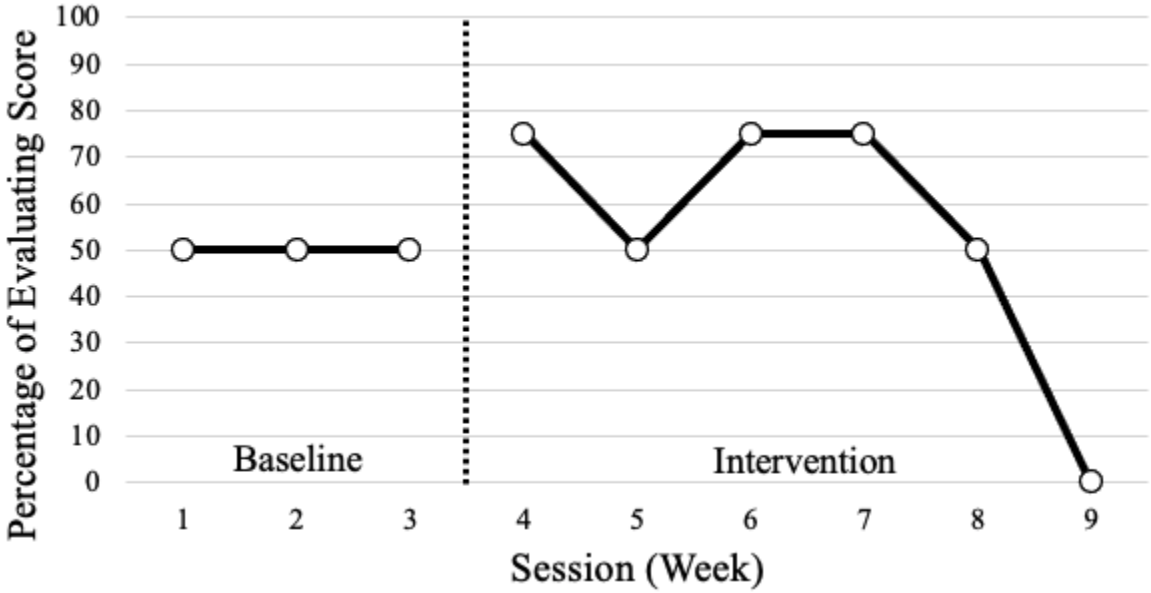

Figure 5. A visual analysis of the percentage of Student 1's evaluating scores.

S2 reached a perfect score of evaluating skills at Week 3 in the baseline phase. Although he temporarily used the evaluation skills perfectly during the baseline phase, it is difficult to address that he had mastered them completely. However, from Week 7 in the intervention, he completed evaluating skills. Figure 6 shows the results of S2's evaluating skills.

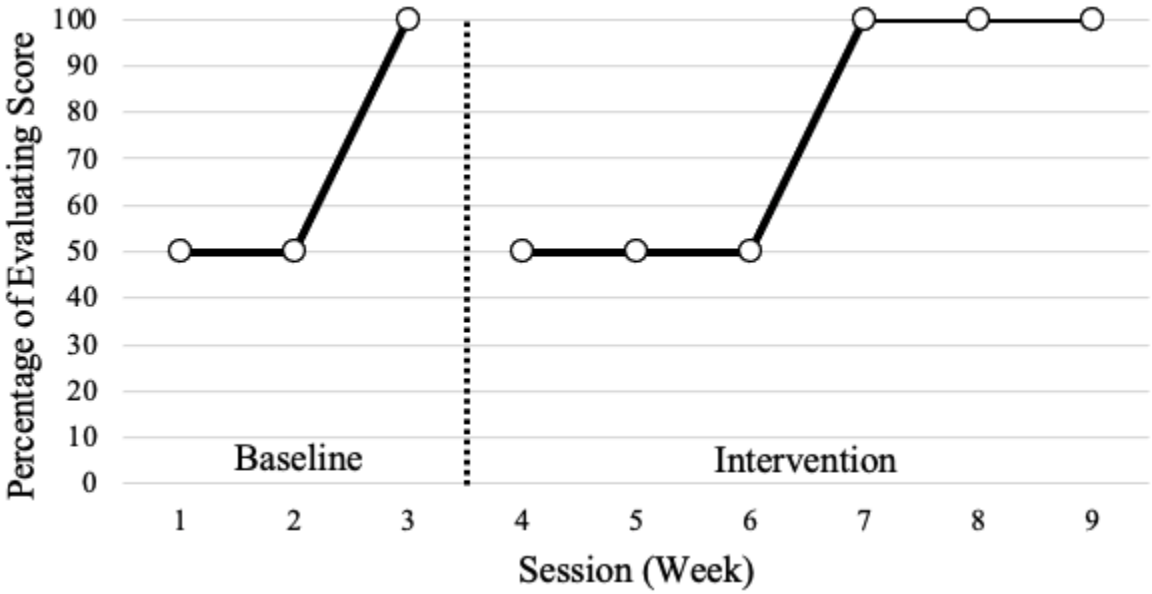

Figure 6. A visual analysis of the percentage of Student 2's evaluating scores.

Figure 7 below reveals that S3 did not use evaluating skills sufficiently during the baseline and intervention phase because S3 did not receive the last three data points in each phase.

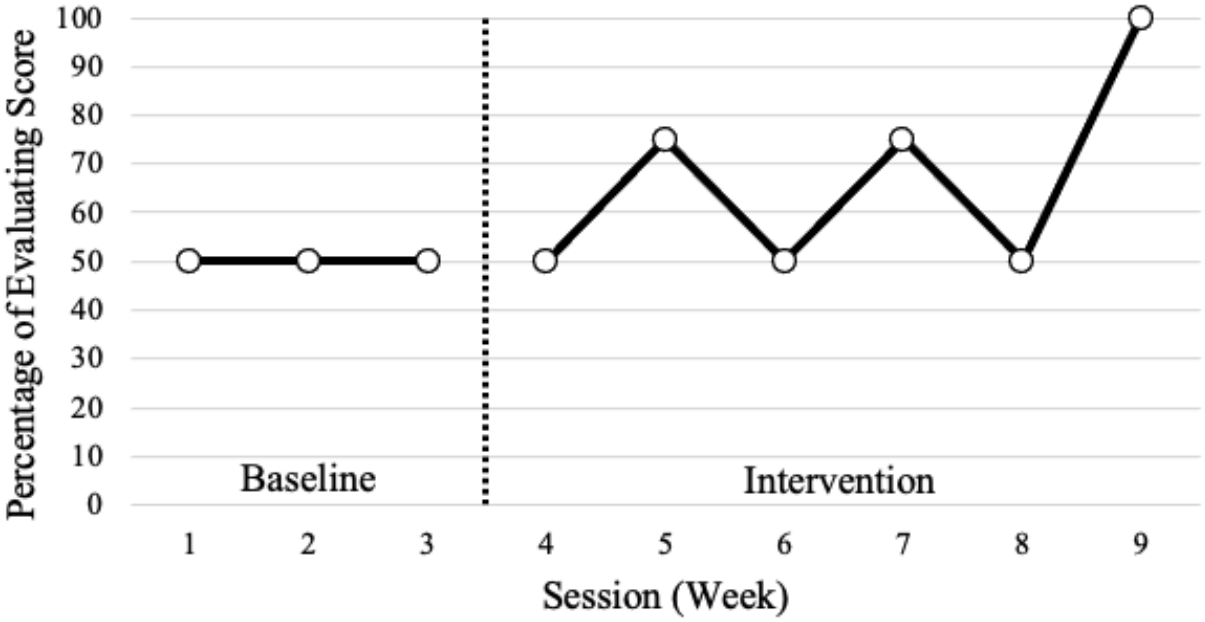

Figure 7. A visual analysis of the percentage of Student 3's evaluating scores.

Managing. The meaning of managing is to save a web page that includes useful information into a mobile device and to utilize the information saved on it. As illustrated by the graph line, S1 did not show her managing skills sufficiently. Figure 8 represents the results of S1's managing skills.

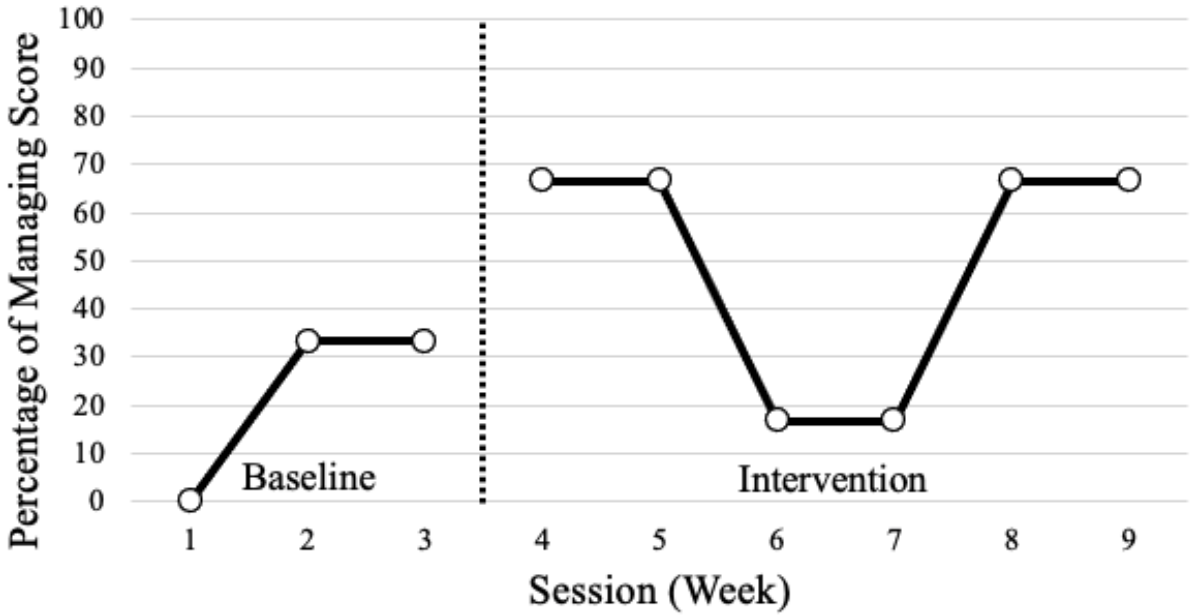

Figure 8. A visual analysis of the percentage of Student 1's managing scores.

Figure 9 below shows that S2 did not used managing skills properly during the entire session because his percentage of managing scores did not achieve with an average of more than 80 three times in a row.

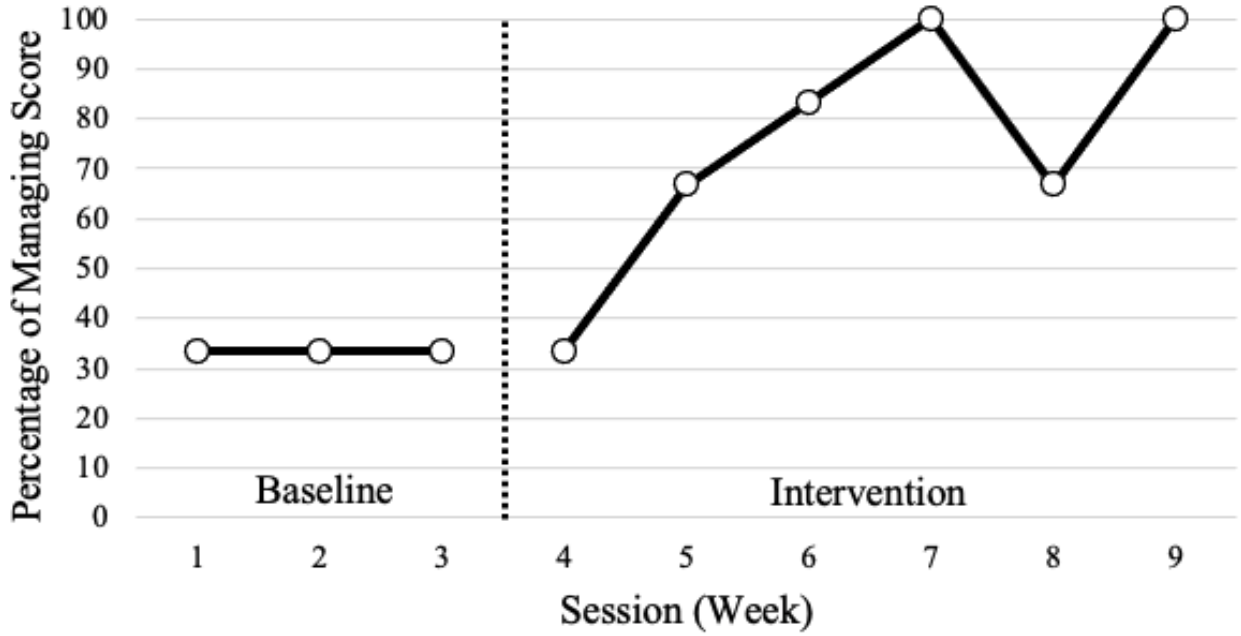

Figure 9. A visual analysis of the percentage of Student 2's managing scores.

S3 also had the same difficulty completing managing skills during the intervention phase as he did in the baseline phase. His percentage of managing scores did not achieve with an average of more than 80 three times in a row. Figure 9 below shows the data of his managing skills.

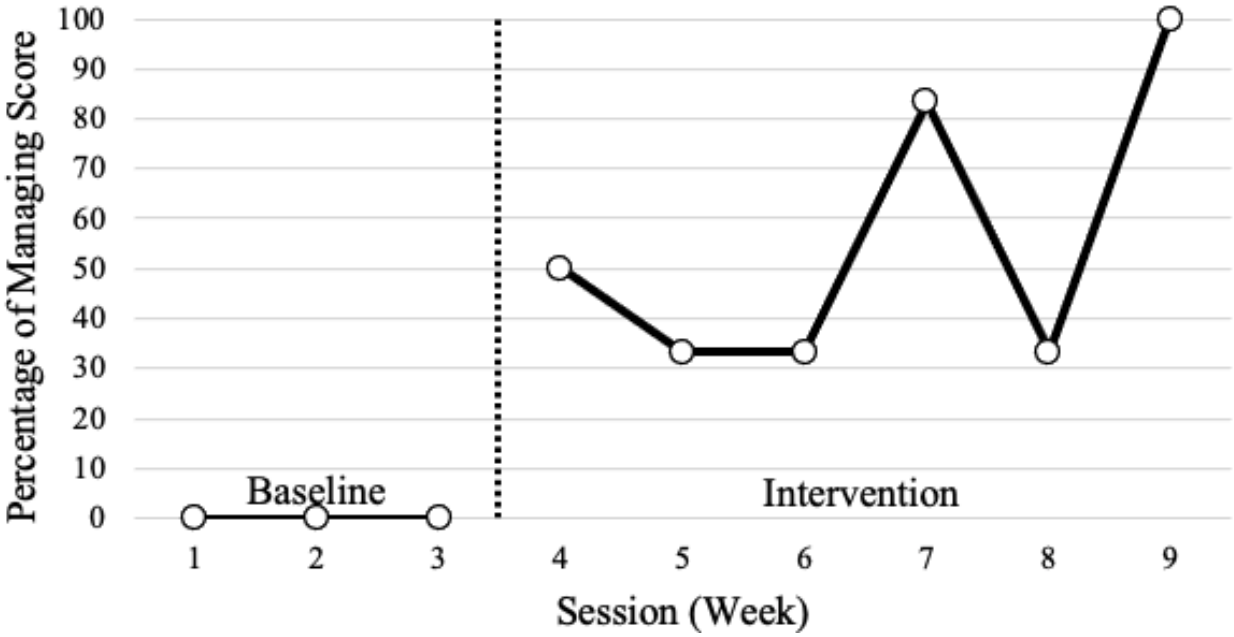

Figure 10. A visual analysis of the percentage of Student 3's managing scores.

The results of the visual analysis method revealed that all students learned the filtering skills significantly at the intervention phase comparing to the baseline phase. In the case of evaluating skills, only one student performed perfectly in the intervention phase. Besides, the results of the management skills show that it is difficult to argue that all students performed perfectly in the intervention phase.

As mentioned above, all the students completed browsing and searching skills perfectly during the 9th week of the experiment, so the improvement rate difference analysis only used the percentage of filtering, evaluating, and managing scores. Table 9 is the total score of all participants' IDL percentages.

Table 9

Total Score of all Participants' Percentage of IDL

Week	W1	W2	W3	W4	W5	W6	W7	W8	W9
S1	17	33	33	67	67	50	50	83	67
S2	33	33	50	42	67	58	100	83	100
S3	17	17	25	58	50	33	83	50	100

Student 1

During baseline, S1 had a mean of 28 (range 17-33%) of the IDL skills such as filtering, evaluating, and managing for the Internet searching. Three data points were collected during the sessions of the baseline phase. For the following intervention phase, she had a mean of 64% (range 50-83%) of the IDL skills. She performed up to 83% of IDL score and kept higher percentile scores for six sessions other than baseline. She got immediately 67% of the score at the first two data point in this phase but then her score decreased within two sessions. She reached 83% which is the highest score at Week 8. There were no overlapping data points compared with the baseline phase. The improvement rate difference (IRD) and its confidence interval (CI) for Student 1 were 100% or 1.00 between baseline to intervention phases. Figure 11 presents a visual analysis of the percentage of IDL scores.

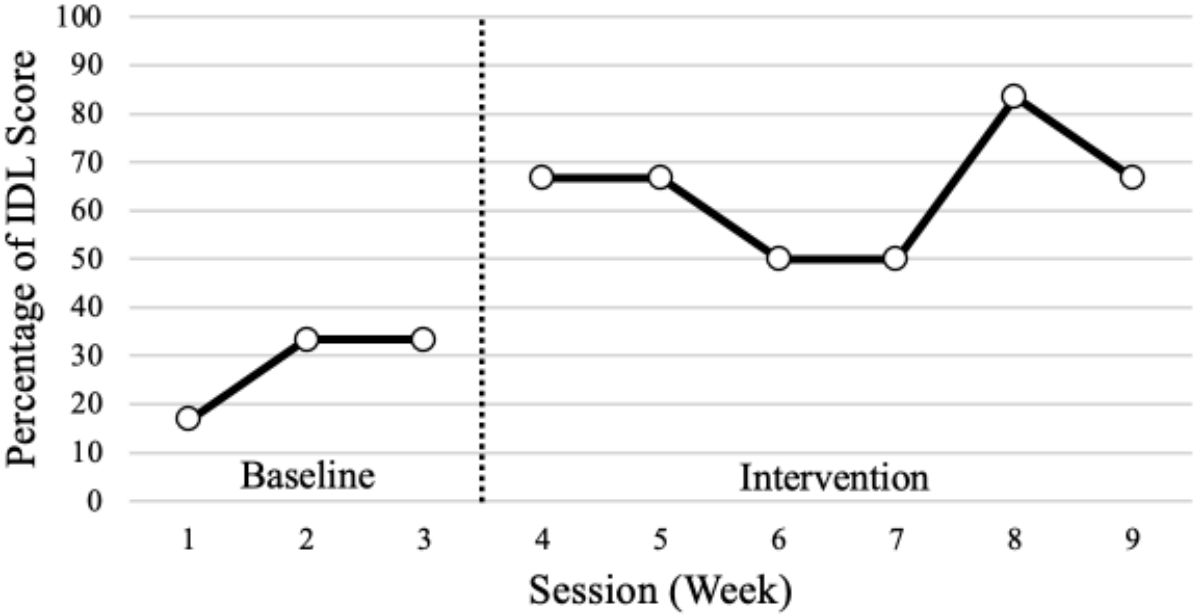

Figure 11. A visual analysis of the percentage of Student 1's IDL scores.

Student 2

During baseline, S2 had a mean of 39 (range 33-50%) of the IDL skills. There were three data points during the sessions of the baseline phase. For the following intervention phase, he performed a mean of 83% (range 42-100%) of the IDL skills. He completed two perfect scores of IDL skills that means he independently searched his future job information. At the beginning of the intervention, his score was under the last score in baseline phase but then the scores from Sessions 5 to 9 were higher than baseline and transitioned to positively increasing. There was one overlapping data point (Session 4) compared with the baseline phase. The improvement rate difference (IRD) for S2 was 75% that means 75% of data points improved during the intervention session. However, the confidence interval (CI) of IRD for S2 was very wide from 0.52 to 0.99 which indicates the IRD score was not statistically trustworthy. Figure 12 presents a visual analysis of the percentage of IDL scores.

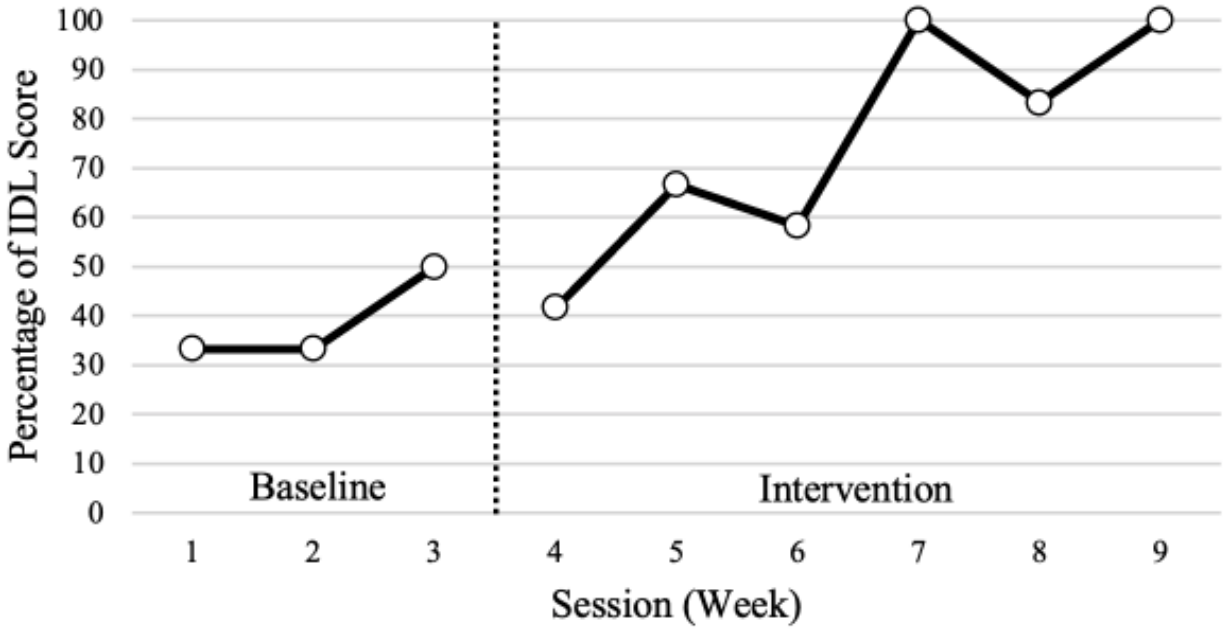

Figure 12. A visual analysis of the percentage of Student 2's IDL scores.

Student 3

During baseline, S3 had a mean of 20 (range 17-25%) of the IDL skills. There were three data points during the sessions of the baseline phase. For the following intervention phase, he performed a mean of 62% (range 33-100%) of the IDL skills. He finally completed 100% of IDL skills at the last session. At the first intervention session, his score was 58 which was over two times greater than the highest score of the baseline phase but then the scores transitioned to decreasing for two data points. There were no overlapping data points compared with baseline phase. The improvement rate difference (IRD) and its confidence interval (CI) for Student 3 were 100% or 1.00 between baseline to intervention phases. Figure 13 displays a visual analysis of the percentage of IDL scores.

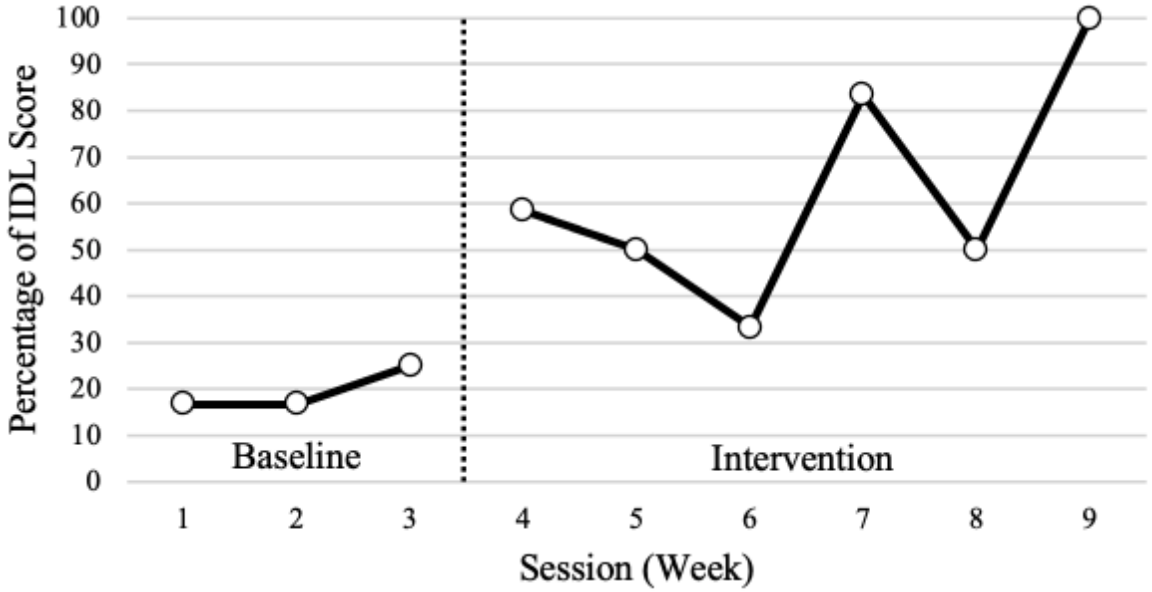

Figure 13. A visual analysis of the percentage of Student 3's IDL scores.

Post Survey Results

For social validity, all three students completed a survey that asked opinions of the technology workshop class based on their learning experiences. All three participants responded that they enjoyed the technology class during the semester. Additionally, the class was helpful in improving their digital competence especially on information and data literacy skills. They practiced searching for valuable and reliable job-related information on the Internet. They realized that a high level of technology skills would be a great advantage for getting a job they wanted or any kind of job. However, all the participants mentioned that they did not find useful data for their future job for two reasons. First, the class time was too short for searching for useful data for them. The actual searching time was around 10 minutes during practice and test time in each session. The second reason was the uncertainty of a future job. At the beginning of the semester, Student 1 wanted to get a job in a hospital. A few weeks later, she changed her mind and searched for information regarding a nail art job.

Summary of Findings

This study investigated the effects of the technology workshop class on the information and data literacy of students with intellectual disabilities. More specifically, the development of information and data literacy (IDL) competence including browsing, searching, filtering, evaluating, and management was analyzed. The baseline phase encompassed 3 weeks, and the intervention phase was conducted for 6 weeks. In the technology workshop class, students learned how to obtain information from the Internet through their personal mobile device, the iPad. The participants took a test each week after the class to measure their IDL competence. During the test, the screens of their iPads were all recorded, and two teachers assessed the students' IDL based on the recorded screens and Internet usage. All participants showed significant improvements to the intervention based on the results of visual analysis of graphed data and the IRD analysis. Also, they were satisfied with the technology workshop class.

CHAPTER 5: DISCUSSION

This chapter describes discussion of the findings, implications for practice, recommendations for future research, and conclusion.

Summary of the Study

The purpose of this multiple baseline across participants design with students who have intellectual disabilities was to examine the effect of using a mobile device in a technology workshop class had on their digital competence. This study used the DigComp framework to develop a technology workshop class and grading sheet. The Improvement Rate Difference (IRD) was used to analyze the effect-size of the digital competence of each phase (Parker et al., 2009) and visual analysis (Lobo et al., 2017) of graphed data was used for assessing treatment effects.

Discussion of the Findings

The research questions are (a) What are the effects of a technology class that teaches use of a mobile device on the information and data literacy skills in digital competence of students with intellectual disabilities?, and (b) What is the progression of digital competence for students with intellectual disabilities during a technology class using a mobile device?

Improvement of Digital Competence

The results of this study revealed that participants' information and data literacy, which is one of the digital competences, was improved. Statistically, participants' information and data literacy (IDL) competence including filtering, evaluating, and managing was increased in the search for information on the Internet. These results are consistent with the results of previous

studies. The prior research (Nguyen et al., 2015) indicated that the use of mobile devices improved students' academic skills and had potential benefits in disability education. Kim-Rupnow and Burgstahler (2017) revealed that technology-based activities targeting students with disabilities are helpful in postsecondary education and employment.

Also, prior research (McMahon et al., 2015) insisted that improving technology skills is effective to being independent, to preparing essential job skills and job searching, and to increasing opportunities to participate fully in society. There are research results showing that the effect of the technology in a practical environment is helpful; this research was not conducted under a real work environment (Damianidou et al., 2018). The results of current study indicate that students' digital competence was improved after taking a Technology Workshop Class focusing on information and digital literacy that can be used generally in any job or to collect job information. The development of the students' digital competence during the class may help students in the job search process and in future jobs.

In this study, students learned the management skills of adding useful web pages to their favorites in the Safari application on an iPad (see Figure 14). As a result of visual analysis, the students did not show any significant changes during the intervention phase. Prior research (Cihak et al., 2015) reported that students' digital literacy skills, including bookmarking, were increased in the computer environment. The difference between previous research and the current research was that the prior study was conducted in a computer environment but the current study was in a mobile device environment. This indicates that students' achievements of digital literacy may be different depending on the device participants use. According to one research study (Cihak et al., 2015), on the other hand, there is no difference in results of email skill by different type of platform. The participants in Cihak and colleague's (2015) study

successfully sent an email from a desktop, laptop, and iPad device. This difference is judged to be due to differences in the teaching content or the devices used in between current study and prior research. Therefore, it is necessary for future research to investigate students' digital competence increases in the different learning environments such as other mobile devices, desktops, and laptops other than the iPad.

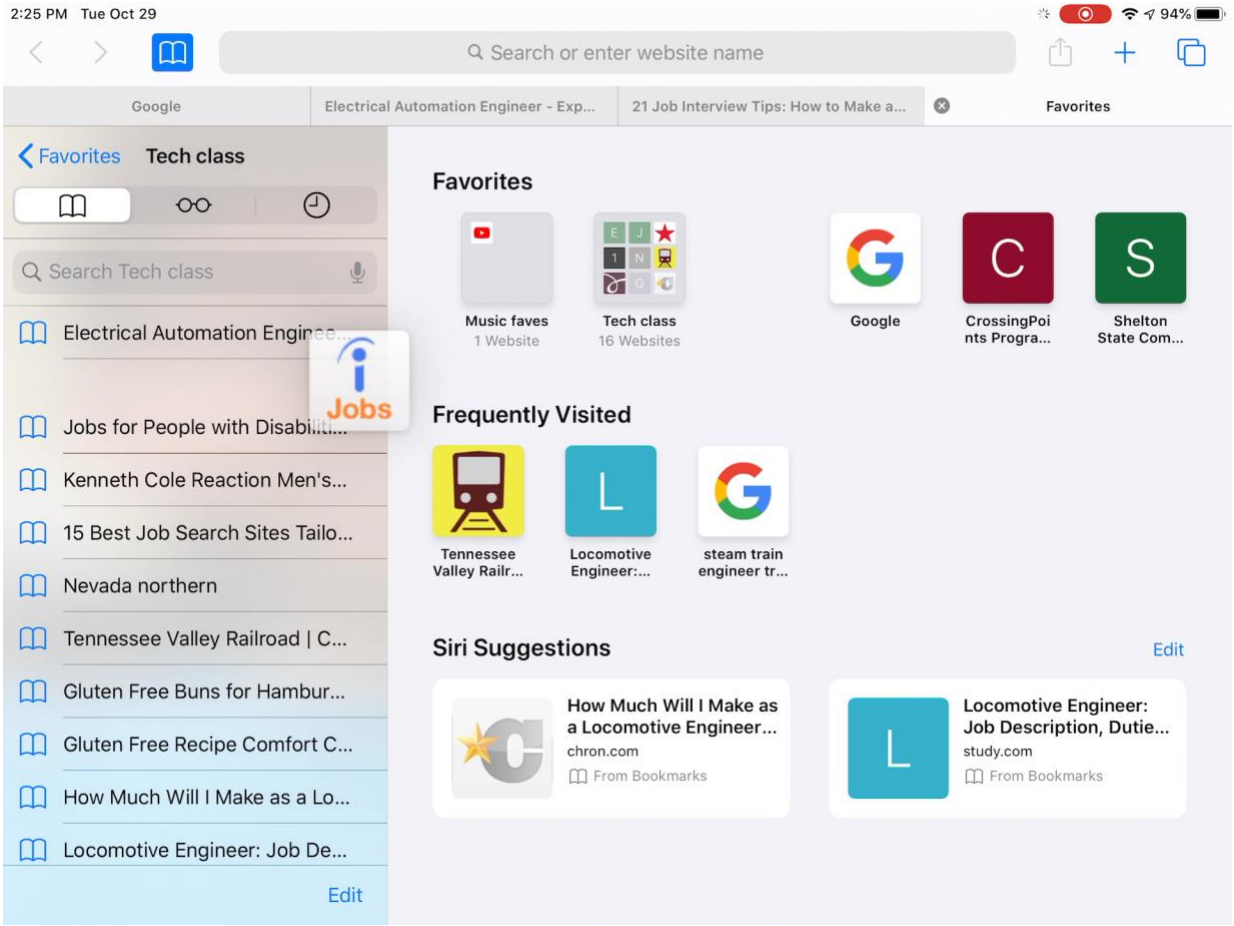

Figure 14. Screenshot of bookmarking.

Ability to Learn Digital Competence

Based on the results of the visual analysis, all participants in this study learned the filtering skills very quickly at the beginning of the intervention phase compared to the baseline phase. Also, their percentage of IDL scores increased over the 6 weeks. This result supports the

findings of other studies (Collins et al., 2014; Spooner et al., 2015; Stephenson, 2015) that students with disabilities successfully performed tasks using a tablet device quickly during the intervention stage.

In this research, all the participants learned filtering skills quickly during the intervention stage, but they had lower scores on evaluating and managing skills in the intervention stage. This is because to learn evaluating and managing skills requires higher cognitive skills than filtering skills. Students with disabilities need more time to study than regular students because of their cognitive abilities (Mahoney & Hall, 2017). In this study, the management ability of S2 steadily increased as the session progressed. Therefore, it indicates that repeatedly practicing learning a new skill is important for students with disabilities.

Process of Developing Digital Competence

The visual analysis in this study indicates that students' achievements were not constant in the intervention section. These results were due to differences in students' characteristics for learning technology. Basically, there is a difference in the participants' cognitive abilities. In addition, participants used different internet hours on average per day, and different applications were used. It is also possible that their test results were different from week to week due to different test questions each week. Long-term research is needed to investigate this phenomenon. Prior research (van Dijk, 2006) had mentioned that a lack of long-term research is one of the shortcomings of digital divide research.

Technological problems have the possibility to affect the learning process of digital competence. There were no issues including network, hardware, and software issues when students took a test every week. During the main learning session in the class, however, students had hardware and software issues. The touch function of S1's device did not work properly while

she was practicing filtering skills. S3 unintentionally activated the screen split function of an iPad and another application was opened. Neither of them could solve the technical problems independently, so the teacher took their device and fixed the issue. They missed the opportunity to practice skills in the class and it affected their results on a test. The ability to solve technical problems is the fifth factor in the problem-solving competence in the DigComp framework (Carretero et al., 2017). Due to the limitation of the class schedule, only the information and data literacy competence was used in this study, but since the five factors are complementary to each other, future research should be conducted considering all five competences of the DigComp framework.

Using Technology for Learning

A class using technology devices such as an iPad can improve students' learning motivation. Several prior researchers (Kellems, Cacciatore, Hansen, Sabey, Bussey, & Morris, 2020; McMahon, Cihak, Gibbons, Fussell, & Mathison, 2013; Neely, Rispoli, Camargo, Davis, & Boles, 2013) reported that participants liked learning the skills using an iPad because it was unusual instruction and more fun. The results of the post survey in this study also indicated that students want to learn more about digital competence. Also, they replied that the class was fun and useful, and that the class increased their interest in technology.

A student with intellectual disabilities needs a lot of opportunities to use a technology device not only for education but also for employment. In the post survey, all the students responded that the time to search for job information during the class was short and not helpful in actually finding the job information they wanted. So, in order for students to obtain sufficient job information, they used a device to access the Internet at home. However, because accessing the Internet has advantages and disadvantages for people with cognitive disabilities (Chadwick,

Quinn, & Fullwood, 2017), teachers and parents need to carefully observe students' mobile device usage patterns. S1 and S2 have devices that they use at home to access the Internet, and they use news, social networks, entertainment, games, music, shopping, and weather applications. Prior research (Dixon, Verenikina, & Costley, 2015) revealed that parents who have children with disabilities are concerned that their children spend too much time on entertainment aps when using an iPad at home. Therefore, in order for students to use their mobile devices educationally at home, they need support from teachers and parents.

Implications for Practice

The results of this study have practical implications for teachers, parents, and policy makers who are trying to develop digital competence for students with disabilities. First, special education teachers can recognize the importance of technology skills for students with intellectual disabilities in their intent to secure a job. It also reminds teachers that to improve digital competence, students need to have learning experiences in a technology class manipulating mobile devices. Second, for parents, the findings of this study indicate it is important not only to provide their children with opportunities to use technology devices but to ensure that they are not addictive for entertainment purposes only. Third, the results of this study may be helpful when policymakers plan technology education programs for students with disabilities.

Recommendations for Future Research

There are four recommendations for future research. First, future research could consider various participants who have different types of disability. The participants in this research had a mild intellectual disability. Digital competence is essential not only for employment but also for daily living in today’s technology world. The results of this study show that teaching information

and data literacy skills is effective on young adults with mild intellectual disabilities but have different types of disabilities. Also, researchers should replicate the study with different age groups, different levels of disability, and learning achievement among various demographic factors.

Second, the research period could be a possible research topic. For this research, participants took a nine-session technology workshop class during a semester. Based on students' characteristics and learning ability, each of the students needed different amounts of time to learn technology skills. For that reason, future research could investigate the time variable for teaching and learning technology skills for people with a disability.

Third, the DigComp 2.1 framework was used to develop a technology class and a grading sheet in this research. The European Union (EU) developed DigComp 2.1 framework over a period of time to cover prior technology frameworks. However, this framework was originally developed for general students in the EU area considering their job market and technology environment. It would be valuable and realistic to develop a framework of technology skills for those with a disability.

Fourth, in this study, the technology workshop class occurred during 1 semester and only covered a specific skill area of digital competence in DigComp 2.1, which was information and data literacy. There were two reasons for this. Information and data literacy, the first dimension of five digital competence areas, is the most basic competence and is connected with all the other competences. The other reason was the limited class time, which made it impossible to cover all five competence areas. The four remaining components of DigComp 2.1 framework are still unexamined and important. Moreover, new technology is developing so fast and affects our life dramatically. Because of that, a new technology framework should be explored in the future.

Conclusion

The purpose of this research was to evaluate the impact of students' digital competence in using a mobile device in a post-secondary transition program, specifically when seeking employment. This study used the Digital Competence Framework for Citizens (DigComp 2.1) (Carretero et al., 2017) to measure participants' digital competence. The students with intellectual disability (ID) attended a total of nine technology classes and learned the information and data literacy competence segment of DigComp. For this research, a multiple baseline across subject (Gast et al., 2014) was used to determine the efficacy of the technology class intervention for improving digital competence for students with ID. For data analysis, the Improvement Rate Difference (IRD) was used to analyze the effect-size of the digital competence (Parker et al., 2009) and visual analysis was used to evaluate level, trend, and stability of the information and data literacy skills. The results of visual analysis of graphed data revealed that all students increased filtering skills, which was one of the essential elements of information and data literacy competence. All participants showed significant improvements in information and data literacy competence based on the IRD analysis. In the follow-up survey results, participants mentioned that they were satisfied with the technology workshop class.

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APPENDIX A

MAIN TOPIC AND QUESTIONS FOR EACH WEEK'S CLASS

	Question 1	Question 2	Main studying topics	Test topic
Week 1		Q. What is your Dream job?	Basic Operation	Your dream job
Week 2	What is your favorite food? Find a recipe of the food	Q. What is your favorite food for Thanksgiving?	Safari App	Thanksgiving recipe
Week 3	Open the Thanksgiving food recipe that you saved in the last class.	Q. Search Halloween events coming up in this city?	keyword	Halloween Food and Events
Week 4	Open the Halloween event in Tuscaloosa that you saved in the last class.	Q. Search "main job skill" for your dream job.	Filtering: Different menu taps	Job skills
Week 5	Open "main job skill of your dream job" that you saved in the last class.	Q. Search "ANY job in Tuscaloosa" you interested in.	Evaluating: Reliable website by domain	Job in Tuscaloosa
Week 6	Open "your dream job in Tuscaloosa" that you saved in the last class	Q. Search "Job Interview Skills" Navigate several websites for job interview skills.	Evaluating: Reliable website by contents	Job Interview Skills
Week 7	Open "job interview skills" that you saved in the last class	Q. Find a good example of CV (image) Find a basic image of "CV"	Managing: Bookmark	Definition and example of CV
Week 8	Open "example of CV webpage" that you saved in the last class or today.	Q. Find job skill video of "your dream job" Find the best video of your dream job	Managing: Create new folder in favorite	Job skill videos
Week 9	Open "job skill video of your dream job" that you saved in the last class or today.	Q. Find a website that helps you find your future job in this city.	Summary of all the contents they learned	

APPENDIX B

DEMOGRAPHIC SURVEY

Parents and students, please answer the following items for participating in the Summer Bridge program.

1. Age. _____

2. What is your gender?
   ☐Male ☐ Female ☐ Prefer not to answer

3. Please list students' disability.

   _____

4. What is your severity state of intellectual disability? Mild, Moderate, Severe, and Profound
   ☐ Mild ☐ Moderate ☐ Severe. ☐ Profound ☐ Don't know

5. Can you access the Internet at home?
   ☐Yes ☐No

   1.1. (If Yes on Q5) What device are you using for Internet access?

   ☐Computer(PC), ☐tablet PC, ☐Smartphone

   5.2. (If yes) How much time do you spend on the internet daily?

   ☐Less than an hour, ☐1-2 hours, ☐2-3 hours, ☐3-4 hours, ☐over 4 hours

6. Do you have a mobile device with internet access?

   ☐Yes ☐No

   6.1. (If Yes on Q6) What applications are you using in your mobile devices (Choose all)?

☐News, ☐Entertainment, ☐Social Networking,
☐Games, ☐Travel, ☐Music,
☐Weather, ☐Photography, ☐Other_____

6.2. How long do you use a mobile device daily?

☐Less than an hour, ☐1-2 hours, ☐2-3 hours,
☐3-4 hours, ☐over 4 hours

APPENDIX C

THE DIGITAL COMPETENCE GRADING SHEET

Date:	1: Students did it. 0: Students did not do it.		
	Student 1	**Student 2**	**Student 3**
Browsing (accessing browser)			
Searching (typing in keyword/s)			
Filtering (data format, date)			
Evaluating (select reliable sites)			
Evaluating (visit at least 2 reliable web pages)			
Managing (taking a screenshot of selected webpage or adding the webpage to bookmark)			
Managing (organizing by creating a folder for needed information)			
Managing (reopening web page from favorites)			

APPENDIX D

TECHNOLOGY WORKSHOP CLASS SURVEY

1. Did the class help you learn new technology skills?

   ☐ Agree ☐ Undecided ☐ Disagree

2. Did the class help you find your future job information?

   ☐ Agree ☐ Undecided ☐ Disagree

3. Do you think the technology skills you learned are important for your future employment?

   ☐ Agree ☐ Undecided ☐ Disagree

4. Did you enjoy learning with iPad?

   ☐ Agree ☐ Undecided ☐ Disagree

5. Would you like to learn new skills using iPad?

   ☐ Agree ☐ Undecided ☐ Disagree

6. Did the technology class help you use your mobile devices?

   ☐ Agree ☐ Undecided ☐ Disagree

7. Would you like to use skills you learned on your mobile device?

   ☐ Agree ☐ Undecided ☐ Disagree

8. Did the class help you use an iPad in the other CrossingPoints classes?

   ☐ Agree ☐ Undecided ☐ Disagree

9. Is there anything that you want to share about your learning experience during the class? Please write down on the back.

Thank you for your participating!

APPENDIX E

DIGITAL COMPETENCE GRADING CRITERIA

Digital Competence	Criteria
Browsing (accessing browser)	A student can check Wi-Fi connection. A student can open the Safari application.
Searching (typing in keyword/s)	A student can access Google main page. A student can type keywords for searching.
Filtering (data format, date)	A student can change search results by data format and period.
Evaluating (select reliable sites)	A student can visit reliable websites based on the assessment of the website's URL.
Evaluating (visit at least 2 reliable web pages)	A student can compare search results by scrolling and navigating at least two web pages.
Managing (taking a screenshot of selected webpage or adding the webpage to bookmark)	A student can take a screenshot or save the webpage with the information they wanted.
Managing (organizing by creating a folder for needed information)	A student can create a folder to manage added favorites webpages in the Safari application.
Managing (reopening web page from favorites)	A student can reopen the webpage that (s)he added in the Safari application.

APPENDIX F

IRB APPROVAL

THE UNIVERSITY OF ALABAMA | Office of the Vice President for Research & Economic Development
Office for Research Compliance

September 11, 2019

Kagendo Mutua, Ph.D.
Professor
Department of ESPRMC
College of Education
The University of Alabama
Box 870231

Re: IRB # 17-OR-425-R1-A "CrossingPonts: A Crimson Tide Model and Pipeline for Inclusive Higher Education"

Dear Dr. Mutua,

The University of Alabama Institutional Review Board has reviewed the revision to your previously approved expedited protocol. The board has approved the change in your protocol.

Please remember that your protocol will expire on December 12, 2019.

Should you need to submit any further correspondence regarding this proposal, please include the assigned IRB application number. Changes in this study cannot be initiated without IRB approval, except when necessary to eliminate apparent immediate hazards to participants.

Good luck with your research.

Sincerely,

[redacted]

Carpantato T. Myles, MSM, CIM, CIP
Director & Research Compliance Officer

358 Rose Administration Building | Box 870127 | Tuscaloosa, AL 35487-0127
205-348-8461 | Fax 205-348-7189 | Toll Free 1-877-820-3066

APPENDIX G

CONSENT FORM

Dear CrossingPoints Parent/s,

As part of CrossingPoints, we collect data on various instructional strategies to learn what is most effective for teaching young people with intellectual disabilities. As part of your son/daughter's participation in the CrossingPoints program, you sign a consent form allowing your child to participate in research projects. We are evaluating our students' digital competence which is ability to search, select, and save information on an iPad to utilize the information on the internet, specifically when seeking employment. Research shows that digital competence is essential in securing work for employees with and without disabilities. We will provide CrossingPoints Technology class to our students to improve their technology skills.

Since we will collect your test scores from the class to evaluate your son/daughters digital competence, we are writing to inform you that the data we collect will be used for research, publication, and/or sharing that information with the Federal Government to help the country to know what to do to determine the impact digital competence may have on the abilities of students with intellectual disabilities to achieve the milestones of a successful life taken for granted by others. When we use the information, we will not use your son/daughter's name or any information that might make someone identify him/her personally. We will collect students' test scores during the technology class. These data will be destroyed following the study. If you do not wish to participate in the study, we will not use your test scores for the study. If you do not wish for your son/daughter to participate in this study, we will not use the test scores for the study.

This project has been approved by the Institutional Review Board at The University of Alabama IRB #: 17-OR-425, titled, "CrossingPoints: A Crimson Tide Model and Pipeline for Inclusive Higher Education." We do not think there are any risks or harm to your son/daughter in this study. If you have any questions about this project, please ask me now. If you have questions later, you can call Dr. Kagendo Mutua at (205) 348-2609. If you have questions about your rights as a person taking part in a research study, make suggestions or file complaints and concerns, you may call Ms. Tanta Myles, the University of Alabama Research Compliance Officer at (205)-348-8461 or toll-free at 1-877-820-3066. You may also ask questions, make suggestions, or file complaints and concerns through the IRB Outreach Website at http://ovpred.ua.edu/research-compliance/prco/ You may email us at rscompliance@research.ua.edu.

If you give consent for your son/daughter to be in this project, please write your name/make an X below. You can have a copy of the letter to keep.

Sincerely,
Investigator

_____ _____
Name of Participant Date

_____ _____
Person Obtaining Consent Date

UNIVERSITY OF ALABAMA IRB
CONSENT FORM APPROVED: 9-11-19
EXPIRATION DATE: 12-12-19

APPENDIX H

ASSENT FORM

ASSENT STATEMENT FOR
PARTICIPATING IN A CROSSINGPOINTS PROJECT

Dear Student,

The CrossingPoints Transition Program is a college program for young people like yourself who might sometimes need supports to be successful in college, independent living, and employment. We are trying to help the other programs and agencies in the country be able to do what we do in CrossingPoints so that everyone with an intellectual disability who wants to obtain employment, attend college, and/or life on their own can do so. This project has been approved by the Institutional Review Board at The University of Alabama IRB #: 17-OR-425, titled, "CrossingPoints: A Crimson Tide Model and Pipeline for Inclusive Higher Education."

We will be collecting information about CrossingPoints, about you, and other students in the program during CrossingPoints Technology class. We will teach you digital competence using an iPad to search, select, and save useful information from the Internet, specifically when seeking employment. We will collect your test scores from the class. These data will be destroyed following the study. If you do not wish to participate in the study, we will not use your test scores for the study. We will be using this information for research, publication, and/or sharing that information with the Federal Government to help the country know what to do to make competitive employment available to as many students with intellectual disabilities as possible. When we use the information, we will not use your name or any information that might make someone know that is you. Your parents know I am asking you to do this and it is OK with them.

Your information will not identify you personally. You are helping others know how to create programs like CrossingPoints. We do not think there are any risks or harm to you in this study. If you have any questions about this project, please ask me now. If you have questions later, you can call Dr. Kagendo Mutua at (205) 348-2609. If you have questions about your rights as a person taking part in a research study, make suggestions or file complaints and concerns, you may call Ms. Tanta Myles, the University of Alabama Research Compliance Officer at (205)-348-8461 or toll-free at 1-877-820-3066. You may also ask questions, make suggestions, or file complaints and concerns through the IRB Outreach Website at http://ovpred.ua.edu/research-compliance/prco/ You may email us at rscompliance@research.ua.edu.

If you agree to be in this project, please write your name/make an X below. You can have a copy of the letter to keep. Thank you very much for your interest.

Sincerely,
Investigator

_____ _____
Name of Participant Date

_____ _____
Person Obtaining Assent Date

UA IRB Approved Document
Approval date: 9-11-19
Expiration date: 12-12-19