

Rowan University

Rowan Digital Works

Theses and Dissertations

3-11-2013

Using digital stories to improve writing skills of students With Autism Spectrum Disorder

Michelle Andreevski

Follow this and additional works at: <https://rdw.rowan.edu/etd>



Part of the [Special Education and Teaching Commons](#)

Recommended Citation

Andreevski, Michelle, "Using digital stories to improve writing skills of students With Autism Spectrum Disorder" (2013). *Theses and Dissertations*. 387.

<https://rdw.rowan.edu/etd/387>

This Thesis is brought to you for free and open access by Rowan Digital Works. It has been accepted for inclusion in Theses and Dissertations by an authorized administrator of Rowan Digital Works. For more information, please contact graduateresearch@rowan.edu.

**USING DIGITAL STORIES TO IMPROVE WRITING SKILLS OF STUDENTS
WITH AUTISM SPECTRUM DISORDER**

by
Michelle Andreevski

A Thesis

Submitted to the Department of
Special Education
College of Education
In partial fulfillment of the requirement
For the degree of
Master of Arts
at
Rowan University
May 10, 2012

Thesis Chair: Joy Xin, Ph.D.

Copyright © 2012 by: Michelle Andreevski.

Dedication

I would like to dedicate this manuscript to my mother, Fania Andreevski

Acknowledgments

I would like to express my appreciation to Dr. Joy Xin for her help and guidance throughout this study.

Abstract

Michelle Andreevski
USING DIGITAL STORIES TO IMPROVE WRITING SKILLS OF STUDENTS WITH
AUTISM SPECTRUM DISORDER
2011/12
Joy Xin, Ph.D.
Master of Arts in Special Education

Writing is an important medium to express one's ideas and needs and is an integral part of the curriculum in secondary schools. Within an accountability system, students are expected to compose narrative, persuasive, and informational essays for state and district level assessments. Students with ASD demonstrate developmental delays in language and communication skills, including verbal and written language, thus, writing is a difficult area and challenge in their learning. This study was conducted to evaluate the effect of computer-assisted instruction using digital stories to teach expressive writing to students with ASD. A total of six students with autism participated in the study. A single subject design with AB phases was used to compare the level of total words written, total words and sentences correctly written, and quality of writing. During the baseline, participants were evaluated by their free writing with assigned topics, and during the intervention, students were shown six stories with digital pictures and wrote a total of six compositions in response to each story. The results showed an increase of their total words written, total words and sentences correctly written, and improvement in their writing quality. Computer-assisted instruction using digital pictures seemed to benefit students with ASD in learning writing.

Table of Contents

Abstract	iii
List of Figures	v
List of Tables	vi
Chapter 1: Introduction	1
1.1 Statement of Problems	1
1.2 Significance of the Study	4
1.3 Purpose of the Study	5
Chapter 2: Literature Review	6
Chapter 3: Methodology	20
3.1 Context of the Study	20
3.2 Instrumentation	26
Chapter 4: Findings	29
Chapter 5: Summary, Conclusions, and Recommendations	43
5.1 Summary	43
5.2 Conclusions	45
List of References	47
Appendix A Lesson Plan for Writing Instruction	59
Appendix B Hand Out	60
Appendix C Student Check List	61
Appendix D Student Survey	62

List of Figures

Figure	Page
Figure 1 Individualized Student Writing Performance	37

List of Tables

Table	Page
Table 1 General Information of Participating Students	22
Table 2 Instructional Procedures	27
Table 3 Student Writing Scores During Baseline	30
Table 4 Student Writing Scores During Intervention	32

Chapter 1

Introduction

Statement of Problems

Writing is an important skill used as effective communication with others in daily lives. Written composition is to demonstrate conceptual knowledge and express one's thoughts, beliefs, and feelings (a primary communication medium) (Graham, 1990). Writing skills are developed through a long process of learning experiences in one's education and life (Diercks-Gransee, Wright, Johnson, & Christensen, 2009). In school, writing is embedded in different academic subject areas. For example, writing is required in learning English, Math, History, and Science, and it is also a required area listed in nationwide achievement standards.

Requirements of No Child Left Behind (NCLB), enacted in 2002, emphasize the amendments of the 2004 Individuals with Disabilities Education Act (IDEA), which mandate that all students should be included in a statewide assessment system, including those with disabilities. However, these high stake tests are an immense challenge for students that struggle with writing skills. According to the report of the National Assessment for Educational Progress (2002), 26% of students are unable to write at a basic level and in 2007, only 24% of students in twelfth grade and 33% of students in eighth grade were proficient in their writing skills.

Moreover, displaying a minimum level of competence on state and district assessments has become a mandatory requirement for students to advance from grade to grade, as well as graduate from high school (Hughes, 2001). Unfortunately,

Students diagnosed with Autism Spectrum Disorder (ASD) typically display great difficulties in social and communication skills. They exhibit deficiencies in verbal and nonverbal communication. Their difficulties with communication skills can impede their social interactions with both peers and adults. Thus, an important intervention for students with ASD is to improve communication skills (Myles & Simpson, 2001).

Writing is often one of the most challenging cross-curricular activities for these students (Asaro-Saddler & Saddler, 2010). There is a great need for evidence-based intervention strategies and instructional methods to improve identified writing skills of students with ASD (Bedrosian, Lasker, Speidel, & Politsch, 2003). If not attempted to be resolved, challenges with writing, which appear in childhood, will follow these students into adulthood (Taylor & Seltzer, 2011). Adequate comprehension and writing skills are needed for effective transition from school to adulthood (McDonough & Revell, 2010), yet writing skills are critical in numerous areas of life after high school. For example, writing skills are important for taking written notes or messages, completing personal documents and paper work, or completing written tasks pertaining to one's career.

In their academic career, Students with ASD will have to eventually face challenges transitioning from high school to adulthood. At the end of their schooling, they will have to complete the requirements for high school graduation (McDonough & Revell, 2010). These requirements include, but are not limited to: high school exit exams, completing diploma paperwork, completing the high stakes assessment, and understanding and being involved in transition planning.

According to Landa & Goldberg (2005), students with ASD have deficits in abstract processing skills, misinterpreting literal information, and lacking the appropriate

problem solving skills needed to obtain a goal, such as completing a writing task. They are developmentally delayed in verbal communication and social interactions with others, which hinders their understanding of meaning in conversation (Landa & Goldberg, 2005). A lack of communication will result in problems with pragmatics, leading to discrepancies in thinking literally, in turn prohibiting them to imagine scenarios that are to be represented in writing (Bishop, 2010). Also, these students lack organizational skills, disabling them from synthesizing their thoughts to be conveyed in written form that leads to compositions that do not make sense. Furthermore, these students have trouble exaggerating their thoughts which limits their ideas and ability to write extensively (Asaro-Saddler & Saddler, 2010). The barrier between verbal communication and understanding prevents students with ASD from writing successful compositions (Landa & Goldberg, 2005).

Writing involves a complex process, for example, steps in: planning, drafting, self monitoring, and revising (Delano, 2007). Students with ASD have difficulty to successfully complete the writing process (Asaro-Saddler & Saddler, 2010). They typically exude distractibility and diminished attention towards a task to a greater extent than those with a general learning disability (Bieberich & Morgan, 2004). Thus, intervention strategies to help these children become more productive writers seem important.

As Ganz (2007) found, most students with ASD are visual learners. Pictures and video images are useful visual aids. Despite the vast difficulties preventing students with ASD from writing effectively, there are many technological programs available to assist these struggling writers to learn more information at a quicker rate (King-Sears, Swanson

& Mainzer, 2011). Digital pictures, used in technological programs with stories, serve as an effective tool in writing instruction. Such visual tools help students with ASD rely on visual processing to learn to organize ideas and sequence thoughts to avoid their weaknesses such as memorization, communication, and auditory processing (Ganz, 2007). Students with ASD seem to be more secure in the presence of the controlled environment a computer provides, and there has been an increased interest to explore whether computer-based learning environments would help these students. Multisensory interactions supported by computer technology will reinforce and improve the writing skills of individuals diagnosed with ASD (Moore, Cheng, McGrath, & Powell, 2005).

However, there are limited studies found in writing instruction to support students with ASD, especially using technology as visual tools embedded in the teaching and learning process to help these students learn writing compositions and to improve writing skills. This is the area of focus and this present study is designed to evaluate computer-assisted writing instruction for students with ASD.

Significance of the Study

Writing is an important communication format to express one's ideas and needs. When children become adolescents, writing skills seem more important in their daily lives to communicate with others as a formal means. Children with ASD demonstrate developmental delays in language and communication skills, including verbal and written language. This delay becomes serious when they grow up to become adolescents, when verbal and written communication is crucial to interact with others. Students with ASD need additional supports. Information is lacking on teaching communication skills to these students with visual stimulation. The objective of this report is to examine the

effects of computer-assisted instruction in writing to increase the writing skills of students diagnosed with ASD. Furthermore, there is great need for additional teaching strategies to be implemented using technology in writing instruction to help students with ASD.

Statement of Purpose

The purpose of this study is to evaluate the effects of a computer based instruction program, Windows, XP Photo Story 3, as a visual aid with digital stories to help ASD students (a) organize ideas (b) evaluate the effects of the program within the confines of transferring ideas into expressive writing compositions (c) examine and compare the effectiveness of the computer-based programs to improve writing skill compositions for students with ASD.

Research Questions

1. Does computer-assisted instruction, using visual aids with a digital story, increase organizational processes of writing compositions for students with ASD?
2. Does computer assisted instruction help students with ASD transfer organized ideas into expressive writing compositions?
3. Do technological photographs, presented in the computer assisted instruction, help improve writing skills of students with ASD?

Chapter 2

Literature Review

Knowledge pertaining to writing is crucial for many areas of an adult's life (Sitlington, 2008). Among other skills, effective writing skills are necessary for students when graduating from high school (Sweeny, 2010).

Students with ASD have deficits in verbal and communication skills. Their lack of communication skills negatively impacts their ability to obtain important learning experiences throughout their academic life, which will result in long term problems for future endeavors such as employment or post secondary education (Mason, Harris, & Graham, 2011). As a result of their struggling language and communication skills, written expression is difficult for these students.

Despite the challenges these students face related to verbal and written communication, interventions that include technology may help them to become better writers, specifically when using computer-assisted programs to provide visual aids (Carnahan, Basham, Musti-Rao, 2009). This chapter reviews research in writing and writing instruction for students with ASD. It focuses on how to use technology to teach writing to these students.

Importance of Writing

Writing requires a wide range of cognitive and reasoning skills. These skills involve encoding, relating, and transferring a thought into logical output (Hollyoak & Morrison, 2005). Besides interactions with others, this reasoning and processing is significant to empower a person to make sense of his or her experiences (Sahyoun,

Soulie`res, Belliveau, Mottron, & Mody, 2009). The reasoning skills of a typically developing child varies or transitions from perceptually based thought processes to concept oriented reasoning (Sahyoun, Soulie`res, Belliveau, Mottron, & Mody, 2009). Thus, transition relies on writing, which in turn depends on an abundance of skills such as: extended knowledge, working memory capacity, control, and presenting ideas to express one's thoughts and beliefs (Sahyoun, Soulie`res, Belliveau, Mottron, & Mody, 2009).

It is important to realize that even a proficient writer can struggle with written language production (Sturm, 2002). Most often, a universal writing strategy can be taught to typically developing students. This method guides students to brainstorm ideas before writing, plan a strategy, organize notes, and develop a plan to write while including additional information throughout the writing process (Mason, Harris, & Graham, 2011). Successful writers are required to keep a single theme in mind, using correct words, syntax, and semantics (Outhred, 1989), but producing a writing composition can prove to be a difficult experience, even for skilled writers (Sturm & Rankin, Beukelman, 1997).

Correspondingly, students with disabilities experience even greater difficulties in writing a text independently and have trouble processing and executing all steps of the writing process (Sturm & Rankin, Beukelman, 1997). For example, students with learning disabilities experience great struggles in creating fluent written text independently, and continue to struggle their entire life. Under such circumstances, these students have literacy problems, struggle in school, fail at statewide assessments, possibly drop out of school, and eventually have an extremely negative attitude toward their

schooling. Even out of school when these students enter the workforce, they need training to improve their writing skills to prepare for employment.

Students without sufficient training to improve writing skills will suffer in many important aspects of life, including daily living, personal/social communication, and occupational preparation and maintenance (Sitlington, 2008). With attention to daily living skills, writing is essential for getting around in the community, engaging in leisurely activities, using recreational facilities, preparing and consuming food, meeting marriage responsibilities and raising children, caring for personal needs, and managing personal finances (Sitlington, 2008). Writing skills are also important for people to communicate with others, making adequate decisions, gaining independence, being able to maintain good personal skills, obtaining socially responsible behavior, and achieving self awareness (Sitlington, 2008). In addition, writing skills are required for occupational preparation and maintenance so that specific planning procedures for employment can be followed, such as knowing and exploring career/occupational possibilities, choosing and preparing career choices, having appropriate work habits and behavior, seeking employment, and obtaining specific occupational skills (Sitlington, 2008). These listed life skills are competencies that students who are deficient in writing have to deal with in their lives (Sitlington, 2008).

When a classified student either graduates high school, his or her school system must provide a cumulative report of academic achievement, functional performance, and recommendations on how to help meet that student's post-secondary goals. Similarly, the transition assessment must be an essential part of this transition process, particularly for those with reading and writing challenges. This assessment must be directly related to

the state and district standards. Significantly, writing is an essential requirement in these standards because each subject area such as Language Arts, Math, Science, and History has a writing requirement embedded.

Writing Challenges of Students with Disabilities

Writing serves as a medium with many forms of communication in many aspects of our lives. Children need to be taught writing skills to successfully complete the requirements of academic subjects, as well as state and nationwide tests, so that they can transition successfully into high school and adult life. Writing is an important skill that students need to learn, yet research in writing instruction for students is not as well defined as research in other academic areas, such as Reading (Graham & Perin, 2007). This directly affects weak writers, including those with a learning disability (LD) and ASD. Mason and colleagues (2011) discovered that there is no program of research available for writing instruction. Little information about the effects of writing instruction is currently present (Mason, Harris, & Graham, 2011).

Use of Technological Programs in Writing Instruction

The current generation of students grew up in a technological society. They are familiar with a computer and the internet. It is found that almost 73% of American citizens have Internet access (Lenhart, Arafeh, Smith, & Macgill, 2008). This generation of students use internet access at home and play with a computer with their parents at a very young age. Primarily, they use technology in two ways: they are either involved in instant messaging, texting, and social networks sites, or they are seeking and researching credible information to pursue their interests (Lenhart, Arafeh, Smith, & Macgill, 2008). To engage these students in a learning process, technology plays an important role.

Teachers integrate technology into course content to enhance instruction by promoting a learner-centered environment through an interactive learning process using a computer, or demonstrating information on an electronic board (Revere & Kovach, 2011). Various technology equipment and programs are used in schools to promote teaching such as Smartboards or Powerpoints. The benefits to technology integration include individualized instruction between teacher and student (Englert, Zhao, Dunsmore, Collings, & Wolbers, 2007), and allows students to work at their own pace or provide immediate feedback.

Since the 1980s, computer-assisted instruction has been integrated throughout schools to assist students in their writing. These strategies have produced different ways of creating, organizing, developing, and drafting that enhance writing by providing writers new perspectives that are distinctive to electronic media (Bacci, 2008). Correspondingly, secondary-level writing intervention, using technology, is proven to improve the writing skills of students (Elwood, Murphy, & Cárdenas, 2006). Writing instruction for adolescents involves process writing along with evaluation, criticism, instruction in different writing genres, grammar, writing conventions, and on-task writing prompts for test purposes. With attention to writing requirements, teachers need to discover promising ways to introduce computer-based programs constructively so that students can engage in writing with meaning (Merchant, 2005). With this in mind, using the communicative potential of new technology, teachers can provide digital literacy and writing practices for students that are increasingly familiar in their daily life (Merchant, 2005).

When writing is integrated in computer assisted instruction, it also includes multi-model presentations of images and colors that assist representations of stories and communication. Computer-assisted instruction integrates still images, video, audio, and sometimes music into teaching, therefore, literacy and writing can be presented in such a way where meaning can be conveyed in many distinct ways. By incorporating technology to help learners explore higher levels of thinking skills with the use of computer programs, new forms of writing such as emails and electronically submitted forms and assignments, can be advocated with students (Cramer & Smith, 2002). For example, computers can support parts of the writing process such as, drafting, editing, and revising (Nagin, 2005). This way, technology enables alternative methods of sharing, editing, and even commenting on writing. It can provide new pathways of teacher-writer and peer-writer relationships, allowing students to collaborate with classmates at remote locations, and enable them to reflect upon the quality of their writing (Peterson-Karlan, Hourcade, & Parette, 2008). It appears that technology can notably change the fundamental nature of writing by providing new multi-media forms and electronic genre (Peterson-Karlan, Hourcade, & Parette, 2008).

In recent years, software tools have become available, like Microsoft's Movie Maker and Photo Story 3. These digital picture programs provide "low-threshold, high-ceiling" tools to enable students to learn from short stories with pictures or videos. These digital videos or pictures integrated into writing provide a number of benefits to students (Hofer & Swan, 2008). For example, digital video can provide an authentic learning experience, engaging students in the writing process to organize their ideas, and create their thinking as a pre-writing readiness. As past practices emphasized the combination

between content and pedagogy, current practices indicate that to successfully achieve full and legitimate understanding of technology integration, there needs to be a conscious combination in areas that involve content, pedagogy *and* technology (Montelongo & Herter, 2010). Thus, integrating technology into writing instruction becomes another area to be explored.

Students struggle with the transition from beginning to read narrative text in the early grades to reading expository text in other subject areas such as History, Science, and Social Studies. In higher grades, they are expected to combine reading and writing in ways to be able to retain information such as writing summaries of certain texts. With the use of technology in the classroom, lessons can be scaffolded by the visual images so that text comprehension will improve, at the same time, writing skills can be introduced to recall the information. Thus, technology may promote student understanding of reading, and result in developing writing skills (Montelongo & Herter, 2010).

It is to be expected that particular digital tools that are currently available for the classroom will evolve in the years ahead. In addition, most technological resources designed for writing, publishing, and networking will also be updated and evolve in the upcoming years. Regardless of the constant upgrade of digital tools that will end up emerging, students may not only be viewed as learners in a classroom, but also as "real writers with something important to say" and have an opportunity to create daily written compositions for an authentic purpose and a certain audience by using individual programs and eclectic forms of digital media (Warschauer, Arada, & Zheng, 2010).

Some may fear that some computer-assisted programs are expensive, albeit most of these programs are free and can be easily accessed through broadly used programs on

the internet. It is conceivable that students will be able to easily find and use these resources outside of the school setting. In light of the overwhelming changes currently happening to literacy in a technological, networked-based, multi-modal, and multi-tasking world, it is crucial for students to have access to technological resources (Hall, Strangman, & Meyer, 2003).

Using Technology in Writing Instruction for Students with Disabilities

Students with LD are prevalent of the school population who are challenged in writing. The evidence shows that students with LD struggle more than their regular peers on almost every degree of writing performance, including organization, text length, quality of writing, as well as mechanical and grammatical skills (Gersten & Baker, 1998).

It is indicated that students with LD demonstrate hardships in regulating cognitive strategies as well as writing strategies (Graham, 2006). Specifically, these students have trouble when attempting text compositions in organized ways, with co-dependent delays in the ability to establish a purpose for writing and preparation for the background knowledge. Multiple studies indicate that students with LD are not able to create information associated to prior relevant information (Williams, 2002). As a result, a student with LD will create a composition of scrambled ideas that fail to represent thoughts in a coherent fashion. Another difficulty these students struggle with pertains to minimal knowledge of text structure, which tells writers about the discourse-level processes of ideas in text. Different types of texts can be presented in multiple ways. For example, there are seven possible ways to compose an expository writing assignment: compare-contrast, problem-solution, description or number of traits, properties or functions, chronological sequence, classification, and explanation (Kamberelis, 1992).

Technology can help these students familiarize the different forms of text to be presented and as a result, it can help to generate the correct form of required writing, as well as to employ the semantic and syntactic devices that fit the appropriate information in the proper textual locations (Kamberelis, 1992).

It is understood that students with LD need much support to tackle basic activities that involve literacy and writing. Therefore, the needs of these students can be met when they are involved in the unique multimedia features of computer-assisted program applications (Eisenwine & Hunt, 2001). There has been continual interest in a diversity of technologies to support these students to enhance their writing skills (Berninger & Amtmann, 2003). These include spell check, word processors, word prediction, speech recognition, digital photos, and text-to-speech programs (Berninger & Amtmann, 2003). These forms of computer-assisted programming are not meant to replace former methods of instruction, but are intended to accommodate students who struggle with writing skills or only perform at, or below, the basic level of proficiency (Berninger & Amtmann, 2003).

Methods of incorporating technology with writing instruction are intended to provide some form of scaffolding for those students that lack basic writing skills (Nagin, 2005). In this case, scaffolding provides an aiming function in the sense that it permits students with disabilities to perform at higher levels of proficiency than expected (Peterson-Karlan, Hourcade, & Parette, 2008). Nevertheless, it is important to mention that inadequate information is provided about the potential of computer-assisted programs that support scaffolding in relation to writing performance of students with LD (Englert, Zhao, Dunsmore, Collings, & Wolbers, 2007). The involvement of scaffolds into the nature of the writing process still remains a challenge for instructors, because

scaffolds imply a social or cognitive connection, whereas writing is almost always private in nature. On the positive side, computer-assisted programs may serve a critical role in supporting learners throughout the writing process with scaffolding, because computer programs can be established in a way where they are designed to offer scaffolds in such a way that may present newly emerging cognitive functions (Englert, Ahao, Dunsmore, Collings, & Wolbers, 2007). In addition, routines and processes can be prompted with the use of technology in a timely way just as a teacher or a tutor would initiate traditional writing processes, then guide the student to perform the task more independently. Accordingly, the findings of Englert and associates (2007) indicated that technological writing tools and text structure strategies has improved students' organizational output and written structure of composed stories, with overall improvement in written production. It is also indicated that teaching and learning writing skills can be advanced through computer-assisted programs (Englert, Ahao, Dunsmore, Collings, & Wolbers, 2007).

Michalski's study (2005) used digital storytelling to teach writing skills to 7th and 8th grade students with LD. These students were not able to write a complete sentence. Their struggles in the writing process were in constructing phrases, using accurate grammar and spelling, employing correct vocabulary words, and creating efficient sentences. Although these students wrote daily as part of their curriculum, they had difficulty transferring their thoughts into writing. Michalski had the students prepare a writing task using pictures. The topic of the writing task was about people, places, and events of each student's life. Michalski had the class bring in pictures of the students' neighborhood, pets, and family members. After the instruction to illustrate the writing

process, she incorporated the pictures to help the students prewrite in an essay form. Next, the students were taught how to use the Microsoft program Power Point to create digital stories using the pictures they brought in and the summaries they previously wrote. The results showed that incorporating digital storytelling improved students' writing skills. Students increased their effort in writing and verbal communication, generated projects using multimedia software and computer technology, and were eager to write more and revise their work (Michalski, Hodges, & Banister, 2005).

Due to emerging computer-assisted programs, there has been a transformational shift in how students learn writing in the classroom. For adolescents with LD, new technology has employed chances to be more prepared for today's technology-rich society (Revere & Kovach, 2011). It is noted that, merely displaying materials on a computer screen does not bring superior literacy skills.

Using Technology in Writing Instruction for Students with ASD

With increasing public awareness for students with ASD, more attention has turned toward effective teaching approaches for children with this diagnosis. Research has indicated that students with ASD often have deficiencies with communication in both oral and written formats (Carroll, Maughan, Goodman, & Meltzer 2004). These students often have been shown to perform at normal levels in the literacy process of word decoding, but their comprehension, language, and communication are great struggles. Moreover, students with ASD demonstrate strong skills in responding to visual cues including visual representation with written words. It is noted that 50% of those diagnosed with ASD do not speak, but are considered greatly visually-oriented (Wetherby & Prizant 2000). Accordingly, there is a rise in educational programs that are

focusing on these visual skills by incorporating various visual aids into instruction for these students (Frith & Happe, 1994). This interest on visual materials extends to characters, text, events, and action presented on computer monitors and incorporated with learning strategies (Wetherby & Prizant 2000).

Bedrosian and colleagues (2003) conducted a study that used technology to help two male 8th grade students to improve their writing skills. Baseline data indicated that these students were only capable of composing two-sentence written production with limited content. During the study, the boys were taught how to cooperatively use story grammar maps, storyboards, and story writing software such as "My Words" to improve their writing composition skills. The results showed that the use of technology proved to be a positive impact on these boys' writing skills in their story planning, revising, and publishing, and thus helped develop their written language skills (Bedrosian, Lasker, Speidel, & Politsch, 2003).

Recently, interests in the use of a computer-assisted learning approach has been increasing with a focus on students with ASD (Moore, Cheng, McGrath, & Powell, 2005). Motivation for this idea results partly from the belief that education is mandatory for improving the lives of these students and also by the belief in the positive effects of computer-assisted instruction. Often, students with ASD appear to have a natural correspondance with computers and have positive gains from individualized tutoring and repetition of exercises through computer-assisted programs (Van-Bourgodondien, Reichle, and Schopler, 2003). These students learn better from a visual perspective, while computer programs with digital pictures benefit these students in a way to learn

writing skills. Using visual aids helps these students build a connection between the images and writing (Van-Bourgodondien, Reichle, and Schopler, 2003).

Particularly, the use of digital pictures in an educational, virtual environment can be beneficial to improve the writing skills for students with ASD. A study done by Parsons and associates (2004) included 36 participants, 12 of them diagnosed with ASD and were 13-18 years old. During baseline, the participants completed four training trials using the computer-assisted program, "Virtual CafeAL". They were told that they were going to see a different environment (digital picture) and that there were different writing tasks to be completed. The participants then had to complete a checklist of tasks. They were encouraged to complete the tasks in the order of the list. It listed tasks such as, order some food from the menu, pay for the food and drink, and order a drink from the counter. After completion of the study, the results indicated that the supportive structure of the digital pictures and checklist allowed the participants to focus on the main tasks and respond to them correctly with written responses. Also, scaffolding the level of support provided and changing the scenes of each digital story over subsequent sessions helped the participants to respond better and independently write better responses. The participants with ASD easily completed the requirements of the computer program, such as answering questions correctly and ordering the correct food to eat in the virtual cafe. Digital pictures were used to enhance their writing skills. Parsons and his team examined time spent responding to tasks, errors made, and each student's basic understanding of the digital pictures. The results indicated that computer-assisted programs that use digital pictures provide a supportive structure for these students and can also help them be on task (Parsons, Mitchell, & Leonard, 2004).

Digital stories are consisted of multimedia or still images that are complimented by a text to tell a story or present a documentary. A key point of digital stories is the fact that they act as a motivator for students with ASD. Furthermore, digital stories provide a different option of expression for struggling writers. The use of digital pictures within computer-assisted programs in the classroom shall help these students discover confidence, voice, and structure in their own writing (Van-Bourgodondien, Reichle, and Schopler, 2003). Although this may be true, the field is still unexplored. It is noted that there is one assuring approach to technological programs which has thus far lacked in research as an educational tool for students with ASD, and that is the use of "virtual environments" (Moore, Cheng, McGrath, & Powell, 2005).

Summary

The review of literature explains the need to improve writing skills of students diagnosed with ASD by using computer-assisted programs. Writing is an important communication skill in society that these students struggle with on a daily basis. Integrating technology into writing instruction, such as computer-assisted programs with digital pictures, helps these students in organizing their ideas and making a structured composition to become better writers.

Computer-assisted programs including digital pictures may be used as a tool to teach written expression to students that are visual learners. These digital pictures may promote their thinking in a logical way during prewriting to expand and organize their ideas to compose. Thus, their writing compositions can be improved.

Chapter 3

Methodology

Setting

School. The study was conducted at a private academy school in southern New Jersey. It is a school for students with special needs, ranging in ages from 5 to 14, serving 52 students from Pre-K to 8th grade. Additionally, it also provides respite services, family support, and direct care to clients, and cash services for parents and families.

In 1984, this school began to operate family support and respite services, then in 1991, per the request of the New Jersey Division of Youth and Family Services (DYFYS), the school started to provide community-based group homes for children with ASD and continues to serve young adults with ASD and other disabilities. In 2000, the school expanded to the initiation of Adult Training Services (ATS). ATS provides vocational training and coaching pertaining to daily living skills of young adults with the resources needed for their successful transition into adulthood. Since 2002, the school has been known as a private academy, as well as a foundation for community services. It is an independent organization and hosts fundraising activities on behalf of the whole organization.

The school strives for individualized learning experiences; therefore, a learning plan is developed and implemented for each student. The school's goal is to attempt to have each student readily prepared for society. For this reason, the school is actively involved in activities of other school districts so that learning attempts are paralleled.

The school also provides each student with enough background knowledge for a smooth

transition to community-based schooling and living. In addition, the school provides training to students through special tutorials, to prepare them for the state required standard tests.

Classroom. The classroom is located on the third floor of the academy. The students are in the classroom daily for Math, Reading, and Social Studies, taught by one teacher. There are eight students, three assistants, and one head teacher in the classroom. The students have access to four computers in the classroom, and are able to go to the Science classroom to use the computers. The writing instruction was provided by the teacher for 30 minutes per day, 4 days a week for 6 weeks.

Participants

Students. Six middle school students with ASD participated in the study. Their ages ranged from 11 to 13, and their academic skills are at different levels. All students have IEP's. In addition to ASD, some of the students are diagnosed with OHI and MD. See Table 1 for student information.

Table 1.

General Information of Participating Students.

OHI: Other Health Impaired MD: Multiple Disabled ASD: Autism Spectrum Disorder

Student	Age	Classification	Writing Scores (NJASK) (200-249=mean score)	TOWL 4 (90-110=mean score)
A	11	OHI	131 Partially Proficient	>70 Very Poor
B	12	ASD	169 Partially Proficient	70-79 Poor
C	13	MD	159 Partially Proficient	80-89 Below Average
D	13	ASD	155 Partially Proficient	>70 Very Poor
E	14	ASD	152 Partially Proficient	80-89 Below Average
F	14	MD	156 Partially Proficient	80-89 Below Average

Individual student information.

Student A. His reading and writing weaknesses included, writing in clear, concise, and organized language in varied formats for a variety of purposes and audiences.

Student B. His reading and writing weaknesses included, demonstrating the ability to view, understand, evaluate, and respond to print, non-textual information, and electronic text.

Student C. His reading and writing weaknesses included, demonstrating the ability to view, understand, evaluate, and respond to print, non-textual information, and electronic text.

Student D. His reading and writing weaknesses included, writing in clear, concise, and organized language in varied formats for a variety of purposes and audiences.

Student E. His reading and writing weaknesses included, demonstrating the ability to view, understand, evaluate, and respond to print, non-textual information, and electronic text.

Student F. His reading and writing weaknesses included writing in clear, concise, and organized language in varied formats for a variety of purposes and audiences, and to demonstrate the ability to view, understand, evaluate, and respond to print, non-textual information, and electronic text.

Teacher. A special education teacher was teaching and overseeing students during Reading, Math, and Social Studies. Reading was normally taught in groups where stories were read and comprehension questions were answered afterwards with

supplemental lessons in Spelling, Grammar, and Vocabulary workbooks. She taught writing to all students in this study.

Materials

Instructional Materials

The instructional materials included a, 1) computer program, 2) handout, and 3) checklist.

Computer program. The computer assisted program, Microsoft, Photo Story 3 (<http://www.microsoft.com/download/en/details.aspx?id=11132>), was downloaded on the four computer stations in the classroom. Photo Story 3 helped to create slideshows using digital photos. Teachers and students were able to post, crop, move, and rotate digital pictures using this program. They were also able to add stunning special effects, soundtracks, and individual own voice narration to their photo stories. In addition, they were able to use Photo Story 3 to personalize their stories with titles and captions.

Handout. The teacher developed the handouts including the writing process. Four steps were listed; prewriting, drafting, revising, and publishing. The students used this handout as a guideline when creating their stories during writing.

Writing checklist. A checklist with the four steps of the writing process was developed by the teacher and delivered to all students. This checklist was used to show which skills were introduced or mastered and when. The checklist included tasks to be completed such as: prewriting (organizing ideas), brainstorming (talk about his or her writing), drafting (creating an acceptable first draft), and revising (using complete sentences to draft compositions effectively).

Measurement Materials

Materials that were used for measurement include Hamil and Larsen's Fourth Edition Test of Written Language Skills (TOWL4, 2011), as well as each student's journals.

TOWL 4, 2011. The fourth edition of the Test of Written Language is a norm-referenced, comprehensive diagnostic test of written expression. It includes subtests and helps to identify students who write poorly, document progress that a student makes in certain writing programs and it also pinpoints a student's strengths and weaknesses in his or her writing abilities. The standard scores were referred to as index scores by TOWL4. They were calculated by applying the sums with a linear transformation to obtain a mean of 100. Only the writing subtest of the TOWL4 was used and scored in this study. The writing subtest's scaled score was transferred to the composite index with the assistance of table 4.3 in the TOWL4 Examiner's Manual.

Journals. These were assigned writing compositions with a topic. A total of six journal entries were assigned. First, to establish baseline, the students completed a free-writing assignment in their journals. After the first entry of free writing was completed, the students created a story in response to pictures in the TOWL4 written language test, where TOWL4 materials were used. Then, the remaining journal entries were in response to stories that use assistive technology with digital pictures. In this intervention stage, the computer-assisted program, Microsoft, Photo Story 3 with digital pictures was provided, and students were required to develop their journals as a composition assignment.

Research Design

A single subject design with AB phases was used in the study. During the baseline, students were instructed to free-write two times and data was recorded regarding the 1) total words written, 2) correct words written, 3) correct number of sentences, and 4) writing quality. During intervention, the students were guided through using Photo Story 3 to develop digital pictures for their own stories in order to create their composition. The same dependent variables, 1) total words written, 2) correct words written, 3) correct number of sentences, and 4) writing quality in each composition were recorded. Writing was based on a rubric that was scaled from 1-8 (weak to strong), based on the New Jersey Core Curriculum Content Standard for Production and Distribution of Writing. The rubric indicates whether the student applied all, some, or none of the requirements for writing production (See appendix A for an example).

Procedures

Instructional procedures.

The instructional Procedures are presented in Table 2.

Table 2.

Instructional Procedures.

Day/Week	Procedure Intervention Phase
Week 1/ Day 1	The students were introduced to a story from the computer-assisted program, Microsoft, Photo Story 3 and previewed a story previously created by the teacher that was titled, “American Flag”.
Week 1/ Day 2	The students read the story in detail and observed each digital picture that was linked to the writing on each page of the digital story, “American Flag”.
Week 1/ Day 3	The students reread the digital story “American Flag” with the digital pictures included. The students were given a journal and instructed to write a response that summarized the digital story.
Week 1/ Day 4	The teacher provided the students with handouts and checklists, and students were informed that the handouts and checklists were to assist them in writing their second compositions.

The process was repeated to teach weeks 2, 3, 4, and 5 of writing compositions with different topics such as dogs, trains, recycling, and the town where the school is located during the intervention phase (See appendix A for an example).

Measurement procedures

The results of the students' journal compositions were examined for improvements after each writing session. The students developed their compositions in response to each digital story. The teacher reviewed each written composition, and counted: total words written, correct words written, correct number of sentences, and writing quality. The results were recorded and data was graphed.

Data collection and analysis

Students were required to write one entry per digital story. Each composition was reviewed and measured by the teacher to record the number of the dependent variables. When reviewing each journal entry, total words written, correct words written, correct number of sentences, and writing quality were recorded. Graphs were developed based on the data to show each student's performance. In addition, all students were provided an interview to answer five questions (see Appendix D) to determine the social validity.

Chapter 4

Results

This study was conducted to determine if computer assisted instruction using digital photographs improves the writing skills of students with ASD. Of the six students (identified as students A through F) that participated in the study, all were male, three were diagnosed with ASD, 2 were diagnosed with MD, and 1 was diagnosed with OHI. During the baseline, students were prompted by a picture to free write two stories that were given by the teacher. During the intervention phase, Microsoft, Photo Story 3 was introduced to the students. Each story included five to six digital pictures and the students were required to write a composition in response to the story. A total of six stories were shown and six compositions were developed by students as writing assignments in class. The total number of words written, number of correct words written, number of correct sentences written, and quality of writing were evaluated and calculated. Table 3 presents the baseline data.

Table 3.

Student Writing Scores during the Baseline

Student	Total Words Written		Correct Words Written		Correct Number of Sentences		Quality Writing		Mean
	#1	#2	#1	#2	#1	#2	#1	#2	
A	6	5	6	4	2	0	1	1	3.1
B	11	10	11	9	0	0	4	4	6.1
C	10	10	4	5	3	1	1	2	4.5
D	17	18	13	13	4	5	5	6	10.1
E	15	18	10	11	3	5	2	3	8.4
F	11	12	6	5	0	0	1	1	4.5
Mean	11.6	12.2	8.3	7.8	2.0	1.8	2.3	2.8	6.1

Baseline Data

During the baseline, the mean of TWW was 11.6 for the Story 1 and 12.2 for the Story 2 with Student A writing 6 total words in Story 1 and 5 total words in Story 2, Student B writing 11 total words in Story 1 and 10 in Story 2, Student C writing 10 total words in both Stories 1 and 2, Student D writing 17 total words in Story 1 and 18 total

words in Story 2, Student E writing 15 total words in Story 1 and 18 words in Story 2, and Student F writing 11 words in Story 1 and 12 words in Story 2. The mean of CWW was 8.8 in Story 1 and 7.8 in Story 2, with Student A writing 6 correct words in Story 1 and 4 total words in Story 2, Student B writing 11 correct words in Story 1 and 9 correct words in Story 2, Student C writing 4 correct words in Story 1 and 5 correct words in Story 2, Student D writing 13 correct words in both Stories 1 and 2, Student E writing 10 correct words in Story 1 and 11 correct words in Story 2, and student F writing 6 correct words in Story 1 and 5 correct words in Story 2. The mean of CNS was 2 for Story 1 and 1.8 for Story 2, with Student A writing 2 correct sentences in Story 1, and 0 correct sentences in Story 2, Student B writing 0 correct sentences for both Stories 1 and 2, Student C writing 3 correct sentences in Story 1 and 1 correct sentence in Story 2, Student D writing 4 correct sentences in Story 1 and 5 correct sentences in Story 2, Student E writing 3 correct sentences in Story 1 and 5 correct sentences in Story 2, and Student F writing 0 correct sentences for both Stories 1 and 2. In addition, the quality of writing was evaluated using a rubric developed by the teacher based on the state core curriculum content standards in writing. The mean scores for QW was 2.3 for Story 1 and 2.8 for the Story 2, with Student A writing at a quality of 1 in both Stories 1 and 2., Student B writing at a quality of 4 in both Stories 1 and 2, Student C writing at a quality of 1 in Story 1 and a quality of 2 in Story 2, Student D writing at a quality of 5 in Story 1 and a quality of 6 in Story 2, Student E at a quality of 2 for Story 1 and a quality of 3 for the Story 2, and Student F with a quality of 1 for both Stories 1 and 2.

Intervention Data

Using the digital stories in teaching expressive writing, students were required to develop a writing composition by reviewing the digital pictures. A total of six stories were developed and student scores are presented in Table 4.

Table 4.

Student Writing Scores during Intervention.

Total Words Written.

Student	Story 1	Story 2	Story 3	Story 4	Story 5	Story 6	Mean
A	8	10	14	10	18	18	13.0
B	11	11	15	10	19	19	14.2
C	13	11	18	14	25	20	16.8
D	13	16	20	19	27	22	19.5
E	15	15	22	22	30	26	21.7
F	20	16	25	25	33	30	24.8
Mean	13.3	13.2	19.0	16.7	25.3	22.5	18.3

Correct Words Written.

Student	Story 1	Story 2	Story 3	Story 4	Story 5	Story 6	Mean
A	3	5	8	8	11	11	7.6
B	8	8	10	10	10	10	9.3
C	10	10	10	10	20	20	13.3
D	13	12	18	18	25	21	17.8
E	10	14	15	19	20	24	17.0
F	15	15	20	21	27	29	21.2
Mean	9.8	10.7	13.5	14.3	18.8	19.2	14.4

Correct Number of Sentences.

Student	Story 1	Story 2	Story 3	Story 4	Story 5	Story 6	Mean
A	0	0	2	2	4	3	1.8
B	1	3	3	3	4	4	3.0
C	3	3	4	4	5	5	4.0
D	2	3	5	5	6	5	4.3
E	5	5	5	5	6	6	5.3
F	6	5	6	6	7	6	6.0
Mean	2.8	3.2	4.2	4.2	5.3	4.8	4.1

Quality of Writing. (based on the rubric).

Student	Story 1	Story 2	Story 3	Story 4	Story 5	Story 6	Mean
A	1	1	2	3	4	5	3.5
B	1	2	2	4	6	6	3.5
C	2	2	3	4	5	7	3.8
D	3	3	4	6	7	8	5.2
E	4	4	5	6	7	7	5.5
F	4	4	4	5	6	7	5.0
Mean	1.8	2.6	5.0	4.7	5.8	6.7	4.4

The mean of TWW was 10 for Story 1, 13.1 for Story 2, 19 for Story 3, 16.7 for Story 4, 25.3 for Story 5, and 22.5 for Story 6. Each student's mean score for TWW was 13 for Student A, 14 for Student B, 17 for Student C, 20 for Student D, 22 for Student E, and 25 for student F. The mean scores for CWW was 9.8 for Story 1, 10.7 for Story 2, 13.5 for Story 3, 14.3 for story 4, 18.8 for Story 5, and 19.2 for Story 6. Each student's mean of CWW was 8 for Student A, 9 for Student B, 13 for Student C, 18 for Student D, 21 for Student E, and 21 for Student F. The mean for CNS was 2.8 for Story 1, 3.2 for Story 2, 4.2 for Story 3, 4.2 for Story 3, 4.2 for Story 4, 5.3 for Story 5, and 4.8 for Story

6. Each student's mean score for CNS was 2 for Student A, 3 for Student B, 4 for Student C, 4 for Student D, 5 for student E, and 6 for Student F. The mean for QW was 2.5 for Story 1, 4 for Story 2, 5 for Story 3, 4.7 for Story 4, 5.8 for Story 5, and 6.7 for Story 6. Each student's mean scores for QW was 3 for Student A, 4 for Student B, 4 for Student C, 5 for Student D, 6 for Student E, and 5 for Student F. Individualized student writing performance is presented in Figure 1.

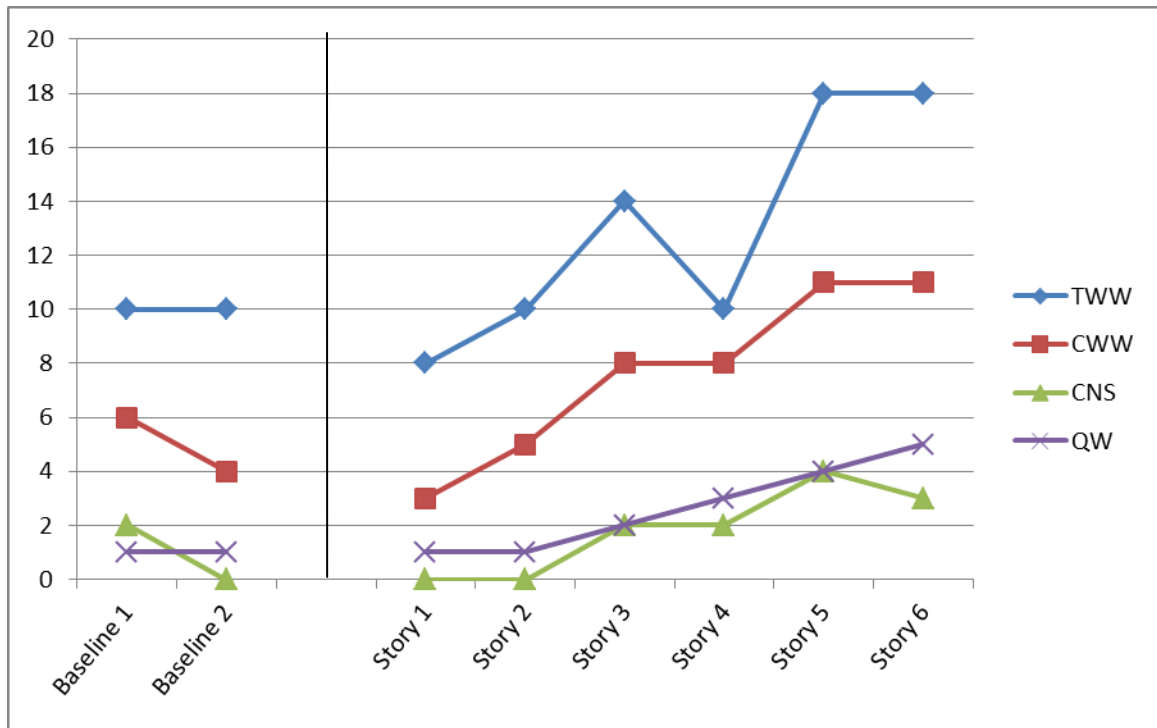
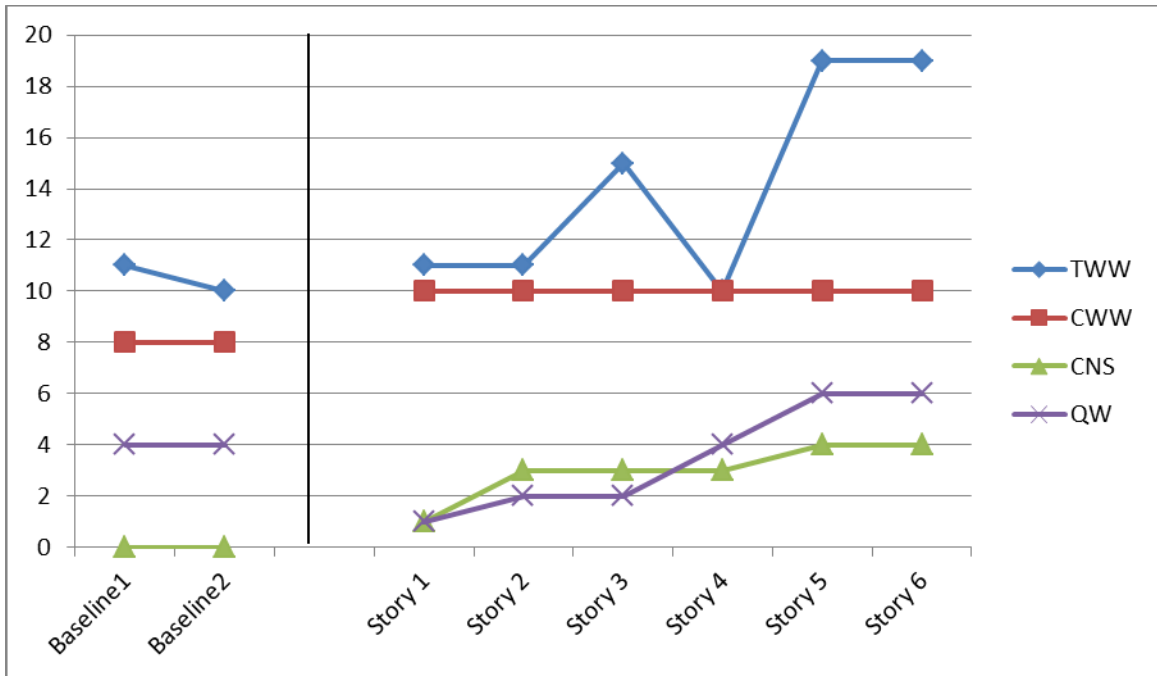
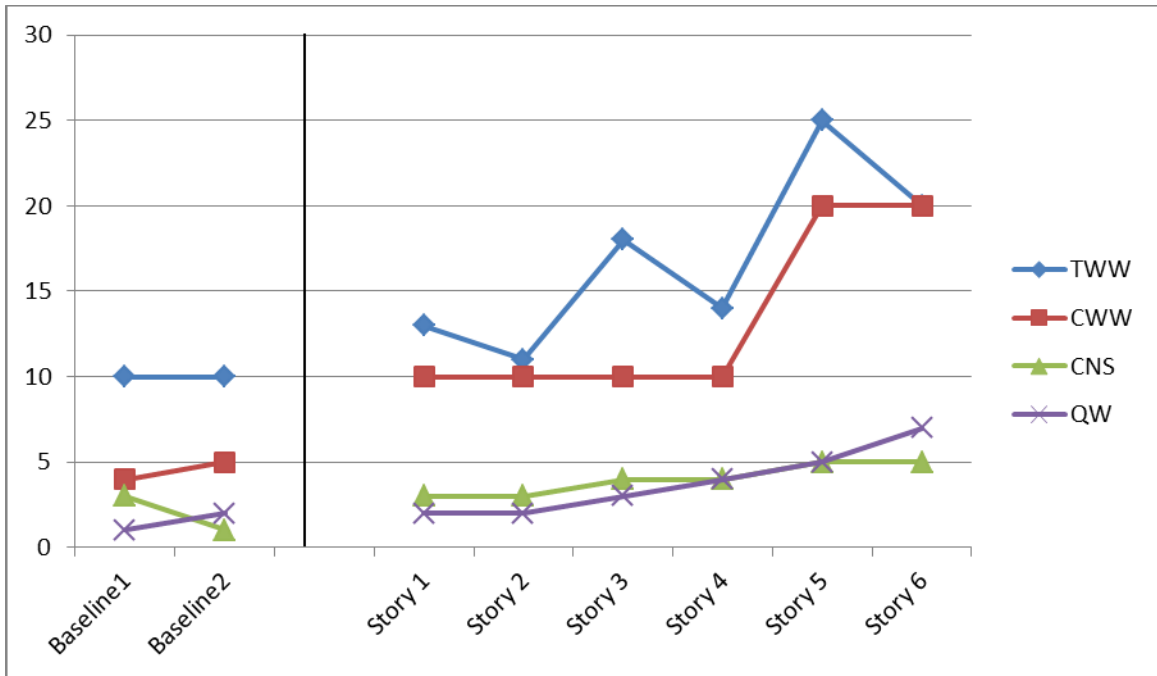


Figure 1. Individualized Student Writing Performance.

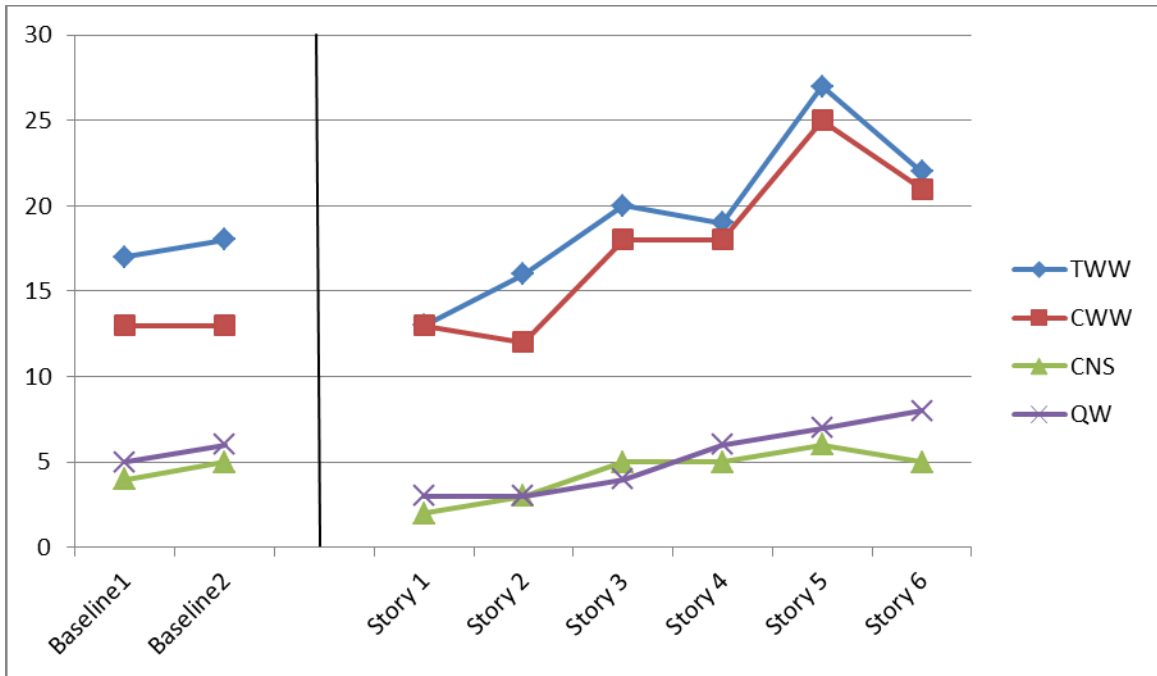
Student A.



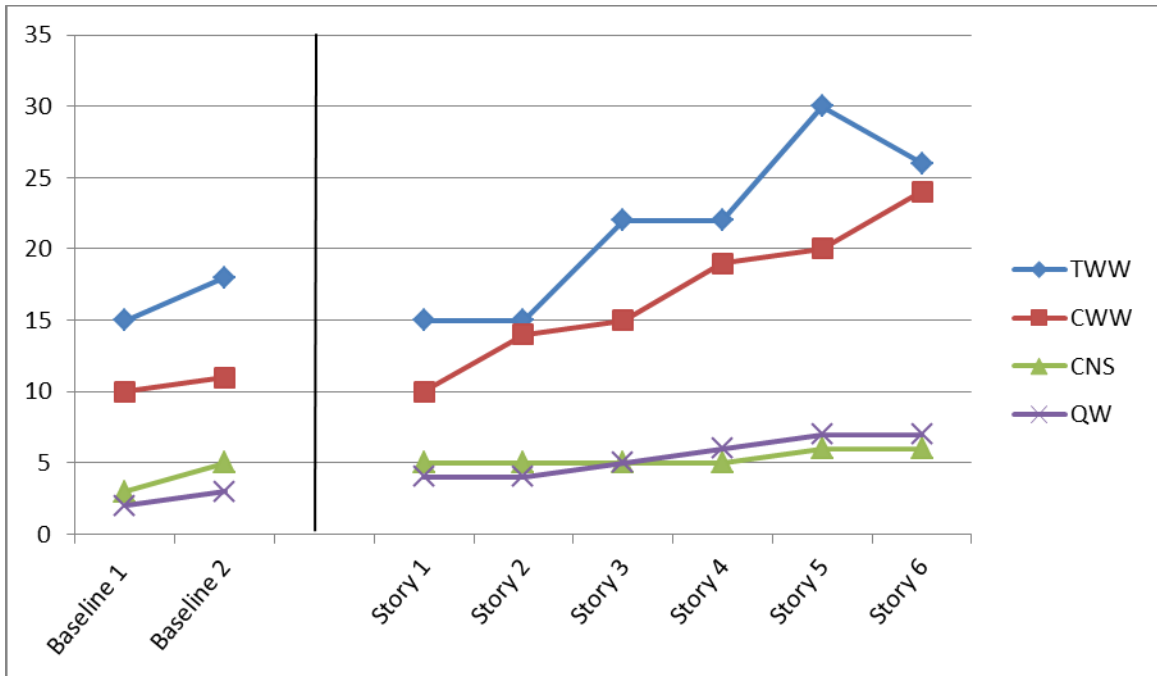
Student B.



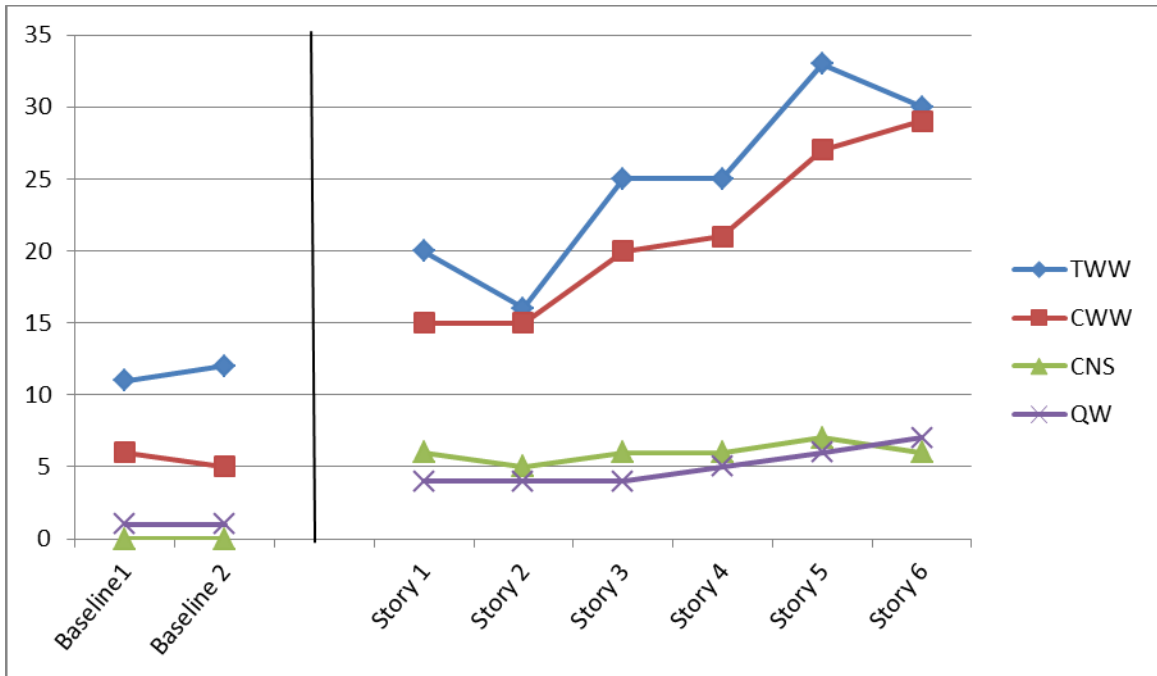
Student C.



Student D.



Student E.



Student F.

Chapter 5

Discussion

The purpose of this study is to (a) evaluate the effects of a computer based instruction program, Windows, XP Photo Story 3, as a visual aid with digital stories to help ASD students organize ideas (b) evaluate the effects of the program within the confines of transferring ideas into expressive writing compositions (c) examine and compare the effectiveness of the computer-based program to teach writing skills of students with ASD.

The first research question addressed, "Does computer-assisted instruction, using visual aids with a digital story, increase organizational processes of writing compositions for students with ASD". The results showed that there was an increase of the quality of writing in each student's writing composition. The data shows that there was an increase of 38% in the quality of writing, based on a rubric that was developed by the teacher. During the baseline, the students were asked to compose stories and many of them had trouble focusing on writing tasks. They had difficulty getting started and their sequence of events was disorganized. Nevertheless, during intervention, the quality of writing proved to be more successful on the measurement that was based on a 1-8 point scale, the final compositions that the students produced in the study leaned more on the higher end of the scale system. At the start of the study, the highest quality of writing was at a level 4 and at the end of the study a level 8 was recorded. The data showed writing improvements in ideation, organization, sentence structure, grammar, and vocabulary.

The second research question asks, "Does computer assisted instruction promote students with ASD to transfer organized ideas into expressive writing compositions". The results showed that the digital photos tremendously helped the students with comprehension and as a result, helped them transfer ideas in visual pictures to their writing. The digital pictures helped them to remember details in the story and more importantly, it helped them to remember proper sequence of the story. These pictures helped the students begin to write and stay focused while writing. Improvement is also shown in all three dependent variables of total words written (TWW), correct words written (CWW), correct number of sentences (CNS), and quality writing (QW).

The mean score of the TWW in the baseline was 11.9 and increased to 18.3 in the intervention, with a 34% increase. At the same time, the mean score of CWW in the baseline was 8.1, and at the end of the intervention phase, the mean score of the correct words written was 14.4, which was an increase of 44%. The mean of CNS during baseline was 1.9 and increased to 4.1 at the end of the intervention phase. Compared to the other dependent variables, this was the largest increase at 54%. The students wrote more complete sentences after using the digital pictures for their writing. Lastly, the mean of QW was a 2.6 during the baseline and increased to 4.4 at the end of the intervention, with an increase of 41%. QW was measured on a scale from 1 to 8, where 1 was the weakest and 8 was the strongest. As the data on the graph for QW shows, all the students in the study improved their writing quality. During the baseline, two students had a QW of 1, and their QW was recorded at a level 5 at the end of the intervention. At the end of the study, the weakest writer's QW reached level 5 and the strongest student's writing compositions reached a level of 7.

Lastly, the third research question, "Do technological photographs, presented in the computer-assisted instruction, improve the writing skills of students with ASD" is strongly represented in the data that there is definite improvement in writing skills as a result of the digital pictures provided in each story through Microsoft's Photo Story 3 computer-assisted program. All four dependent variables (TWW, CWW, CNS, and QW) showed a positive outcome and student progress. The results showed that the number of words, the correct number of words and sentences increased, and the quality of writing has improved.

As Lenhart and colleagues stated (2008), students with ASD are accustomed to using the internet. They are familiar with a computer and the internet (Internet World Stats, 2008; Lenhart, Arafeh, Smith, & Macgill, 2008). As a result, the students in this study were able to easily understand and manipulate the digital pictures to improve their writing skills through their compositions. The data also supports Peterson-Karlan and colleagues by showing that technology can notably change the fundamental nature of writing by providing new multi-media forms and electronic genre (Peterson-Karlan, Hourcade, & Parette, 2008).

Conclusion

In conclusion, the study proved to be successful within the population of students with ASD. In the future, these particular participants will continue to work on compositions with the use of digital pictures. If increased time was available, additional stories would have been added to the study; hence the results would have been stronger. Limitations within the study include; the length of the study, the sample size, research method, and the number of teachers used in the study. The length of the study was five

weeks. In order to reinforce the program and writing improvement, the study would need to be longer. If given an entire school-year for the study, the students would be able to become very familiar with the program and the required writing guidelines, thus the writing skills of students with disabilities would further improve. In addition, only six students were used in the study; three diagnosed with ASD, two with multiple disabilities (MD) and one with other health impaired (OHI) disabilities. In the future, a larger sample size would make the study stronger because there would be more samples for data collection and including only students that are diagnosed with ASD (and not any other disabilities) would additionally make the study more reliable. To further the credibility of the study in the future, a multiple baseline research design should be used. In that case, there would be more evidence to show improvement throughout the study. Lastly, only one teacher was involved in the current study. If more teachers participated to implement the computer-assisted program, they would collect more data to compare the results of the writing improvement of students with ASD.

References

- Aarons, M., & Gittens, T. (1992). *The handbook of autism: A guide for parents and professionals*. NY: Tavistock and Routledge.
- Asaro-Saddler, K., & Saddler, B. (2010). Planning instruction and self-regulation training; Effects on Writers with Autism Spectrum Disorders. *Exceptional Children*, 77(1), 107-124. Retrieved from <http://search.ebscohost.com.ezproxy.rowan.edu/login.aspx?direct=true&db=aph&AN=53426919&site=ehost-live>
- Bacci, T. (2008). Invention and drafting in the digital age: New approaches to thinking about writing. *Clearing House*, 82(2), 75-81. Retrieved from <http://search.ebscohost.com.ezproxy.rowan.edu/login.aspx?direct=true&db=aph&AN=35041976&site=ehost-live>
- Banaszewski, T. (2002). Digital storytelling finds its place in the classroom. *Multimedia Schools*, 9(1), 32-35.
- Bedrosian, J., Lasker, J., Speidel, K., & Politsch, A. (2003). Enhancing the written narrative skills of an AAC student with autism: Evidence-based research issues. *Topics in Language Disorders*, 23(4), 305-324. Retrieved from <http://search.ebscohost.com.ezproxy.rowan.edu/login.aspx?direct=true&db=psych&AN=2003-09461-006&site=ehost-live>

- Berninger, V. W., & Amtmann, D. (2003). Preventing written expression disabilities through early and continuing assessment and intervention for handwriting and/or spelling problems: Research into practice. In H. L. Swanson, S. Graham & K. R. Harris (Eds.), *Handbook of Learning Disabilities* (pp. 345-363). New York: Guilford Press.
- Bieberich, A. A., & Morgan, S. B. (2004). Self-regulation and affective expression during play in children with autism or down syndrome: A short-term longitudinal study. *Journal of Autism and Developmental Disorders*, 34(4), 439-448.
- Bishop, D. V. M. (2010). Overlaps between autism and language impairment: Phenomimicry or shared etiology? *Behavior Genetics*, 40(5), 618-629.
- Carnahan, C., Basham, J., & Musti-Rao, S. (2009). A low-technology strategy for increasing engagement of students with autism and significant learning needs. *Exceptionality*, 17(2), 76-87.
- Carroll, J.M., Maughan, B., Goodman, R., & Meltzer, H.(2004). Literacy difficulties and psychiatric disorders: evidence for co morbidity. *Journal of Child Psychology and Psychiatry*.
- College Board Advocacy and Policy Center. (2003). National Commission on Writing for America's Families, Schools, and Colleges. Retrieved from <http://www.host-collegeboard.com/advocacy/writing/>

College Board Advocacy and Policy Center. (2005). National Commission on Writing for America's Families, Schools, and Colleges. Retrieved from

<http://www.host-collegeboard.com/advocacy/writing/>

Cramer, S. R., & Smith, A. (2002). Technology's impact on student writing at the middle school level. *Journal of Instructional Psychology*, 29(1), 3-14. Retrieved from

<http://search.ebscohost.com.ezproxy.rowan.edu/login.aspx?direct=true&db=eft&AN=507748206&site=ehost-live>

Delano, M. E. (2007). Use of strategy instruction to improve the story writing skills of a student with asperger syndrome. *Focus on Autism & Other Developmental*

Disabilities, 22(4), 252-258. Retrieved from

<http://search.ebscohost.com.ezproxy.rowan.edu/login.aspx?direct=true&db=aph&AN=28407476&site=ehost-live>

Dierks-Gransee, Wright-Weissenburger, Johnson, & Christenson. (2009). Curriculum-based measurement of Writing for high school students. *Hammil Institute on Disabilities*, 30(6).

Eisenwine, & Hunt. (2001). *Handbook of early literacy research*

(Vol. 1., pp. 11-29). NY. The Guilford Press.

Elwood, S., Murphy, S. W., & Cárdenas, D. (2006). Enacting multimedia writing center pedagogy in a rural high school. *Clearing House*, 80(2), 86-88. Retrieved from

<http://search.ebscohost.com.ezproxy.rowan.edu/login.aspx?direct=true&db=aph&AN=24558065&site=ehost-live>

Englert, C. S., Zhao, Y., Dunsmore, K., Collings, N. Y., & Wolbers, K. (2007).

Scaffolding the writing of students with disabilities through procedural facilitation:

Using an internet-based technology to improve performance. *Learning Disability*

Quarterly, 30(1), 9-29. Retrieved from

<http://search.ebscohost.com.ezproxy.rowan.edu/login.aspx?direct=true&db=eric&AN=EJ786223&site=ehost-live;>

<http://www.cldinternational.org/Publications/Publications.asp>

Frith, U., & Happe, F. (1994). Autism: Beyond theory of mind. *Cognition*, 50, 115–132.

Ganz, J. B. (2007). Classroom structuring methods and strategies for children and youth with autism spectrum disorders. *Exceptionality*, 15(4), 249-260.

Gersten, R., & Baker, S. K. (1998). Real world use of scientific concepts: Integrating situated cognition with explicit instruction. *Exceptional Children*, 65(1), 23-35.

Retrieved from

<http://search.ebscohost.com.ezproxy.rowan.edu/login.aspx?direct=true&db=eft&AN=507673311&site=ehost-live>

Graham, S. (1990). The role of production factors in Learning Disabled students' compositions. *Journal of Educational Psychology*, 82.

Graham, S. (2006). Strategy instruction and the teaching of writing: A meta-analysis. *Handbook of writing research* (pp. 187-207). NY. Guilford Press.

- Graham, S. & Perin, D. (2007). Writing next: Effective strategies to improve writing of adolescents in middle and high schools. *Alliance for Excellent Education*.
- Hall, T., Strangman, N., & Meyer, A. (2003). *Differentiated instruction and implications for UDL implementation*. Wakefield, MA: National Center on Accessing the General Curriculum.
- Hofer, M., & Swan, K. O. (2008). Technological pedagogical content knowledge action: A case study of a middle school digital documentary project. *Journal of Research on Technology in Education*, 41(2), 179-200.
- Hollyoak, K.J. & Morrison, R.G. (2005). Thinking and Reasoning: A Readers Guide. *The Cambridge Handbook of Thinking and Reasoning*.
- Hughes, C. (2001). Transition to adulthood: Supporting young adults to access social, employment, and civic pursuits. *Mental Retardation and Developmental Disabilities Research Reviews*, 7(2), 84-90.
- Individuals with Disabilities Education Act. (2004). *U.S. Department of Education*.
<http://www2.ed.gov/policy/speced/guid/idea/idea2004.html>
- Izzo, M. V., Yurick, A., & McArrell, B. (2009). Effects of text-to-speech on access and achievement for high school students with disabilities. *Journal of Special Education Technology*, 24(3), 9-20. Retrieved from
<http://search.ebscohost.com.ezproxy.rowan.edu/login.aspx?direct=true&db=eft&AN=52961998&site=ehost-live>

Kamberelis, G. (1992). Markers of cognitive change during the transition to conventional literacy. *Reading and Writing, 4*, 365-402.

King-Sears, M., Swanson, C., & Mainzer, L. (2011). Technology and literacy for adolescents with disabilities. *Journal of Adolescent & Adult Literacy, 54*(8), 569-578.

Lenhart, A., Arafeh, S., Smith, A., & Macgill, A. (2008). Writing, Technology, and Teens. *Pew Internet & American Life Project*.

Landa, R., & Goldberg, M. (2005). Language, social, and executive functions in high functioning autism: a continuum of performance. *Journal of Autism and Developmental Disorders, 35*(5), 557-73.

Mason, L. H., Harris, K. R., & Graham, S. (2011). Self-regulated strategy development for students with writing difficulties. *Theory into Practice, 50*(1), 20-27. Retrieved from

<http://search.ebscohost.com.ezproxy.rowan.edu/login.aspx?direct=true&db=eric&N=EJ937321&site=ehost-live;>

<http://www.informaworld.com.ezproxy.rowan.edu/openurl?genre=article&id=doi:10.1080/00405841.2011.534922>

McDonough, J.T., & Revell, G. (2010). Accessing employment supports in the adult system for transitioning youth with autism spectrum disorders. *Journal of Vocational Rehabilitation, 32*(2).

- Merchant, G. (2005). Electric involvement: identity performance in children's informal digital writing. *Discourse: Studies in the Cultural Politics of Education*, 26(3), 301-314.
- Michalski, P., Hodges, D., & Banister, S. (2005). Special education classroom: A teacher's story of adaptations. *Teaching Exceptional Children Plus*, 1(4).
- Microsoft Photo Story 3 for Windows XP. (2012). Microsoft website:
<http://www.microsoft.com/enus/download/details.aspx?displaylang=en&id=11132>
- Montelongo, J. A., & Herter, R. J. (2010). Using technology to support expository reading and writing in science classes. *Science Activities*, 47(3), 89-102. Retrieved
- Moore, D., Cheng, Y., McGrath, P., & Powell, N. (2005). Collaborative virtual environment technology for people with autism. *Focus on Autism & Other Developmental Disabilities*, 20(4), 231-243.
- Myles, B.S., & Simpson, R.L. (2001). Effective practices for students with asperger's syndrome. *Focus on Exceptional Children*, 34, 1-14.
- National Center for Educational Statistics. (2002). National Assessment for Educational Progress. *The Nation's Report Card: Reading*. website:
<http://nces.ed.gov/nationsreportcard/writing/results2002/natachieve.asp>
- Nagin, D. (2005). Group based modeling of development. (pp. 1-39). *US. Library of Congress Cataloging in Publication Data*.

National Center for Educational Progress, (2002). *National Center for Education Statistics*. website:

<http://nces.ed.gov/nationsreportcard/>

National Center for Educational Progress, (2007). *National Center for Education Statistics*.

website:

<http://nces.ed.gov/nationsreportcard/>

No Child Left Behind. (2002). *U.S. Department of Education*.

website:

<http://www2.ed.gov/nclb/landing.jhtml>

Outhred, L. (1989). Word processing: its impact on children's writing. *Journal of Learning Disabilities*, 24, 578-579.

Parsons, S., Mitchell, P., & Leonard, A. (2004). The use and understanding of virtual environments by adolescents with autistic spectrum disorders. *Journal of Autism & Developmental Disorders*, 34(4), 449-466. Retrieved from

<http://search.ebscohost.com.ezproxy.rowan.edu/login.aspx?direct=true&db=aph&AN=14079883&site=ehost-live>

Peterson-Karlan, G., Hourcade, J., & Parette, P. (2008). A Review of assistive technology and writing skills for students with physical and educational disabilities. *Physical Disabilities: Education and Related Services*, Vol. 26 (2), 13-32.

- Revere, L., & Kovach, J. V. (2011). Online technologies for engaged learning: meaningful synthesis for educators. *Quarterly Review of Distance Education*, 12(2), 113-124. Retrieved from http://search.ebscohost.com.ezproxy.rowan.edu/login.aspx?direct=true&db=aph&AN=66_173718&site=ehost-live
- Sahyoun, C. P., Soulières, I., Belliveau, J. W., Mottron, L., & Mody, M. (2009). Cognitive differences in pictorial reasoning between high-functioning autism and Asperger's syndrome. *Journal of Autism and Developmental Disorders*, 39(7), 1014-1023.
- Shulman, L. (1987). Knowledge and teaching: foundations of the new reform. *Harvard Educational Review*, 57(1), 1-22.
- Shumway, S., & Wetherby, A. M. (2009). Communicative acts of children with autism spectrum disorders in the second year of life. *Journal of Speech, Language, and Hearing Research*, 52(5), 1139-1156
- Sitlington, P. L. (2008). Students with reading and writing challenges: Using informal assessment to assist in planning for the transition to adult life. *Reading & Writing Quarterly*, 24(1), 77-100. Retrieved from [http://search.ebscohost.com.ezproxy.rowan.edu/login.aspx?direct=true&db=eric&AN=EJ781946&site=ehost-live;](http://search.ebscohost.com.ezproxy.rowan.edu/login.aspx?direct=true&db=eric&AN=EJ781946&site=ehost-live) <http://www.informaworld.com.ezproxy.rowan.edu/openurl?genre=article&id=doi:10.1080/10573560701753153>

- Stromer, R., Kimball, J. W., Kinney, E. M., & Taylor, B. A. (2006). Activity schedules, computer technology, and teaching children with autism spectrum disorders. *Focus on Autism & Other Developmental Disabilities*, 21(1), 14-24. Retrieved from <http://search.ebscohost.com.ezproxy.rowan.edu/login.aspx?direct=true&db=aph&AN=19887349&site=ehost-live>
- Sturm, J.M. (2002). Effects of hand-drawn and computer generated concept mapping on the expository writing of middle school students with learning disabilities. *Learning Disabilities Research and Practice*, 17(2), 124-139.
- Sturm, J. M., Rankin, J. L., & Beukelman, D. R., (1997). How to select appropriate software for computer-assisted writing. *Intervention in School and Clinic*, 32, 148-161.
- Sweeny, S. M. (2010). Writing for the instant messaging and text messaging generation: Using new illiteracies to support writing instruction. *Journal of Adolescent & Adult Literacy*, 54(2), 121-130. Retrieved from <http://search.ebscohost.com.ezproxy.rowan.edu/login.aspx?direct=true&db=eric&AN=EJ900637&site=ehost-live;>
<http://dx.doi.org.ezproxy.rowan.edu/10.1598/JAAL.54.2.4>
- Sylvester, R., & Greenidge, W. (2009). Digital storytelling: Extending the potential for struggling writers. *Reading Teacher*, 63(4), 384-395. Retrieved from <http://search.ebscohost.com.ezproxy.rowan.edu/login.aspx?direct=true&db=aph&AN=46729974&site=ehost-live>

- Taylor, J. L., & Seltzer, M. M. (2011). Employment and post-secondary educational activities for young adults with autism spectrum disorders during the transition to adulthood. *Journal of Autism and Developmental Disorders*, 41(5), 566-574.
- Tobias, A. (2009). Supporting students with autistic spectrum disorder (ASD) at secondary school: A parent and student perspective. *Educational Psychology in Practice*, 25(2), 151-165. Retrieved from <http://search.ebscohost.com.ezproxy.rowan.edu/login.aspx?direct=true&db=eric&AN=EJ864976&site=ehost-live;> <http://www.informaworld.com.ezproxy.rowan.edu/openurl?genre=article&id=doi:10.1080/02667360902905239>
- Van Bourgondien, M.E., Reichle N.C., & Schopler E. (2003). Effects of a model treatment approach on adults with autism. *Autism Developmental Disorders*, 33(2), 131-40.
- Van Manen, M., & Adams, C. (2009). The phenomenology of space in writing online. *Educational Philosophy & Theory*, 41(1), 10-21.
- Warschauer, M., Arada, K., & Zheng, B. (2010). Laptops and inspired writing. *Journal of Adolescent & Adult Literacy*, 54(3), 221-223.
- Wetherby, Amy M., Ph.D., & Prizant, Barry M, Ph.D. (2000). Introduction to autism spectrum disorders. *Autism Spectrum Disorders: A Transactional Developmental Perspective. 1.*

Williams, S.C. (2002). How speech-feedback and word prediction software can help students write. *Teaching Exceptional Children, 34*, 72-78.

Appendix A

Lesson Plan for Writing Instruction

Objective: Students will be able to read a digital story for comprehension and compose a written composition to summarize the story.

Materials: Computer program Microsoft, Photo Story 3

(<http://www.microsoft.com/download/en/details.aspx?id=11132>, 2) handout, and checklist.

Procedure: Using Microsoft's Photo Story 3, the teacher will present a previously prepared digital story to each student during the first week (in the following weeks, the student creates his or her own digital story with the assistance of the teacher). After reviewing the story, the teacher will review the handout with the student that explains the four steps of the writing process. Then, the students are instructed to create a composition in response to the digital story reviewed. Then the teacher will give the student a checklist to ensure that the four steps of the writing process have been completed.

Measurement: The teacher will measure the student performance through the student's journal responses. The journals are reviewed by the teacher to record total words written, correct words written, correct number of sentences, and writing quality.

Appendix B

Hand Out

FOUR STEPS OF WRITING PROCESS

STEP 1: PREWRITING

- Decide on a topic to write about
- Consider who will read or listen to your written work
- Brainstorm ideas about the subject
- Do research

STEP 2: DRAFTING

- Put the information you learned in your own words
- Write sentences and paragraphs even if they are not perfect
- Read what you have written and make sure it says what you mean
- Show it to others and ask for suggestions

STEP 4: REVISING

- Read what you have written again
- Think about what others said about it
- Make sure sentences are complete
- Correct spelling, capitalization, and punctuation
- Read your writing to make sure it flows smoothly

STEP 5: PUBLISHING

- Illustrate, perform, or set your creation to music
- Read your writing aloud
- Put your writing on display
- Congratulate yourself on a job well done

Appendix C
Student Checklist

CHECK EACH COMPLETED ITEM

_____ I started my sentences with capital letters

_____ I used proper punctuation

_____ I checked my spelling

_____ I reread my writing and made corrections

Appendix D

Student Survey

1. Do you think the computer story helped you to become a better writer? How?
2. What have you learned through the computer program on how to make a story?
3. In your opinion, how do you think the computer story can help other students?
4. What helped you the most from these computer stories?
5. If you were a teacher, how would you use computer stories to teach writing?

