Effects of test-taking strategy instruction on high-functioning adolescents with autism spectrum disorder

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EFFECTS OF TEST-TAKING STRATEGY INSTRUCTION ON HIGH-FUNCTIONING ADOLESCENTS WITH AUTISM SPECTRUM DISORDER

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2000

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ABSTRACT

Effects of Test-Taking Strategy Instruction on High-Functioning Adolescents with Autism Spectrum Disorder

By

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Students with autism spectrum disorder (ASD) are expected to take various forms of tests in general education classrooms, therefore test-taking skills are very important and a necessary tool for students with ASD as they strive for academic success. The Test-Taking Strategy (Hughes, Schumaker, Deshler, & Mercer, 2002) has been found to be useful for students with learning disabilities and emotional behavioral disorders (EBD), but not yet with students with ASD.

The purpose of this multiple-probe design study was to investigate the effects of test-taking strategy instruction on high-functioning adolescents with ASD. Specifically, the Test-Taking Strategy (Hughes et al) was taught to four participants (i.e., one eleventh, one tenth, one eighth, and one sixth grade student) in an intensive after-school program. This strategy served as the independent variable in this study. Parallel Probe Tests (i.e., dependent variable) were used to measure participant performance throughout the baseline and instruction phases of the study. Two Generalization Probe Tests were used to
measure students’ abilities to apply the Test-Taking Strategy (Hughes et al) to researcher-constructed tests using content being covered in the courses of greatest difficulty for the participants. Additionally two Maintenance Probe Tests were used to determine whether participants remembered the strategy steps two weeks after instruction ended. Visual analysis of graphed data from the parallel Probe Tests, Generalization Probe Tests, and Maintenance Probe Tests revealed that three of the four high-functioning students with ASD were able to learn the Test-Taking Strategy (Hughes et al), generalize the learning to challenging tests, and maintain the knowledge two-weeks after instruction ended. The fourth participant also was able to learn the strategy and generalize the learning to challenging tests. This participant, however, needed a brief review to reach mastery on the Maintenance Probes administered two weeks after instruction ended.

At the completion of this study, participant and parent satisfaction related to the test-taking instruction was measured using a 3-and 5-point likert scale respectively. Satisfaction levels for both participants and their parents were very high.
# TABLE OF CONTENTS

ABSTRACT .........................................................................................................................................................iii

LIST OF TABLES ...................................................................................................................................................vii

ACKNOWLEDGEMENTS .......................................................................................................................................viii

CHAPTER 1 INTRODUCTION .............................................................................................................................1
  Statement of the Problem ....................................................................................................................................6
  Purpose of the Study ..........................................................................................................................................8
  Significance of Study .........................................................................................................................................9
  Limitations of Study .......................................................................................................................................10
  Definition of Terms .........................................................................................................................................11
  Summary and Overview of Remaining Chapters .............................................................................................15

CHAPTER 2 REVIEW OF LITERATURE ...........................................................................................................17
  Search Procedures .........................................................................................................................................17
  Selection Criteria ...........................................................................................................................................18
  Review and Analysis of Studies Related to Test-Taking Strategies and Students without Disabilities ......19
  Summary of Research Related to Test-Taking Strategies and Students without Disabilities .........25
  Review and Analysis of Studies Related to Test-Taking Strategies and Students with Disabilities Other than Autism .................................................................26
  Summary of Research Related to Test-Taking Strategies and Students with Disabilities Other than Autism ..................................................................................36
  Review and Analysis of Studies Related to Students Strategy Use, Instructional Strategies, and Strategy Instruction Related to Students with Autism .................................................................37
  Summary of Research Related to Students Strategy Use, Instructional Strategies, and Strategy Instruction Related to Students with Autism .................................51
  Review of Literature Summary .....................................................................................................................52

CHAPTER 3 METHODOLOGY ...........................................................................................................................56
  Research Questions .........................................................................................................................................56
  Description of the Participants and Setting ........................................................................................................57
  Description of Materials and Research Instrumentation ..................................................................................60
  Description of the Design ...............................................................................................................................63
  Description of Procedures ...............................................................................................................................65
  Analysis of the Data .........................................................................................................................................72
## LIST OF TABLES

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Participant Demographics</th>
<th>57</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 2</td>
<td>Steps of the Test-Taking Strategy</td>
<td>66</td>
</tr>
<tr>
<td>Table 3</td>
<td>Participants' Baseline and Controlled Practice Probe Tests</td>
<td>77</td>
</tr>
<tr>
<td>Table 4</td>
<td>Participants' Pre-and Posttest Measures</td>
<td>78</td>
</tr>
<tr>
<td>Table 5</td>
<td>Participants' Advanced Practice and Generalization Scores</td>
<td>80</td>
</tr>
<tr>
<td>Table 6</td>
<td>Participants' Maintenance Probe Test Scores</td>
<td>80</td>
</tr>
<tr>
<td>Table 7</td>
<td>Participant Satisfaction Data</td>
<td>82</td>
</tr>
<tr>
<td>Table 8</td>
<td>Parent Satisfaction Data</td>
<td>84</td>
</tr>
</tbody>
</table>
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CHAPTER 1

INTRODUCTION

Autism is a developmental disability characterized by impairment in a person's ability to communicate and interact with others. Autism spectrum disorder (ASD) encompasses a broad definition of autism that includes related disabilities such as Asperger Syndrome (AS), Rett's Syndrome, and Pervasive Developmental Disorder (Dunlap & Bunton-Pierce, 1999). The most recent estimates of prevalence rates for ASD are between 2 in 1,000 and 6 in 1,000 children of all racial, ethnic, and social groups (Centers for Disease Control and Prevention, 2004). Furthermore, there have been reports of increases in the number of children receiving diagnoses of autism (National Institute of Mental Health, 2003). As such, the number of young children with autism coming into the educational system each year is significantly greater than in the past, and the demand for services to meet the needs of this special population will continue to grow (Shipley & Wilder, 2001).

In 2003, approximately 141,022 children were served under the classification of autism for special education services. Because not all children with ASD receive special education services under the classification of autism, the education data may underestimate the actual prevalence of ASD (Centers for Disease Control and Prevention, 2004). As an increasing number of children with autism enter full inclusion
settings, administrators and teachers are unsure about which educational programs are best suited for individual children with AS (Szatmari, 1991).

Students with autism can succeed academically, but may face difficulties because they have a unique cognitive approach that affects their learning abilities. Individuals with ASD tend to have problems with organization, work completion, and motivation. In addition, they have significant challenges in comprehension of abstract concepts and characters in literature, inference, or application (Donnelly, 2005).

People with autism often focus on details, thus they fail to see how pieces of information fit together to form a larger picture. For example, when taking exams, individuals with ASD may interpret things differently than those without ASD because they think more in-depth about isolated elements on the test. They also tend to change topics suddenly, in the middle of conversation, but perceive the change to be associated. Furthermore, they can easily recall memorized information. Some have photographic memories while others can recall auditory or visual information in its entirety. On the other hand, the same individuals may forget everyday short-term words that they are not interested in, whereas those without ASD recall those words automatically (Donnelly, 2005).

Students with autism need educational programs that focus specifically on their unique needs. Among different learning techniques and environments, some will be better suited for certain children with autism than others. Therefore, it is crucial that school personnel and families work together to address those individual needs by identifying and developing appropriate programs. When students with autism do not receive quality education that takes their special needs into account, they may become
low achievers academically. Hence, educators for students with autism need to focus specifically on designing, implementing and evaluating their curriculum (Kinney & Fischer, 2001).

There are many factors that negatively affect academic achievement of students with ASD. For example, Fondacaro (2001) identified two characteristics of children with Asperger syndrome (AS) that negatively affect academic performance and behavior within the school environment. The first is an obsession or eccentric preoccupation with a particular interest. For example, some children with ASD obsess with toys and may become very disturbed when they are taken away from them. Other children with ASD fixate on certain pieces of information, such as bus time schedules or train destinations. The second characteristic that Fondacaro identified is the children's lack of tolerance for tasks perceived to be overwhelming. For example, adolescents with AS often slam their books down when they find math tasks difficult or complex and escape into their inner worlds to avoid the math.

Another factor that affects children's academic achievement and intellect is test anxiety. Beidel, Turner, and Taylor-Ferreira (1996) examined the effects of a study skills and test-taking strategies curriculum, called the Testbusters Program, with elementary students with test anxiety disorders. The program was designed specifically for elementary and middle school students to teach effective study habits, study skills, and test-taking strategies and included behavioral contracts to ensure consistent study behaviors for 11 weeks. Participants were placed in general education classrooms in public schools. The Testbusters Program reduced general levels of test anxiety and
distress while taking exams. Furthermore, the students’ overall grade point averages improved significantly.

Students with low achievement exist in almost every educational setting. There are various causes for the low achievement, but one of the main reasons students perform poorly is they have not learned proper learning strategies (Schumaker, Deshler, & Denton, 1984). Therefore, teachers of low achieving students must put a major emphasis on assisting these students in becoming independent learners. To become independent learners, these students must learn strategies that allow them to master various learning tasks that may be used in different instructional settings as they work on their own (Schumaker, Deshler, & Denton, 1984). When students with low achievement begin to use learning strategies effectively, they begin to transform themselves into independent learners instead of dependent learners. After they master the learning strategies, students are more successful in academic areas (Strichart & Mangrum, 1993). Moreover, students’ negative perceptions about their own ability to learn improve (Hattie, Biggs, & Purdie 1996; Jones, Slate, Blake, & Sloas 1995).

For years, educators have recognized the importance of teaching elementary, middle, and secondary level, students to acquire study skills (i.e., step-by-step processes to assist with learning). Strichart and Mangrum (1993) explained that one of the major reasons students have learning problems is that they lack adequate study skills for success in school. Unfortunately, many students with disabilities do not acquire study skills in elementary school and therefore continue to struggle as secondary students (Campbell & Olsen, 1994). The academic demands become increasingly difficult as students progress through the K-12 curriculum (McKenzie, 1991a). Secondary students are expected to
acquire large amounts of information, retain the information, and then demonstrate their knowledge of the information through various assignments and tests. Teaching students specific learning strategies can assist with these challenges (McKenzie, 1991b).

Learning strategies, like study skills, are composed of specific steps required to perform a particular task. Learning strategy instruction differs from study skill instruction in that a greater emphasis is placed on the rationale for using the strategy, when to use the strategy, and how to monitor its usage. Thus, learning strategy instruction is more comprehensive than study skill instruction.

Learning strategy instruction involves teaching students how to learn and perform when faced with challenging tasks. Learning strategies can be used not only by individuals on their own, but also in a classroom setting. Initially, learning strategy instruction was conceptualized as an intensive intervention to be taught primarily in resource room settings. More recently, this type of instruction has been used successfully in general educational settings where students with mild disabilities were found to be capable of being strategic learners (Scanlon, Deshler & Schumaker, 1994). Scanlon et al. note, however, that regardless of setting, teachers must spend sufficient instructional time to ensure that students become fluent in using the strategies that are taught.

One of the most important learning strategies involves test-taking skills. Students with autism are expected to take various forms of tests in general education classrooms. However, many students lack sufficient test-taking skills despite the fact that these tests are the primary means of assessing students in school (Good & Brophy, 1990). Test-taking skills help ensure that the testing results accurately reflect students’ knowledge. These skills include reading and following directions, thinking through questions prior to
recording responses, and proofreading and checking answers. They also include preparing prior to an exam and practicing with different types of tests that teachers commonly give (Good & Brophy, 1990).

The Test-Taking Strategy (Hughes, Schumaker, Deshler, and Mercer, 2002) was developed to help students: "(a) allocate time and order of importance to each section of a test, (b) carefully read and focus on important elements in test instructions, (c) utilize other learning strategies, (d) systematically and quickly progress through a test by selectively answering or abandoning questions, (e) make well-informed guesses, and (f) take control of the testing situation through regular use of self-talk and the application of test-wiseness principles" (Hughes, Schumaker, Deshler, & Mercer, 2002, p. 3). This comprehensive scheme is useful in various test-taking situations.

Researchers (Hughes & Schumaker, 1991; Hughes, Deshler, Ruhl, and Schumaker, 1993), investigated the effectiveness of the aforementioned test-taking strategy for students with learning disabilities and students with emotional and behavioral disorders. Both types of students benefited from instruction in this strategy.

Statement of the Problem

Students with autism can succeed academically, but may face difficulties because of their unique cognitive approach that affects their learning abilities. Individuals with ASD usually have executive function deficits (Geller, 2005) that interfere with their organization capability. When they are faced with complex organizational demands, they are frequently immobilized and sometimes unable to begin their required tasks (Bebko & Ricciuti, 2000). Distraction and sequencing are other common problems for students
with ASD. For some children, distraction may result from visual stimuli, while for others it may result from auditory or sensory stimuli. Distractibility impedes students' sustained concentration while they are performing their tasks. These students often cannot remember the precise order of tasks because they focus on specific details and fail to see the relationships that exist between them (Wagner, 1999). Difficulties with generalization are well-known in ASD and have important implications for educational practices as well. Students with ASD frequently cannot apply what they have learned in one situation to another situation within similar settings. Although none of these characteristics apply to the entire population of students with autism, these learning problems are seen in a large percentage of the students with autism to a significant degree (Mesibov, 2005).

There are many behavioral factors that negatively affect academic achievement of students with ASD. Fondacaro (2001) identified two characteristics of children with Asperger syndrome (AS) that negatively affect academic performance and behavior within the school. The first is an obsession or eccentric preoccupation with a particular interest. The second is the children's lack of tolerance for tasks perceived to be overwhelming. Test-anxiety is another factor that affects children's academic achievement and intellect (Beidel, Turner, and Taylor-Ferreira, 1996).

Test-taking skills are very important for students with ASD as they strive for academic success. Students with ASD are expected to take various forms of tests in general education classrooms. Unfortunately, many students lack sufficient test-taking skills despite the fact that these tests are the primary means of assessing students in school (Good & Brophy, 1990). The test-taking demand is particularly critical because
academic success in inclusive settings is determined primarily by test scores.
approximately 60% of a student's total grade for a course depends on test scores
(Putnam, 1992). Researchers have found that, in test-taking situations, students with
learning disabilities attend to the wrong part of test directions, are misled by irrelevant
information, and do not search for information persistently (Scruggs & Mastropieri,
1988).

For students with autism, the journey to academic success is not easy. Test-taking
skills represent one of the tools that can be used to accomplish academic success.
Acquisition of test-taking skills helps students address academic challenges, maintain
focus on study and course work, and ultimately achieve success in one's chosen area of
study. Therefore, mastering test-taking skills and strategies developed to meet these
challenges can determine the course of a student's life for years to come.

Purpose of the Study

The purpose of this study was to investigate the effects of test-taking strategy
instruction on high-functioning adolescents with autism spectrum disorder. To address
this purpose, the following research questions were answered.
1. Does instruction on the Test-Taking Strategy provided to high functioning
students with ASD result in mastery performance on Controlled Practice Tests
specifically aligned to the strategy steps?
2. Does instruction on the Test-Taking Strategy provided to high functioning
students with ASD result in mastery performance on classroom-type tests that do
not specifically align with the strategy steps?
3. Do high functioning students with ASD retain their test taking skills two weeks after completion of the instruction?

4. To what extent, are students with ASD satisfied with the Test-Taking Strategy?

5. To what extent, are parents of students with ASD satisfied with the results of the Test-Taking Strategy?

Significance of the Study

Students with ASD face many obstacles in school. Eliminating as many obstacles as possible through learning strategy instruction has the potential to improve their academic achievement significantly. An increasing number of leaning strategies have been developed to enhance students’ academic performance, especially in the area of reading and writing (Strichart & Mangrum, 1993). However, the majority of research in the field of autism has focused on reducing behavioral problems, increasing language abilities, or increasing social skills for children, instead of the implementation of learning strategy instruction. Therefore, as students with autism advance through the upper grades, teachers and parents may be unprepared because of the continued increase in academic demands.

The test-taking strategy has been found to be useful for students with learning disabilities and EBD, but has not been investigated with students with ASD. This study will determine whether or not the Test-Taking Strategy can be effectively taught to high-functioning students with ASD. This information will be helpful to teachers and parents of students with ASD. With the help of the Test-Taking Strategy, students with ASD may be more successful in passing their state’s proficiency requirements (as determined
by standardized test scores, and preparing for college. This research will add to the literature in the field of autism. Specifically, it will add information about the effectiveness of strategy instruction related to taking tests for students with ASD.

Furthermore, the Individuals with Disabilities Education Act (IDEA) of 1997 (U.S. Department of Education, 2004) and the No Child Left Behind (NCLB) Act of 2001 (U.S. Department of Education, 2004) support the need for this study with their emphasis on improved achievement by all students. IDEA mandates that all students, including those with disabilities, have access to and progress through the general education curriculum. The 2004 reauthorized Individuals with Disabilities Educational Improvement ACT (IDEA) requires that special education and related services, as well as supplementary aids, be based on peer reviewed research supported by strong evidence to the extent practical [612(d)(1)(A)(VI)(aa) of IDEA]. NCLB also establishes performance goals that public schools must meet by the year 2013-2014 (Clarke, 2003). To satisfy these requirements, teachers need to learn effective ways to help students meet these standards. Learning strategy instruction has the potential to assist with these challenges.

Limitations of the Study

Several limitations of this study should be mentioned. ASD affects approximately 1% of the population of children with disabilities in the United States, which is approximately 12% of the total disability population (National Dissemination Center for Children with Disabilities, 2001). Therefore, the participants in this study were drawn from a population of low incidence disabilities. The study was further limited by the
reluctance of families of students with ASD to participate in a 6-week after-school program. Some families were unwilling to have their children participate in a program that required this amount of time. As such, the generalizability of the results to all students with ASD regardless of family involvement is hindered. Another limitation was that only males participated in the study. Therefore, caution should be used when generalizing to female. Finally, the instruction took place at Odyssey Charter School located in Northwest Las Vegas instead of the students’ home schools. Thus, the students were faced with unfamiliar surroundings. Therefore, generalizability of the results to their home school may be limited.

Definition of Terms

1. Acronym Mnemonic Device: A type of mnemonic device that consists of a word formed from the initial letters of other words and is particularly useful when students are expected to provide a set of responses instead of a single response (Scruggs & Mastropieri, 1988).

2. Advanced Practice: Practice designed to measure how well students apply newly learned strategy steps in course materials. It gives students ample opportunity to practice applying the strategy in materials that are used in the classroom tests. (Hughes, Schumaker, Deshler, and Mercer, 2002).

3. Asperger Syndrome (AS): Similar in most areas to Autism Spectrum Disorder, except there is no clinically significant delay in language and no clinically significant delay in cognitive development, self-help skills, adaptive skills, and curiosity about environment (Kupperman, Bligh, & Barouski, 1992). A variant of
autism, at the milder end of the spectrum of autistic disorders (Klin, Volkmar, & Sparrow, 2000).

4. Autism Spectrum Disorder (ASD): Autism is a developmental disability that affects a person's ability to communicate, understand language, play, and interact with others. Autism is a neurological disability that is presumed to be present from birth and is apparent before the age of three. Autism spectrum disorder (ASD) encompasses a broad definition of autism that includes related disabilities such as Asperger Syndrome (AS), Rett's Syndrome, and Pervasive Developmental Disorder (Dunlap & Bunton-Pierce, 1999).


6. Controlled Practice: Practice designed to use different elements of the Test-Taking Strategy on the Probe Tests. It gives students ample opportunity to practice applying all of the steps of the strategy to tests that closely align with the strategy steps. By practicing the strategy on these easier materials, students can build their confidence and fluency (Hughes, Schumaker, Deshler, and Mercer, 2002).

7. Executive Function: A wide range of abilities including planning, organization, goal selection, flexibility, self-regulation, inhibition, and set maintenance. They are called executive functions because they represent the organization and control mechanisms of the person. These cognitive processes are thought to be mediated by the frontal lobes (Geller, 2005).

8. FIRST: Letter Mnemonic Strategy – Designed to aid students in memorization of lists of information by teaching them to design mnemonic
devices or memorization aids, and in finding and making lists of crucial information (Deshler, Schumaker, Harris, & Graham, 1999).

9. Generalization: Method to measure the degree to which students can generalize the acquired strategy to the “real” world (e.g., other populations and situations) and maintain their use of the strategy over time (Hughes, Schumaker, Deshler, and Mercer, 2002).

10. High-Functioning Autism: The condition of individuals who display symptoms of autism and are able to function close to a normal level in society. High-functioning persons with autism have mental abilities in the average to above-average range. Generally, the social difficulties created by their autism do not adversely impact their ability to interact with others on a day-to-day basis (Kupperman, Bligh, & Barouski, 1992).

11. Learning Strategies: Techniques, principles, or rules which enable a student to learn to solve problems and complete tasks independently (Schumaker, Deshler, & Denton, 1984).

12. Maintenance: Method designed to periodically check to see if students are continuing to use the strategy appropriately (Hughes, Schumaker, Deshler, & Mercer, 2002).

13. Pervasive Developmental Disorders (PDD): There are two conditions in PDD. One condition is PDD-not otherwise specified (PDD-NOS), and the other is Atypical PDD.

   a. PDD-NOS is most often used to describe individuals who meet some, but not all the criteria for autism. Either the person is not impaired in
all three areas considered when making a diagnosis of autism (social
development, communication, and activities and interests) or the
problems are very slight in one or more areas.

b. Atypical PDD is most often used to describe a child whose symptoms
resemble Asperger syndrome, but who does not meet all the criteria,
such as a person with extreme AS-style obsessions but with a severe
speech delay (Waltz, 1999).

14. PIRATES Mnemonic Device: A first-letter mnemonic device to increase the
likelihood of remembering the necessary steps in a testing situation. "PIRATES"
stands for Prepare to Succeed, Inspect the Instructions, Read, Remember, and
Reduce, Answer or Abandon, Turn Back, Estimate, and Survey (Deshler,
Schumaker, Harris, & Graham, 1999).

15. Rapid-Fire Verbal Rehearsal: is an exercise meant to help students memorize
the strategy steps. Each student is selected in rapid succession to name the
next step of the strategy. The students are expected to fire back the name of a
step as rapidly as possible, hence the name, 'rapid-fire' (Deshler, Schumaker,
Harris, & Graham, 1999).

16. Test-Taking Strategy: One of the strategies included in the Strategy Instruction
Model developed at the Center for Research on Learning at the University of
Kansas. The strategy was developed to provide an effective tool to improve
student performance on classroom tests. Specifically, the strategy was designed
to help students: (a) allocate time and order of importance to each section of a
test, (b) carefully read and focus on important elements in test instructions, (c)
utilize other learning strategies, for example, the FIRST-Letter Mnemonic Strategy, in conjunction with this strategy, (d) systematically and quickly progress through a test by selectively answering or abandoning questions, (e) make well-informed guesses, and (f) take control of the testing situation through regular use of self-talk and the application of test-wiseness principles. When all of the above components are sustained, this strategy provides students with a comprehensive routine that can be used in a variety of test-taking situations (Deshler, Schumaker, Harris, & Graham, 1999).

Summary and Overview of Remaining Chapters

Learning test-taking skills is important for students with autism because students in any grade frequently take various forms of tests in their general education classrooms. High-functioning students with autism spectrum disorder have often experienced frustration and preoccupation when they perceive tasks as overwhelming (Fondacaro, 2001). Researchers have found that learning test-taking skills can reduce general levels of test anxiety and distress when taking an exam (Beidel, Turner, and Taylor-Ferreira, 1999). Furthermore, effective use of learning strategies can enhance students’ academic achievement and change students’ negative perceptions about their own ability to learn (Hattie, Biggs, and Purdie 1996; Jones, Slate, Blake, and Sloas 1995).

The test-taking strategy has been found to be useful for students with learning disabilities and EBD, but has not been investigated with students with ASD. Therefore, additional research is needed in the field of autism. In Chapter 2, a review of literature pertinent to this study is presented. Chapter 3 contains a discussion of the methodology
used in this study. The results of the study and related implications are provided in Chapters 4 and 5.
CHAPTER 2

REVIEW OF LITERATURE

This chapter includes reviews and analyses of three areas of studies that are relevant to test-taking strategy instruction and high-functioning adolescents with autism spectrum disorder. The three areas are: (1) studies related to test-taking strategies and students without disabilities, (2) studies related to test-taking strategies and students with disabilities other than autism, and (3) studies related to strategy use, teaching strategies, and strategy instruction and students with autism. Understanding these studies is necessary to understand the effects of test-taking strategies on students with autism, including potential benefits and limitations of such strategies. The chapter starts with search procedures for the literature review and then proceeds to discussion of the selection criteria that were used to include literature in this review. Finally, the three areas of studies mentioned above are reviewed and analyzed. After each area is discussed, a summary for that area is provided. At the end of the chapter, a summary for the entire review of literature is provided.

Search Procedures

A systematic search through four computerized databases (i.e., Educational Resources Information Center, Psychological Abstracts, Web of Knowledge, and Dissertation Abstract International) was conducted. The following descriptors were used:
Learning strategy, test-taking, autism, Asperger syndrome, adolescent, academic skills, social skills, and strategy instruction.

Additionally, a search was conducted through the extensive collection of articles posted on the University of Kansas Center for Research on Learning website. This ancillary search was conducted because the intervention used in this dissertation study is a part of the Strategic Instruction Model (SIM) developed at this center.


Selection Criteria

No literature related to students with autism and test-taking instruction was identified. Therefore, this review includes three bodies of literature that most closely relate to the current study: a) test-taking instruction and students without disabilities, b) test-taking instruction and students with disabilities other than autism, and c) strategy use, instructional strategies, and strategy instruction related to students with autism.

Because three bodies of literature were included in this review, it was necessary to establish three different sets of criteria for selection of literature to include in this review.
First, experimental studies were included in the review of literature related to test-taking instruction and students without disabilities if: (a) participants were school-aged or university students without disabilities, and (b) the purpose of the study was to examine the effectiveness of a test-taking strategy intervention on students' academic performance. Second, experimental studies were included in the review of literature related to test-taking instruction and students with disabilities other than autism if: (a) participants were school-aged students with disabilities other than autism, and (b) the purpose of the study was to examine the effectiveness of a test-taking strategy intervention on students' academic performance. Third, experimental studies were included in the review of literature related to strategy use, instructional strategies, and strategy instruction related to students with autism if: (a) participants were school-aged students with autism, Asperger syndrome, or autism and learning disabilities, and (b) the purpose of the study was to examine the use of strategies by students with ASD or to examine the effectiveness of instructional strategies used to teach students with ASD or to examine the effectiveness of strategy instruction for students with ASD.

Review and Analysis of Studies Related to Test-Taking Strategies and Students without Disabilities

Beidel, Turner, and Taylor-Ferreira (1996) examined the Testbusters program designed specifically for elementary and middle school students from 4th through 7th grades. The purpose of the study was to determine if the Testbusters program decreased anxiety and improved academic performance in test-anxious children. The participants in this study were eight children (four boys and four girls) between the ages of 9 and 12.
All eight participants were Caucasian and were from upper-middle-class socioeconomic families. They were enrolled in general education classrooms in public elementary and middle schools, and instructional sessions took place in a clinical setting.

The program included several components designed to promote the acquisition of several specific skills. First, to establish good and consistent study habits, the participants' current study behaviors were assessed. Second, the participants were required to study an additional 15 to 20 minutes per night after completing their nightly homework, using an academic subject in which they were having difficulty. The final four weeks of the program focused on improving specific test-taking skills. The participants were taught how to use the test time allotted to their advantage. In addition, they were taught to carefully read all instructions, eliminate incorrect options from multiple-choice questions to increase the chance of identifying the correct answer, and to identify the use of absolute words such as never or always that provide clues about the veracity of true-false statements. The final lesson addressed how to review tests handed back by the teacher to identify testing mistakes to improve their performance on the next exam.

To ensure compliance, a contract between the participants and their parents was established. The participants received a small reward each night they completed their study assignment, and a somewhat larger reward if they studied every weeknight during the entire week.

Comparisons between the initial assessment and the 6-month reliability assessment were conducted using a pairwise-comparison t-test. The t-test was used to determine
whether there were significant differences between *The Test Anxiety Scale for Children* (TASC) scores, pulse rates and *The Self-Assessment Manikin (SAM)* ratings during the vocabulary test and the read aloud task, and grades. A repeated measures ANOVA across six pulse readings within each task (i.e., vocabulary test, read aloud) indicated that the first reading was significantly higher than all others. There was a significant decrease in pulse rate during the reading aloud task at the 6-month follow-up period. There were no differences on pulse rate during the vocabulary task.

The results of this study also showed that the participants' academic achievement improved significantly after the intervention. Overall grade point averages across five subjects improved from a C to a B. In addition, pre- to post-comparison of grade changes showed strong trends for improvement in every individual subject with the exception of mathematics.

The Testbusters program effects included improving academic achievement as well as decreasing anxiety. This study would have been stronger if the researchers randomized participants and had a control group. Furthermore, the participants were all Caucasian and were from upper-middle-class backgrounds, therefore the results of the study should not be generalized to students who are not part of this population. In addition, the researcher noted that after the intervention, participants with test-anxiety reported decreased anxiety when taking a test. However, because the participants knew in advance that the test was not related to their school grade, researchers should be cautious in generalizing this finding to naturalistic settings.

Vattanapath and Jaiprayoon (1999) investigated the effectiveness of test-taking strategies for multiple-choice English reading comprehension tests. The participants in
the study were 60, first year nursing students, who studied English reading as a compulsory course at Mahidol University in Thai. They were all female, and their ages were between 18 to 20 years old.

Both the experimental and the control group were instructed with the same teaching technique for 16 weeks in their English reading courses where approximately three hours of English reading was taught each week. The experimental group was given additional training in test-taking strategies for multiple-choice English reading comprehension tests as supplementary teaching to the regular English course. The instruction lasted for a total of 3 hours and 20 minutes that consisted of ten 20-minutes sessions, one lesson a week.

A multiple-choice English reading comprehension test used as a pre-test and post-test, was administered to both groups of participants. The test consisted of 40 items and the participants were allowed 100 minutes to complete it. A Likert rating-scale questionnaire was administered to the experimental group at the end of the course to investigate participant attitudes toward the teaching of test-taking strategies. The questionnaire was divided into two parts. The first part consisted of questions eliciting background information about the students, their opinion about taking the English test, and their test-taking strategy learning experience. The second part was designed to measure participant attitudes toward the learning and teaching of test-taking strategies for multiple-choice English reading comprehension tests. The t-test was used to determine whether there was any significant difference between the achievement of the control group and that of the experimental group. Coefficient Alpha was employed by SPSS to determine the reliability of the questionnaire.
There was a significant difference between the mean scores of the pre-test ($M = 21.8$) and the post-test ($M = 27.3$) of the experimental group at the .05 level, $t(29) = 8.94$, $p < 0.05$. This implies that the participants in the experimental group improved their reading comprehension significantly after they were taught with both regular lessons and the test-taking strategies. When the post-test mean scores obtained from the control ($M = 23.8$) and the experimental groups ($M = 27.3$) were compared, there was a significant difference at the .05 level, $t(29) = 3.02$, $p < .05$. This analysis demonstrates that the participants in the experimental group achieved significantly higher scores than those in the control group. As for the participants' attitudes, they responded positively towards the learning and teaching of test-taking strategies for multiple-choice English reading comprehension tests.

This study would have been stronger if the researchers randomly assigned participants to the control and experimental groups. Additionally, the participants were all female, first year nursing students, and as such, caution should be used when generalizing to students who are not part of this population.

Bowker and Irish (2003) conducted a study to determine whether teaching test-taking skills increases standardized test scores. Forty-five high school students, 11th graders, participated in this study. The research was conducted in three junior American History classes in the high school because all juniors in the state of Illinois were required to take the Prairie Achievement Examination (PSAE) and the American College Testing (ACT) tests. The participants were taught test-taking skills once per week for 16 weeks. The skills chosen for this study included: bubbling, erasing on the Scantron sheet, choosing correct answers, breaking down unknown words, practicing posture and stretches,
tracking, following directions, practicing negative questions, and challenging and motivating students to perform well on standardized tests. The participants completed the sample PSAE as a pretest, and a posttest in order to assess the effects of test-taking strategies taught in the classroom. The participants’ test-taking behavior was evaluated during four teacher observations spaced throughout the sixteen-week project using the Teacher Observation checklist. There were three items on the checklist: a) erasures on test, b) not tracking questions to answers, and c) not prepared for test.

The researchers found that test-taking skills related to taking standardized tests improved. Specifically, students became more aware of erasure smudges on Scantron answer sheets. The erasures on Scantron sheets decreased from pretest to the posttest (54% to 28%). The students learned the importance of filling in response bubbles completely and erasing error responses completely to avoid machine scoring errors. Participants’ tracking during tests (i.e., looking from test questions to Scantron sheet) improved from the pretest to the posttest (8% to 90%). The researchers found tracking was the most beneficial for raising test scores. The third item on the Teacher Observation checklist, participant preparedness, however, went from 91% on the pretest to 37% on the posttest. The researcher reported that the participants had become less prepared because the teachers initially provided needed equipment, such as pencils and erasers before each test and, as a result, the participants expected that support to continue and subsequently came to testing situations without needed materials. Overall Participants’ scores increased from the pretest (44%) to the posttest (51%).

The positive results from this study suggested test-taking instruction is an effective intervention to improve standardized test scores for high school students. However, there
was a weakness related to demographic information. It is important to report participants’ demographic information to readers, but the researchers did not give participants’ information such as gender or whether they had disabilities or not. The researchers did not mention what experimental design they used, either. Another weakness was with the third item on the checklist, participant preparedness. Participant preparedness decreased from 91% prepared for the pretest to 37% prepared for the posttest. The researcher should not have handed out needed equipment such as pencils and good erasers for the pretest because this may have fostered dependency among the participants and negatively affected their preparation for the posttest. The participants might have expected the instructor to provide the equipment for them.

Summary of Research Related to Test-Taking Strategies and Students without Disabilities

Groups of researchers studied test-taking strategies for students without disabilities and found that students who learned test-taking strategies significantly improved their academic performance. The research seems to suggest that test-taking strategies can benefit students regardless of age and the level of education because the participants in these studies included elementary and middle, and university students. Test-taking strategies may also be able to reduce the anxiety caused by taking tests. The study concluded by Beidel, Turner, and Taylor-Ferreira (1996) revealed that the students had decreased anxiety after learning the strategies. This is consistent with the research of Vattanapath and Jiprayoon (1999), who found that students’ attitudes toward test-taking strategies were positive. When students have positive attitudes toward the strategy, it is
likely that they feel more comfortable with test-taking and thus they may feel less anxiety.

One weakness of these studies is that it is difficult to generalize the findings. These studies targeted specific groups (e.g., 11th graders in junior American History classes or elementary and middle school students, who are Caucasian and of the middle class or first year nursing female students at Mahidol University at Thai). Also, the researchers did not randomize the participants. Vattanpath and Jiprayoon (1999) included a control group in their study but Beidel, Turner, and Taylor-Ferreira (1996) did not have a control group. Bowker and Irish (2003) did not provide detailed demographic information. However, the fact that different groups improved their academic performance after learning test-taking strategies suggests that the findings may be generalizable to broader groups of people.

Review and Analysis of Studies Related to Test-Taking Strategies and Students With Disabilities Other than Autism

Ritter and Idol-Maestas (1986) investigated whether instruction in a test-taking strategy would result in improved scores on content-area tests (far generalization) for two groups of students: poor comprehenders and participants whose comprehension was at least average. The 56 participants (28 in an experimental and 28 in a control group) were sixth graders in a middle school. All participants had taken the Metropolitan Achievement Test (MAT) and 20 of the participants earned reading comprehension percentile scores between 2 and 44 on the MAT (M = 22.1). Eight of these 20 students were also identified with learning disabilities. The remaining 12 participants who scored
44 or less in comprehension had received additional reading support in elementary school and were still eligible for reading support at the middle school level. All experimental participants were taught the SCORER test-taking strategy as a group during their independent reading period. The instructional period lasted 28 minutes and occurred four days per week for 15 days. The control group participants attended their usual reading period. The elements of SCORER were presented verbally to the experimental participants in order of occurrence (first, schedule your time; second, clue words; third, omit difficult questions; forth, read carefully; fifth, estimate your answer; and finally review your work). Participants were given a sample test and were asked to apply the components being studied. The students did not take the test; they only applied the test-taking components under study. After acquisition of each component was completed, the participants reviewed the accumulated parts of SCORER by applying them to sample tests on each of three days. After evaluating acquisition of SCORER in its entirety, mastery was assessed and recorded. Mastery for the application of SCORER components was defined as three out of four sample tests with 80% accuracy.

For the dependent measures, six mini-tests, designed by the investigators, were used to assess near-generalization for mastery. Six science tests administered by the science teacher were used as the far-generalization measure. The instructional period lasted 28 minutes and occurred four days per week.

Acquisition, mastery, and generalization of the test-taking strategy by the experimental group were measured. On acquisition measures, the experimental group demonstrated daily acquisition (M = 81.1%), with the poor readers averaging a daily mean of 70%. However, the participants did not demonstrate acquisition of SCORER in
its entirety when asked to describe all SCORER components during three different sessions. On the mastery measures (near generalization), the experimental group performed significantly better on near generalization measures than the control group, $F(1,53) = 87.16, p < .001$ on social studies tests. The poor comprehenders of the experimental group also scored significantly better than low readers in the control group, $F(1,17) = 72.59, p < .001$. The average and good readers performed significantly better than the control group, $F(1,32) = 43.58, p < .001$. All participants in the experimental group improved on the posttest as compared to their pretests. On the generalization measures (far generalization), the experimental group performed significantly better than the control group, $F(1,53) = 7.73, p < .001$, on science tests.

The results of the study revealed that poor comprehenders can benefit from a test taking strategy approach taught in a large group setting. The strength of this study was the use of test scores in general education settings as a measure of the test-taking strategy's effectiveness. Thus, generalized use of strategies outside the training setting was possible. This study would have been stronger if the researchers measured maintenance one or two weeks after completing instruction. The researcher should also have applied SCORER to essay questions because the participants should have been exposed to tests that are similar to classroom tests. Another weakness of this study is lack of long term follow-up.

Hughes and Schumaker (1991) examined the effects of teaching a comprehensive test-taking strategy to adolescents with learning disabilities. Six adolescents, five eighth graders and one seventh grader (five males and one female) participated in the study. All
participants were enrolled in a middle school resource class for one or two periods a day for instructional sessions.

Testing materials consisted of 10 Probe Tests that were constructed to be equivalent and parallel in format. Each Probe Test had 29 items, organized in four sections. Two sections included a total of 12 true-false items, two sections consisted of a total of 17 multiple-choice questions. The researchers designed a test-taking checklist to measure whether students were performing the steps of the test-taking strategy as they took the Probe Tests.

The researchers used a multiple-probe design (Horner & Baer, 1978). Three participants participated in each of two applications of the design. In the baseline procedures, separate Probe Tests were administered to the participants on different days, and it took 23 minutes to complete the tests. As a part of the strategy, participants learned the acronym mnemonic device, “PIRATES,” to increase the likelihood that they would remember the necessary steps to use in a testing situation. “PIRATES” stands for Prepare to Succeed; Inspect the Instructions; Read, Remember, and Reduce; Answer or Abandon; Turn back; Estimate; and Survey consecutively.

The researchers provided seven stages of instruction (i.e., Describe, Model, Verbal Rehearsal, Initial Practice, Advanced Practice, Posttest, Generalization). During the Describe Stage, rationales for learning the test-taking strategy were discussed. During the Model Stage, the instructor demonstrated how to complete each strategy step in sequence and how to recycle the steps while thinking aloud so the participants could witness all the cognitive processes involved in the strategy steps. During the Verbal Rehearsal, the
participants practiced naming all the steps and the instructor checked participants' memorization of the steps until they reached the mastery requirement individually.

During the Initial Practice Stage, participants engaged in practice activities by applying the first four steps of the strategy (P, I, R, and A), and took a practice test for 10 minutes. The participants continued to practice the first four strategy steps until reaching the mastery criterion. During the Advanced Practice Stage, participants took 15 minutes to complete a Practice Test which included performing all the strategy steps. When participants reached the mastery level by scoring 90% of the required responses, they proceeded to the sixth instructional stage. During the Posttest Stage, they took the successive Probe Tests until they reached at least 90% mastery level. During the Generalization Stage, the participants were encouraged to use the test-taking strategy when they took a test in their general education classrooms or other settings.

For the generalization measurement, the researchers collected test scores from all major unit tests taken during the course of the study. These mainstream class unit tests contained multiple-choice and true-false items. The researchers collected a minimum of four test scores for the period before training began and a minimum of three test scores after implementing training. The instructional process from the first baseline probe test through the last posttest took each participant approximately 4 weeks (an average of 18 instructional sessions). Each session lasted about 20 minutes.

Data analysis involved a visual analysis of graphed participant performance. Specifically, the trend, slope, and level of participant performance data were analyzed. All participants experienced three conditions: baseline, instruction, and maintenance. Two independent observers assessed interscorer agreement on individual tests.
Agreement was assessed using 25% of the all Probe Tests given during the study and mean interscorer agreement ranged from 86% to 100%.

The results of the study indicated that all six participants applied the strategy while taking tests in selected general education classes, and their test grades in those classes were higher after test-taking strategy instruction than before the instruction. The study demonstrated that students with learning disabilities can learn to apply a comprehensive test-taking strategy in a generative way to contrived tests and general education class tests.

The researchers showed a strong relationship between the dependant variable and the independent variable. Students who received the Test-Taking Strategy instruction improved their test scores. A strength of this study was the use of a student’s test scores in general education and other classroom settings as a measure of the Test Taking Strategy’s effectiveness. One weakness of this study was the lack of long-term follow-up. It would have been interesting to assess whether students continued to use the strategy several months after the instruction ended.

Hughes, Deshler, Ruhl, and Schumaker (1993) examined the effects of test-taking strategy instruction on students with emotional and behavioral disorders (EBD). This study included six participants with EBD (i.e., four eighth graders and two seventh graders). Six additional students with learning disabilities and two students with other disabilities received the Test-Taking Strategy instruction along with the six study participants with EBD. The researchers used the same materials and methods as those used in the Hughes and Schumaker (1991) study. The researchers used a multiple probe design with replication across participants. Each participant experienced three
conditions: baseline, instruction, and maintenance. Two independent observers assessed interscorer agreement on the individual tests. Agreement was assessed using 25% of the tests given during the study and mean interscorer agreement ranged from 89% to 100%.

The results of this study indicate that the average score for the group during baseline was 32% (range, 22% to 35%). After instruction in the Test-Taking Strategy, their average test score was 71% (range, 46% to 96%). The researchers indicated that the six participants with EBD successfully acquired and continued to use this comprehensive test-taking strategy up to 11 weeks after instruction. However, after instruction in the strategy, test scores improved for five of the participants while the test score for Participant 4 stayed about the same. The researchers noted that Participant 4 had a lower IQ Score (i.e. 78) than the other participants. This suggests that the Test-Taking Strategy may not be effective for students with lower IQ. Thus, replication of this study is needed.

A strength of this study was the use of test scores in general education and other classroom settings as a measure of the Test Taking Strategy's effectiveness. Thus, generalized use of strategies outside the training setting was possible. One weakness of this study was lack of long-term follow-up measures.

Fatata-Hall (1997) investigated the effects of study skills in improving the social studies performance of eighth-grade students with learning disabilities. Sixteen boys and six girls participated in the study. They were all identified as having learning or emotional disabilities.

The participants were taught how to take notes and prepare for tests through direct instruction for twelve weeks. The instruction focused on strategies for taking tests with different types of formats including true/false, multiple choice, and essay. As part of the
study skills and test-taking strategies, the students learned to analyze the textbook and identify important passages as they were discussed in the social studies class.

The results of the study revealed that the participants improved their overall averages as well as test scores in social studies. The participants' test scores after the twelve week intervention period revealed that grade averages in social studies rose thirteen points when compared with pretest. Eighteen of the twenty-two students raised their test scores to 83% on the social studies posttest. Furthermore, students reported that they felt more confident in their test-taking abilities and displayed better organizational skills through the use of a table of contents for their notebooks.

This finding was consistent with previous studies examining the effectiveness of test-taking strategies for students with learning or emotional disabilities. It appears that direct instruction and small group interaction are appropriate for teaching test-taking skills. This study would have been stronger if the researchers had included a control group randomized the subjects, and generalized the findings across academic areas and settings. An additional weaknesses of this study was the lack of follow-up study.

Cater et al. (2005) examined the effects of test-taking strategy instruction on the test performance of secondary students with high-incidence disabilities. Participants were 38 adolescents with high-incidence disabilities. All of the participants met the state and local eligibility requirements for having a disability and attended a single public high school. Test-taking strategy instruction sessions occurred during the regular school schedule and were conducted in a small classroom. A total of 20 participants were assigned to Group 1. These participants ranged in age from 15 to 19 years ($M = 16.8$), with the majority being male (65%) and African American (60%). Primary disability
labels were learning disability (75%), mild mental retardation (15%), and language impairment (10%). A total of 18 participants were assigned to Group 2. These participants ranged in age from 15 to 19 years ($M = 16.0$). Half of the students were male (50%), and the majority were African American (78%). Primary disability labels were learning disability (72%), mild mental retardation (22%), and language impairment (6%).

Participants completed a simulated version of The Tennessee Competency Achievement Program — Mathematics (TCAP) and the Test Anxiety Inventory (TAI) (Spielberger, 1980) before the test-taking strategy intervention. The intervention in this study consisted of a series of six lessons presented over six 90-minute class periods. The content taught in these lessons was test-taking strategies for taking multiple-choice math and language arts exams. The lessons involved providing participants with a rationale for the strategy, modeling multiple examples of strategy use, and providing repeated opportunities for participants to practice applying the strategies to worksheets and practice tests.

Included among the strategies were checking all work carefully, watching the clock, marking questions that had been skipped, filling in the answer sheets carefully and completely, and doing the easiest questions first. Additional lessons covered topics that were more specific to the particular content area. In the area of mathematics, the instructor taught the participants to sort math problems into those that covered geometry, word problems, computation-oriented problems, and ones that involved fractions, decimals, and percentage questions.

Participants were assigned to one of two groups, according to their class schedules. The instructor provided participants in Group 1 (i.e., those receiving the intervention
first) test-taking strategy instruction during one of three instructional blocks (i.e., 90 minutes). The number of students in each instructional block ranged from six to seven. Students in Group 2 (i.e., those who would receive the intervention later) remained in their scheduled classrooms and received regular instruction in math. After delivering the intervention to Group 1, the simulated TCAP was administered again to both groups.

The following week, the instructor delivered the same test-taking strategy instruction to Group 2. The instructor provided these students instruction during one of three instructional blocks in cohorts of five to seven students. Researchers implemented this delayed treatment so that every student would receive the intervention prior to taking the actual TCAP test the following spring. Group 1 returned to their scheduled classrooms and received regular instruction in math. After delivering the intervention to Group 2, participants in both groups took the simulated TCAP and TAI.

An independent-samples t test (two-tailed) was used to evaluate differences between the mean percentage correct score of Group 1 and Group 2 on the pretest of the simulated TCAP test. Paired-samples t tests (two-tailed) were also used to compare scores on the simulated TCAP test before and after students received the test-taking strategy instructional package.

The results revealed that test-taking strategy instruction slightly improved participants' performance on the simulated mathematics competency test. Participants in Group 2 also demonstrated a small but significant decrease in test anxiety, as measured by the TAI, following strategy instruction.

This study would have been stronger if the researchers used randomized group assignment and if the instruction had been longer than six class sessions. This was
a relatively brief time period when compared to other similar studies. The researcher reported that after intervention, participants with test-anxiety reported decreased anxiety when taking a test. However, the participants knew that the test was not related to their school grade so generalization to naturalistic settings is questionable. The strength of this study is that both experimental and control groups received the intervention. This method reduced the weakness of many group design studies (i.e., withholding intervention from the control group).

Summary of Research Related to Test-Taking

Strategies and Students with Disabilities Other than Autism

Studies related to test-taking strategies and students with disabilities other than autism revealed that test-taking strategies benefit middle and high school students with learning disabilities, emotional and behavioral disorders, and high incidence disabilities, students who are poor comprehenders and students whose comprehension is at least average. Ritter and Idol-Maestas (1986) found poor comprehenders and students whose comprehension was at least average performed better in tests from general educational settings after test-taking instruction. Hughes and Schumaker (1991) and Hughes, Deschler, Ruhl, and Schumaker (1993) demonstrated that students with learning and emotional disabilities can apply test-taking strategies to general education class tests and improve their grades. Fatata-Hall (1997) found that teaching study skills and test-taking strategies using direct instruction and small group instruction helps improve the test scores of students with learning or emotional disabilities. Cater et al. (2005) revealed that test-taking strategy instruction can improve the performance of students with learning
disabilities in the area of mathematics and can also decrease test anxiety. However, the improvement achieved by test-taking strategy instruction in Cater et al. (2005) was slight. This may mean that the test-taking strategies related to mathematics performance need to be studied further. Also, Hughes, Deshler, Ruhl, and Schumaker (1993) found that their test-taking strategy may not be effective for students with low IQ. These studies would have been stronger if the researchers had assessed the participants' abilities to generalize these skills across academic areas and settings.

Review and Analysis of Studies Related to Student Strategy Use,
Instructional Strategies, and Strategy Instruction Related to Students with Autism

This section of this review of literature chapter includes discussion of research specifically related to students with autism. Investigations involving strategy use among students, instructional strategies that teacher use, and the provision of strategy instruction are discussed.

Student Strategy Use

Bebko and Ricciuti (2000) conducted two memory experiments to examine the effect of changing the nature of the learning situation on strategy use: One experiment used a serial recall task and the other a recall readiness task. The purpose of Experiment 1 was to determine whether children with autism use rehearsal strategies on tasks involving the ordered recall of new information. One group of students was a high-functioning group and the other group consisted of children with moderate cognitive impairments.

The high-functioning group of students with autism consisted of 11 boys, with mean verbal IQ (VIQ) of 70, mean verbal mental age (VMA) of 9 years 6 months and mean
chronological age (CA) of 9 years 7 months. The group with the moderate-functioning, autism or mild to moderate intellectual impairments consisted of 11 boys, with VIQ 40-70 and VMA > 4 years. The mean VMA for this group was 6 years 7 months and the mean CA was 11 years 8 months. All participants took part in both memory experiments.

In Experiment 1, instructions were given both verbally and non-verbally by gesture and demonstration. The stimuli were 6 x 8 cm pictures of common objects (e.g., apple, coat and spoon) mounted on 6 x 10 cm white cards. There was one picture per card, and a total of 12 stimulus cards. For every stimulus card, there was an identical response card, yielding a total of 24 cards (two of each picture).

Participants were asked to label all of the stimulus cards to verify that they were familiar objects. The response cards were then placed in front of the participants and covered with a large piece of blank Bristol board. The experimenter explained and demonstrated that the participant would be shown some pictures and then asked to remember them in the same order that they had been presented. These stimulus cards were shown to the participant, one at a time, for 3 seconds each, and then placed face down from the participant’s left to right. Following the last stimulus card there was a 15 second delay and then the response cards were uncovered for recall. The participant was asked to match response cards to the corresponding face-down stimulus cards.

The results revealed that the majority of participants in the high-functioning group used specific strategies, whereas participants in the moderate-functioning group did not. The participants in the moderate-functioning group demonstrated a more severe executive functioning deficit. To examine further the influence of executive functioning deficits on the performance in this type of task, the researchers conducted Experiment 2.
Experiment 2 involved an investigation of a recall readiness task. For this recall readiness task, the two groups of participants from Experiment 1 were tested, but new participants of normally developing children were included to validate the adapted recall readiness procedures. A 48 x 16 cm display board was used to present the stimulus pictures. After a stimulus card was inserted into the display board, the researcher demonstrated the task and told the child that there were pictures behind the doors of the display board and that they could look at, in any order, as often and for as long as desired.

The goal was to remember all of the pictures in their correct sequence. The task began with up to eight familiarization trials, using different stimuli from the test trials. A child was classified as a rehearser on the recall readiness task by observing any of the indicators outlined for the task in experiment 1 or a sequential pattern of door openings on two or more trials.

The results, which were analyzed using ANOVA, revealed rehearsers recalled more than non-rehearsers (0.53 v. 0.40), although the difference was not statistically significant, $F(1, 9) = 1.304, p = 0.283$. The results indicate that the recall readiness task is effective for eliciting rehearsal strategy use among young normally developing children who may not otherwise be spontaneous strategy users.

In Experiment 1 and 2, participants, particularly those in the high functioning group, used spontaneous strategies on both memory tasks. Similarly, changing task structure was found to have an important impact on increasing strategy use. The results reveal that participants with cognitive impairment have more deficits in executive functioning than participants who are high functioning.
Executive functioning impairments have been assumed to be a fundamental deficit in the information processing skills of individuals with autism. The results of this study revealed executive functioning difficulties are associated more with delays in cognitive maturity or developmental delay, than autism uniquely. Thus, an important educational implication of the study is that there is a need to teach directly specific cognitive strategies to children with autism, rather than assuming they will develop the strategies on their own.

There were several limitations for this study. To assess the reliability of data, two observers should have simultaneously collected data for at least 25% of the sessions. The researchers only reported 94% for inter-rater agreement without indicating the percentage of sessions observed. Also, the researchers did not measure the fidelity of treatment. Lack of follow-up and generalization measures were also weaknesses in this study.

O’Connor and Klein (2004) examined procedural facilitation, the effects of three kinds of facilitation on reading comprehension. Each student read passages under four conditions: answering prereading questions, completing cloze sentences embedded in the text, resolving anaphora (e.g., finding what short cut words stand for, such as “Rob” for “Robert”) by identifying relevant antecedents, and control (reading only). Twenty adolescent students with autism spectrum disorders (ASD) participated in this study. Nineteen were male, and one was female. The students’ mean age was 15.11 years ($SD = .99$). Four of the students attended self-contained classrooms, six students attended regular classrooms with some resource support, and 10 attended partially integrated programs. The participants’ scores on standardized reading comprehension were
programs. The participants’ scores on standardized reading comprehension were significantly lower than their standardized word identification scores \([t (1, 19) = 28.71, p < .001]\).

Five stories were adapted from the grade six level of a reading series. The passages involved human participants but emphasized nonfiction content (e.g., a story about an archeological dig). A total of 14 participants and their families chose to complete the study at home, and six chose to do so at school. The students were accustomed to participating regularly in assessment sessions as part of a long term study.

In a within subjects design, each student read five stories, one each in the prereading question condition, the anaphoric cuing condition, and the cloze condition, and two in the control condition. Instructions for each type of intervention were given immediately before the passage.

For the prereading question condition, participants were asked a few questions to which they answered verbally. For the anaphoric cuing condition, the participants were told to circle words that represented a long version of a shorter word (e.g., a person called ‘Robert’ is called ‘Rob’ for short). The students were then shown an example and tried a practice question. Before the cloze task, the participants were told to fill in the blanks as they read and write down the word that belongs in the blank. The sequence of the interventions was randomized and balanced across students. Each passage and the break required about 10 minutes, for a total session of approximately 60 minutes.

A repeated measures analysis of variance indicated that conditions differed significantly in their effects on reading comprehension. Post hoc contrasts showed that
$n^2 = .36$] and cloze completion [$F(1,19) = 1.06, p = .32$ $n^2 = .28$] were small and not statistically significant.

The researchers found that the procedural facilitation variable significantly affected students' comprehension of the texts. Post hoc analysis indicated that these effects were accounted for by the anaphoric cuing facilitation, which produced medium effect sizes and appeared to benefit more than half of the students substantially. The effects of the other two interventions, prereading question and the cloze condition, were smaller and not statistically significant.

The procedures and results of the study indicate two educational implications. First, teachers, parents, and educational assistants can encourage students with ASD to check the antecedents of pronouns as they read. Second, students can be taught to check the referents of pronouns as an independent strategy. The strength of this study is that each participant experienced all three conditions, so the researchers could determine which intervention was appropriate for each participant. The weakness of this study was the lack of generalization measures to determine whether the strategies could be used in inclusive settings. Also, there was no control group or follow-up study.

Schlosser and Blischak (2004) examined the effects of synthetic speech and print feedback on spelling acquisition and generalization in children with autism. Four children (two Caucasian and two Asian-American boys) with autism and no functional speech participated in the study. They were between 9 and 12 years old, and were enrolled in self-contained classrooms in elementary and middle schools. Each participant was taught to spell words with a speech-generating device under three feedback conditions: speech-print, print, and speech. In the auditory–visual condition, children
received both speech and print feedback, whereas in the auditory (speech) and visual (print) conditions, only one type of feedback was provided. An adapted alternating treatments design was used and the student’s performance was graphed for visual analysis.

All four children reached criterion across conditions. Although one child was most efficient with speech–print followed by speech feedback, the rest of the children reached criterion first with print or speech–print feedback. These findings confirmed that children that exemplify the primarily visual profile spell words most efficiently when feedback involves print. On the other hand, children that fit the auditory profile spell words most efficiently when feedback involves speech.

This study guides parents and teachers of children with autism. Parents and teachers of children with autism need to consider the sensory profile of their children when producing instruction in spelling. The study also contributes to the literature related to the learning characteristics of children with autism.

The strength of this study is that each participant experienced all three conditions, so the researcher could decide which intervention was appropriate for each subject. The weaknesses of this study include inability to generalize the findings to situations in inclusive settings and lack of follow-up study.

**Instructional Strategies**

Tjus, Heimann, and Nelson (2001) examined the effect of interaction patterns between children with autism and their teachers when using a specific multimedia and communication strategy. A total of 11 children with autism (nine boys and two girls) participated in the study. All participants attended specialist schools for children with
autism. Nine children with mixed intellectual disabilities (four boys and five girls) also participated in the study (mean chronological age = 11.4 years; language age = 4.7 years). Seven of the participants had at least one motor or sensory impairment and two (both boys) had Down's syndrome. This group was matched with the autistic group according to mental age and language age.

Nine teachers (six female and three male) also participated. Two of the teachers were helping participants in both groups. The distribution of numbers of participants and teachers for each group was as follows: four teachers assisted eleven participants with autism and seven teachers supported nine participants with mixed intellectual disabilities. All participants with mixed intellectual disabilities had worked with computers before participating in the study. None of the participants with autism had any previous experience with computer-based instruction.

All participants used a Swedish version of the Alpha software program and were involved in the intervention over 3 to 4 months. Participants with autism received on average 25.6 sessions over 16.9 weeks and participants with mixed intellectual disabilities received 21.8 sessions over 17.7 weeks. Each session lasted on average 21.1 minutes for participants with mixed intellectual disabilities and 32.0 minutes for participants with autism. The teachers were instructed to sit beside their participants and allow them to explore the lessons freely in order to maintain high motivation. They tried to pick up relevant utterances from the participant and to recast them for acquisition of new syntactic structures.

A behavior was coded for each lesson using 10-second time samples. A two-tailed significance level was used, but a one-tailed significant level was accepted for their
specific hypotheses for ‘off task’. One of the authors coded all observations to give a total of 342 minutes (38 lessons), and reliability was checked by a graduate student who coded 10 percent of the material. The reliability coefficient was kappa = 0.81.

For the total group, a significant increase from start to end of treatment was observed for the category of verbal expressions ($z = 2.19, p < 0.001$; one-tailed). For the participants with autism significant results emerged for the categories of verbal expressions ($z = 2.19, p < 0.02$, one-tailed); seek help ($z = 1.99, p < 0.05$); and enjoyment ($z = 1.89, p < 0.05$, one -tailed). These findings suggest that the participants with autism talked more, had more fun and turned more often to their teachers for help at the final lesson than they did at the beginning of treatment. For participants with mixed intellectual disabilities no significant changes were observed.

Very few changes were noted in teachers’ patterns of interaction over time. However, there was some decrease in procedure comments for the total group ($z = 2.85, p < 0.01$) and for the teachers of children with autism ($z = 2.93, p < 0.01$).

There were significant correlations found initially between teachers’ recasts and participants’ verbal expressions for both groups ($r = 0.69, p < 0.001$) for all participants; ($r = 0.69, p < 0.05$) for participants with autism, and ($r = 0.71, p < 0.05$) for participants with mixed intellectual disabilities. However, at the end of training the only significant correlation was between participants’ verbal expressions and teacher’s recasts: ($r = 0.65, p < 0.05$) for the autistic group; ($r = 0.74, p < 0.05$) for the participants with mixed intellectual disabilities; and ($r = 0.70, p < 0.001$) for the total group.

The researcher found there was a positive relationship between participants’ verbal expressions and the teacher’s elaboration (recasts) through the strategy intervention for
both groups. This finding was consistent with previous findings related to the relationship between children's language and teacher's communication. The researchers also found that teachers were more willing to encourage children functioning at a higher language level by praising them more often. It is crucial for teachers to encourage students more often by praising and responding to them. This study would have been stronger if researchers had investigated the generalization of the findings across subjects and settings. The weaknesses of this study were the lack of follow-up.

Akmanoglu and Batu (2004) examined the effectiveness of simultaneous prompting in teaching pointing-to-numerals to individuals with autism. Participants were three students with autism, two male and one female, ranging in age from 6 to 17 years old. All participants were attending special education schools. For two male participants, all sessions were conducted in a classroom in their own school. For the female student, all sessions were conducted in a classroom at the university center for children with developmental disabilities.

The controlling prompts were written on 10 cm X 15 cm cards. Cards were white and numerals were black. During training sessions, three target stimuli cards were placed on the table where teaching would take place and then an introduction took place (e.g., "Now we are going to learn numerals with you. First, I will speak and you will listen. Then, when I ask you, you point to or give the numerals that I ask.") Then, an attentional cue (e.g., "Baris, are you ready to work with me?") and task direction (e.g., "Serap, which one is five?" or "Serap give me/point to card three.") were delivered. Next, a controlling prompt and modeling were delivered (e.g., "Look, this is five." "Now you show me which one is five."). Lastly, if the subject's response was correct and given
within 4 seconds, he or she was verbally praised. Incorrect responses were ignored. A multiple probe design was used across three behaviors and replicated across three subjects. Student performance was graphed for visual analysis.

Results revealed that simultaneous prompting was effective in teaching pointing-to-numerals to children with autism. Maintenance data revealed that participants maintained the skills taught for one to four weeks, and generalization data showed that participants were able to generalize the skills they learned across another set of materials (e.g., calendar pages).

This finding was consistent with previous studies examining effectiveness of simultaneous prompting on discrete behaviors. Thus, simultaneous prompting can be used with individuals with autism to teach both discrete and chained behaviors. This finding could extend the use of typical intervention agents, such as parents and peers, instead of experts who teach children with autism. This study would have been stronger if researchers had used a larger sample and conducted follow-up study.

Ohtake, Yanagihara, Nakaya, Takahashi, Sato, and Tanaka (2005) investigated how elementary-age, prelinguistic to emergent one-word communicators with autism and severe cognitive disabilities would repair communication breakdowns (i.e., a situation where the communication partner does not understand the goal or intent of the behavior accurately and timely (Halle, Brady, & Drasgow, 2003; Wetherby et al., 1998)). Two second-grade students (7 years 9 months, and 8 years 1 month of age) and one fifth-grade student (10 years 10 months of age) participated in the study. All three boys attended the same special school affiliated with the faculty of education at a university in Japan.
The procedure used to set up communication breakdowns consisted of four steps: establishing a joint-activity routine, interrupting the chain of the routine to evoke the student’s request, providing a communication breakdown, and responding to the request. All breakdown opportunities were embedded into daily routine activities. For example, in tickling, the communication partner raised her arms, sang a song, or said some ritualistic phrases to let the student know what she was going to do, and then she tickled the student for several seconds. This sequence was repeated several times until an expectant eye gaze was evoked. Data were collected on communication initiations and communication repairs over 3 weeks in a variety of places in the school (e.g., playground, playroom, classroom) throughout the school day. Student performance was graphed for visual analysis.

The results revealed that the participants repaired almost all breakdowns, using repetitions and modifications predominantly and evenly as repair strategies. Furthermore, the participants repaired communication breakdowns effectively to convey their original intent by supplementing the original communication acts with semantic categories. When they repaired communication breakdowns by modifications, they were more likely to use less-conventional forms. When the type of breakdown was not attending and not responding, they predominantly selected modifications rather than repetitions. The ratio of modifications to repetitions was substantially higher in the not attending and not responding condition (6:1 or 7:1) than in the remaining four conditions. This means that all the students selectively modified rather than repeating the original communication act when the communication partner diverted attention away from them.
The positive results from this study provided necessary support for repair strategies as an effective intervention for children with severe cognitive disabilities. This study extended the literature on communication repairs by including elementary-age children with severe cognitive disabilities who are prelinguistic to emergent one-word communicators.

There were several limitations for this study. To assess the reliability of data, two observers should have simultaneously collected data during at least 25% of the sessions, distributed randomly, but the researchers did not collect interobserver reliability data. The use of treatment of fidelity is important to enhance internal and external validity and reliability of this study, but the researchers did not measure the fidelity of treatment either. Furthermore, the findings of this study cannot be generalized to inclusive settings, and there was no follow-up study.

**Strategy Instruction**

Webb, Miller, Pierce, Strawser, and Jones (2004) investigated the efficacy of using the SCORE Skills Strategy (Vernon, Schumaker, & Deshler, 1996) to teach high-functioning adolescents with autism spectrum disorders five important social skills. A total of 10 high-functioning adolescents with autism spectrum disorder (ASD) participated in the study. Nine of the boys were White and one was Asian. The ages of the participants ranged from 12.3 to 17.2 years ($M = 14.8$ years). The boys were in grades 6 through 11. Their receptive and expressive language ability standard scores were above 75, and cognitive verbal standard scores ranged from 74 to 126. The study took place in a community public agency building. The SCORE Skills Strategy program includes instruction in five skills that children need to cooperate successfully with others.
took place in a community public agency building. The SCORE Skills Strategy program includes instruction in five skills that children need to cooperate successfully with others. Each skill consists of a series of steps that participants can use to effectively take part in and cope with the demands of a teaming situation. Each skill also has three body language expectations: voice sound, facial expression, and eye contact. The SCORE Strategy, from the Cooperative Strategies Series developed at the University of Kansas Center for Research on Learning, was used throughout the intervention phase. Instruction consisted of thirteen 60-minute sessions held two times per week for 6 1/2 weeks.

Participants learned the acronym mnemonic device, “SCORE,” to increase the likelihood of remembering the necessary steps in a teaming situation. “SCORE” stands for share ideas, compliment others, offer help or encouragement, recommend changes nicely, and exercise self-control. Students engaged in role-play situations and table games. All lessons followed the same instructional procedures: Advance Organizer, Introduction of the Skill, Discuss the Skill Steps, Model the Skill, Conduct Verbal Practice, Role-Play Practice, Post Organizer, and Application Activity.

A multiple-baseline-across-skills design was used to assess the participants’ entry level and acquisition of the five skills.

The researchers found that high-functioning adolescents with autism spectrum disorder mastered the five social skills of the SCORE Skills Strategy. Additionally, the high-functioning adolescents with ASD mastered the skills by working in a cooperative group setting. All of the participants made substantial gains in the performance of the five social skills after instruction. Furthermore, their performance of the five social skills was significantly better at the end of the study.
The positive results from this well-designed study suggest SCORE Skills Strategy is an effective intervention for children with ASD. Part of the pre and post assessment was a written test. However, some children with ASD have difficulty with fine motor skills, so it is hard to measure their obtained skills from a written test. Rather, to observe these children's behavior, a checklist should be used. Also, if the researchers used visual aids (graphs) in reporting the study results, readers could more easily understand the procedures and results. Lack of follow-up and generalization measures were weaknesses in this study.

Summary of Research Related to Student Strategy Use, Instructional Strategies, and Strategy Instruction Related to Students with Autism

Studies related student strategy use revealed that some students with autism use strategies when attempting to perform requested tasks. Bebko and Ricciuti (2000) found that some high-functioning children with autism use spontaneous strategies to increase their ability to remember and that lower-functioning students need to be taught specific strategies to help them with memory demands. Thus, Bebko and Ricciuti (2000) concluded that not everyone benefited equally from the use of strategies. The high-functioning group used strategies more successfully than the moderate-functioning group. O'Connor and Klein (2004) found procedural facilitation, such as anaphoric cuing facilitation, can be effective in helping adolescent students with autism with reading comprehension, though other interventions, such as prereading questions and cloze procedures were not effective. Schlosser and Blischak (2004) found synthetic speech and print feedback can be effective for spelling acquisition and generalization in children.
with autism, depending on the sensory profile of children with autism.

Studies related to instructional strategies for students with autism revealed that students with autism benefit from instructional strategies. Tjus, Heimann, and Nelson (2001) found that using a specific multimedia and communication strategy helps children with autism talk more, have more fun and seek assistance from their teachers more frequently. The researchers, however, revealed that the specific multimedia and communication strategy did not help children with mixed intellectual disabilities, while children with autism benefited. Akmanoglu & Batu (2004) found simultaneous prompting in teaching pointing-to-numerals to individuals with autism can be effective for individuals with autism. Ohtake et al. (2005) found that repair strategies can be an effective intervention for children with autism when communication breakdowns occur.

Finally, studies related to strategy instruction for students with autism revealed that students with autism benefit from strategy instruction. Webb, Miller, Pierce, Strawser, and Jones (2004) used the SCORE Skills Strategy to improve the social skills of adolescents with ASD. This study demonstrated that using strategy instruction can help children with autism improve their performance in variety of tasks. The researchers found that social skill learning strategy instruction was effective for high-functioning adolescents with ASD. Problems with the previously described studies were lack of follow-up and generalization measures. Additionally, some studies had a randomization problem (e.g., Tjus, Heimann, & Nelson, 2001).
Review of Literature Summary

Several researches found that test-taking strategies benefited students without disabilities by significantly improving their academic performance. Also, Beidel, Turner, and Taylor-Ferreira (1996) found that the students had decreased anxiety after learning the strategies. This is consistent with the finding of Vattanapath and Jiprayoon (1999), who found that students’ attitudes toward test-taking strategies were positive. When students have positive attitudes toward the strategy, it is likely that they feel more comfortable with test-taking and thus they may feel less anxiety.

Studies related to test-taking strategies and students with disabilities other than autism also revealed that test-taking strategies can benefit students with various disabilities, such as learning disabilities, emotional and behavioral disorders and high incidence disabilities and students with poor comprehension abilities. Ritter and Idol-Maestas (1986) found poor comprehenders and participants whose comprehension was at least average had better test performance in general educational settings after being taught test-taking skills. Hughes and Schumaker (1991) and Hughes, Deschler, Ruhl, and Schumaker (1993) demonstrated that students with learning and emotional disabilities can apply test-taking strategies to general education class tests and improve their grades. Fatata-Hall (1997) found that teaching study skills and test-taking strategies using direct instruction and small group instruction helps improve the test scores of students with learning or emotional disabilities. Cater et al. (2005) revealed that test-taking strategy instruction can improve the performance of students with learning disabilities in the area of mathematics and can also decrease test anxiety.
Studies related to strategy use by students with autism revealed that students with autism use strategies while performing requested tasks. Bebko and Ricciuti (2000) found that high-functioning students used strategies successfully, while moderate-functioning students did not use strategies as well. O’Connor and Klein (2004) found procedural facilitation can be effective in helping adolescent students with autism with reading comprehension. Schlosser and Blischak (2004) found synthetic speech and print feedback can be effective for spelling acquisition and generalization in children with autism, depending on the sensory profile of children with autism.

Studies related to instructional strategies for students with autism revealed that students with autism benefit from specific instructional strategies. Tjus, Heimann, and Nelson (2001) found using a multimedia and communication strategy can encourage children with autism to talk more, have more fun and turn more often to their teachers for help, but the same strategy did not help children with mixed intellectual disabilities. Akmanoglu & Batu (2004) found simultaneous prompting in teaching pointing-to-numerals to individuals with autism can be effective for individuals with autism. Ohtake et al. (2005) found that repair strategies can be an effective intervention for children with autism when communication breakdowns occur.

Studies related to strategy instruction for students with autism also revealed that students with autism benefit from strategy instruction. Webb, Miller, Pierce, Strawser, and Jones (2004) used the SCORE Skills Strategy to improve the social skills of high-functioning adolescents with ASD.

The studies mentioned above generally had a problem with randomization and lacked follow-up and generalization measures. However, the results of all of the studies suggest
that teaching test-taking strategies or other strategy instruction can improve the performance of students with and without disabilities.

While a number of studies related to test-taking strategies involving students without disabilities and students with disabilities other than autism have been conducted, no study has been conducted to investigate the effects of test-taking strategy instruction on students with autism. Because test-taking strategy instruction can benefit students with or without disabilities other than autism and because students with autism can benefit from strategy use, instructional strategies and strategy instruction, there is some evidence that students with autism may benefit from test-taking strategy instruction. This may be especially true for high-functioning students with autism.
CHAPTER 3

METHODOLOGY

The purpose of this study was to investigate the effects of Test-Taking Strategy Instruction on high-functioning adolescents with autism spectrum disorder. This chapter is organized into six sections related to the methodology for this study: (1) research questions; (2) description of the participants and setting; (3) description of materials and research instrumentation; (4) description of the design; (5) description of procedures; and (6) analysis of the data.

Research Questions

1. Does instruction on the Test-Taking Strategy provided to high functioning students with ASD result in mastery performance on Controlled Practice Probe Tests specifically aligned to the strategy steps?

2. Does instruction on the Test-Taking Strategy provided to high functioning students with ASD result in mastery performance on classroom type tests that do not specifically align with the strategy steps?

3. Do high functioning students with ASD retain their test taking skills two weeks after completion of the instruction?

4. To what extent, are students with ASD satisfied with the Test-Taking Strategy?
5. To what extent, are parents of students with ASD satisfied with the result of the Test-Taking Strategy?

Description of the Participants and Setting

Participant Pool

According to the Nevada Public Schools Autism Report, 1,164 children with autism were identified in Nevada public schools in 2003. They were placed in a range of programs from specialized self-contained programs for children with autism to general education classrooms.

Participant Selection

The participants for this study were recruited through community announcements distributed to parent group organizations and local disability organization web pages within Clark County in the State of Nevada. The announcements encouraged interested parents to contact the researcher by e-mail or phone. When parental contact occurred, further screening was conducted using the participant screening questionnaire (see Appendix A). Afterwards, a letter outlining the purpose and goal of the project including the date of the introductory meeting and required participant information (i.e., psychological and achievement reports that contain IQ and reading scores) to be brought to the meeting was mailed to the parents.

Participation criteria included the following: (a) current educational eligibility of autism spectrum disorder; (b) 12 to 17 years old; (c) full-scale IQ score above a 100 standard score, as measured within the previous three years; (d) reading achievement level of at least 4th grade level (e) currently attending a general education classroom for
at least one period a day; and (f) parents’ agreement to transport their child to and from
sessions three times a week for the six-week project.

Participant Demographics

Based on the previously described criteria, four adolescents participated in the study.
All participants had the educational eligibility of autism spectrum disorder; and were
considered high functioning, as indicated by intellectual capabilities. Table 1 displays
demographic data for each participant. All participants were male. Three were white and
one was Asian. The ages of the subjects ranged from 12.1 to 17.8. The mean age for the
participants was 14.9. The subjects were in grades six through eleven. The percentage of
time per day they each spent in general education classes as identified on their IEPs
ranged from 80% to 100%. All participants took medication prescribed by their
respective doctors.

Participant 1 was a male and an Asian. He was 17.8 years old and in the 11th grade.
He was diagnosed with Asperger syndrome and he was an English Language Learner
(ELL). He did not attend an ELL class because his school did not offer this type of class.
He attended the resource room one period a day to learn reading and writing. His Verbal
IQ and Performance IQ scores were 102 and 109, respectively. His Full Scale IQ was
110. Participant 2 was a male and white. He was 16.4 years old and in the 10th grade. He
was diagnosed with Asperger syndrome. He attended the resource room one period a day
to learn organization skills. His Verbal IQ and Performance IQ scores were 129 and 75,
respectively. His Full Scale IQ was 140. Participant 3 was a male and White. He was
13.3 years old and in the 8th grade. He was diagnosed with High-functioning autism.
He attended the resource room one period time a day because he had a problem with Mathematics. His Verbal IQ and Performance IQ scores were 95 and 111, respectively. His Full Scale IQ was 118. Participant 4 was a male and white. He was 12.1 years old and in the 6th grade. He was diagnosed with Asperger syndrome. His Verbal IQ and Performance IQ scores were 126 and 112, respectively. His Full Scale IQ was 123.

Table 1

*Participant Demographics*

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<td>Full Scale IQ</td>
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<td>118</td>
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AS: Asperger Syndrome
HA: High-Functioning Autism

Setting

The study took place at Odyssey Charter School located in Northwest Las Vegas. Three rooms were used: two for instructional purposes and the other as students' play and relaxation room. The first instructional room had four tables with two chairs at each
table. The room was also equipped with a teacher’s desk, a chalkboard, a cabinet, a bookshelf, an overhead projector, an LCD projector, a laptop, and a screen. The walls were decorated with posters of Paraphrasing, Test-Taking, and Sentence Writing Strategies. Classroom rules and a clock hung on the wall. The second instructional room was an adjacent room to the first room. The second classroom was used when students or the teacher of the first classroom were working beyond the normal school hours. The second instructional room had eight tables with two chairs at each table and two extra blue chairs. The room was also equipped with a teacher’s desk, a chalkboard, a smart board, an overhead projector, an LCD projector, and a laptop. The first and second instructional rooms were divided by a brown screen. The play and relaxation room had one table with eight chairs. Students used the room when they had snack, finished their assignment early, received social skill tutoring or while they were waiting for their transportation.

Description of Materials and Research Instrumentation

Instructor’s Manual

The researcher used the Test-Taking Strategy Instructor’s Manual (Hughes, Schumaker, Deshler, & Mercer, 2002) for this study because it provided systematic and concrete instructional steps that typically are beneficial for students with ASD. The manual contained scripted lessons organized into eight instructional stages. Each instructional stage included a description of lesson goals and materials needed for the lessons (e.g., cue cards, score sheets, progress charts). Also the manual included scoring instructions, evaluation guidelines and instructional suggestions for teachers.
Probe Tests

There were 13 Probe Tests (1 Pretest, 6 Controlled Practice Tests, 2 Posttests, and 4 Maintenance Tests) in the Instructor’s Manual (Hughes, Schumaker, Deshler, & Mercer, 2002). A total of 10 Probe Tests were used for ongoing monitoring in this study. These Probe Tests were constructed to be equivalent and parallel.

Each Probe Test had 23 items and was organized into five sections including Multiple Choice, True/False, Matching, Fill in the Blank, and Essay questions. For each section of the Probe Tests, two types of items appeared: easy-to-answer items and fictitious items. The fictitious items were constructed such that the answer would not be known by any student. Thus, educated guessing was required on these items because there were no “real” answers.

An example of an easy-to-answer item is

Christmas occurs in

a. Spring  c. Winter
b. Summer  d. Fall

An example of a fictitious item is

The Argualan colonists fought the king because of

a. land rights
b. cruelty
c. unfair taxation of export products
d. water rights
Test-Taking Score Sheet

A Test-Taking Score Sheet was used to evaluate student performance on the Probe Tests (see Appendix B). The Score Sheet was organized into three sections. The first section was used to measure students' behaviors as they prepared to take their tests and as they progressed through the steps of the Test-Taking Strategy. The second section was used to measure student behavior related to test instructions. The third section was used to measure students' abilities to answer test questions. A percentage score for each Probe Test was determined by dividing the number of points earned by the total number of items on the score sheet (72). Mastery was set at 90%.

Advanced Practice Score Sheet

An Advanced Practice Score Sheet (see Appendix C) was used to evaluate student performance on Advanced Practice Tests for generalization. The Score Sheet was organized into two sections. The first section was used to measure students' behaviors as they prepared to take their tests and as they progressed through the steps of the Test-Taking Strategy. The second section was used to measure student behavior related to taking tests using the strategy steps. A percentage score for each Advanced Practice Test was determined by dividing the number of points earned by the total number of items on the score sheet (14). Mastery was set at 85%.

Maintenance Probe Tests

There were four Maintenance Probe Tests. Two Maintenance Probe Tests were administered to each participant. The Maintenance Probe Tests had 23 items and were organized into five sections including Multiple Choice, True/False, Matching, Fill in
Blank, and Essay. Thus, the Maintenance Probe Tests were parallel in structure to the Probe Tests.

Generalization Tests

The researcher constructed two tests from participants’ textbooks to measure generalization. These tests were from subject areas in which the participant had academic difficulty. Mastery was set at 85%.

Participant Satisfaction Questionnaire

At the end of the six weeks, the four participants completed the Participant Satisfaction Questionnaire, to measure their satisfaction with the instructional program (see Appendix D). Specifically, participants evaluated whether their participation in the instruction helped them: (a) learn the Test-Taking Strategy (b) use the Test-Taking Strategy on other tests, (c) handle difficult tests, and (d) make them more competent. Participants answered six questions using a 3-point Likert-type scale (“1”-Not Satisfied - “3” Very Satisfied), two yes-no questions, and one open-ended question.

Parent Satisfaction Questionnaire

At the end of the six weeks, the parents of the four participants completed a questionnaire regarding their satisfaction with the instruction. They were asked if: (a) the participation benefited their adolescent, (b) their adolescent was able to do better with academic subjects, (c) their adolescent understood the need for improvement, and (d) their adolescent could use the Test-Taking Strategy in other tests (see Appendix E). Parents answered five questions using a 5-point Likert-type scale “1”-Extremely Dissatisfied-“5” Extremely Satisfied), two yes-no questions, and one open-ended question. They also had an opportunity to provide any additional comments.
Description of the Design

A multiple-probe design (Horner & Baer, 1978) was employed. Students participated in four training sequences of the design: baseline, instruction, generalization, and maintenance. All four participants received at least three Probe Tests during baseline. When the baseline performance of participants showed little or no variability, Participant 1 and Participant 2 received the Test-Taking Strategy instruction and concurrent Probe Tests and then two Generalization Probe Tests. Two weeks after completing the instruction, Participant 1 and Participant 2 took two Maintenance Probe Tests two days apart. Once Participant 1 and Participant 2 within the multiple-probe design obtained 90% mastery on a Controlled Practice Probe Test, Participant 3 and Participant 4 were administered one more baseline Probe Test. Participant 3 showed little or no variability and therefore received the Test-Taking Strategy instruction and concurrent Probe Tests and then two Generalization Probe Tests. Two weeks after completing the instruction, Participant 3 took two Maintenance Probe Tests two days apart. Once Participant 3 within the multiple-probe design obtained 90% mastery on Controlled Practice Probe Tests, Participant 4 was administered two more baseline Probe Tests because of his ascending baseline. When the baseline performance of Participant 4 showed little or no variability, he began to receive the Test-Taking Strategy instruction and concurrent Probe Tests and then two Generalization Probe Tests. Two weeks after completing the instruction, Participant 4 took two Maintenance Probe Tests two days apart. Thus, all students experienced four conditions: baseline, instruction, generalization and maintenance. See Appendix F for an outline of the Session Schedule.
The multiple probe design provides a procedure for collecting data that permits a thorough functional analysis of the variables related to the acquisition of behavior across the components of a chain or successive approximation sequence. Furthermore, intermittent probes provide an alternative method for establishing stable baselines when continuous measurement during extended multiple baselines proves impractical, unnecessary or reactive (Horner & Baer, 1978). The length of establishing a stable baseline depends on each participant’s abilities.

Description of Procedures

At the beginning of the study, a group meeting of the parents and adolescents was held to provide an overview of the study procedures, explain the importance of regular attendance of the subjects, complete consent and student information forms, and answer any questions the parents and subjects had. In addition, there were four phases in this study (see Appendix G).

Phase I: Preparation and Training of Research Assistant and Observer

The researcher held three training sessions for a research assistant and an observer. During the first session, the researcher provided an overview of autism. Emphasis was placed on the characteristics of high-functioning adolescents with autism. During the second session, the researcher explained the Test-Taking Strategy instruction. During the third session, the researcher explained how to score students’ performance using the Test-Taking Score Sheets and related procedures. The researcher also explained how to conduct fidelity of treatment observations using Fidelity of Treatment checklist (see Appendix H).
For interscorer agreement, there were two scorers for this study. The primary scorer was a research assistant. Secondary scorer was the researcher. During the third training session in addition to providing instruction related to scoring student work, the researcher had the assistant practice scoring several tests under the researcher’s supervision. Then, the researcher had her score additional tests independently, receive feedback from the researcher, score another test, receive further feedback from the researcher, and so forth until the assistant’s scoring revealed at least 80% agreement with the researcher’s scoring on two consecutive attempts.

For interobserver agreement of fidelity of treatment, there were two observers used in this study. During the third training session, the researcher had an assistant and an observer practice completing the fidelity of treatment checklist while the researcher delivered a sample lesson. “Yes” responses on the checklist indicated compliance with experimental procedures. Two observers practiced until the observers’ scorings revealed at least 80% agreement.

*Phase II: Baseline Data Collection*

During baseline, three separate Probe Tests were administered to the participants. Each of the three probes was administered on a different day and each time students were given 25 minutes to complete the probe test. They were told to answer each question as best they could and to do what they typically did to earn the best grade possible on a test. They were also informed that the purpose of the test was to determine how they take tests.

*Phase III: Implementation of Test-Taking Instruction*

The researcher taught the Test-Taking Strategy following the scripted lessons
provided in the Test-Taking Instructor’s Manual. The lessons were organized into eight instructional stages. They were Pretest, Describe, Model, Verbal Practice, Controlled Practice, Advanced Practice, Posttest, and Generalization.

At the completion of the baseline phase for each participant, the researcher provided feedback related to his test-taking performance based on the Pretest Probes administered during baseline. This feedback was provided to each participant individually without the presence of other participants. After receiving this feedback, each participant was asked to demonstrate his commitment to learning the Test-Taking Strategy by writing a goal statement. The participant was encouraged to include in his goal statement specific reasons he wanted to learn the strategy.

During the Describe Stage, the purpose of the Test-Taking Strategy was introduced, and the rationale for using the strategy was discussed. Participants also discussed hypothetical situations where they would be able to use the Test-Taking Strategy. Participants were told that this strategy was not intended to take the place of studying and that use of the strategy alone could not guarantee passing grades. The researcher discussed how previous students had improved their grades using the Test-Taking Strategy. Charts were presented to illustrate previous students’ test grades before and after the implementation of the Test-Taking Strategy. Then, the researcher expressed her expectations of similar results from them.

During the Model Stage, the researcher used a sample test to demonstrate how to complete each strategy step in sequence while thinking aloud so that participants could see the steps performed as well as hear the cognitive processes involved in performing the strategy steps. Specifically, the use of the PIRATES mnemonic device and the PASS,
Run, ACE submnemonic devices was demonstrated (see Table 2). An overhead projector and transparency of a test similar to the Probe Tests were used as the steps and cognitive processes were modeled. In later parts of the demonstration, students were asked to participate to provide guided practice in applying the strategy steps as well as to check their understanding of the strategy to that point.

During the Verbal Practice stage, participants were led in a rapid-fire rehearsal exercise for the purpose of verbally rehearsing and memorizing the steps of the strategy. After participants practiced naming each step of the strategy, they were checked individually to assess their ability to say the steps in sequence. When a participant could name all of the steps of the strategy in order without prompting, he proceeded to the next instructional stage.

During the Controlled Practice stage, participants reviewed the mnemonic and submnemonic devices of the Test-Taking Strategy and applied these steps to the Probe Tests. They were told they had 25 minutes to complete a test. After each initial practice attempt, the participant’s performance was scored using the Test-Taking Score Sheet (Appendix B). Each participant was provided with positive and corrective feedback privately. Participants continued in this stage of instruction until they scored 90% of the required responses on one Probe Test. Prior to taking each Probe Test, the strategy steps were reviewed and participants’ questions were answered.

During the Advanced Practice stage, participants brought a test they had recently taken in a general education classroom. They were instructed to take the test again using the strategy steps. They were given 50 minutes to complete the test. After each practice attempt, the participant’s responses were scored using the Advanced Practice
Test-Taking Score Sheet (Appendix C), and positive and corrective feedback was given to the participant. When a participant reached the mastery criterion of 85% of the required responses during an advanced practice attempt, he proceeded to the next instructional stage, Posttest. At this stage, participants took successive Probe Tests until they scored 90%. In generalization, the last instructional stage, the researcher constructed two exams using textbooks from each participant's weakest subject area and the participants took the exams. Participants were encouraged to use the Test-Taking Strategy each time they took a test in their general education classrooms or elsewhere. Also, participants discussed where and when they had used the strategy. Finally, they made cue cards as book marks listing the strategy steps to carry with them. After they took tests in their other classes, participants were scheduled for individual discussions to determine (a) whether they had used the strategy on their last test, (b) if they found it helpful, and (c) whether they had modified/adapted the strategy to help them reach their goal. Also, during this stage, participants took two Maintenance Probe Tests two weeks after instruction ended to determine whether they maintained the use of the strategy steps. The instructional process, including baseline Probe Tests and Maintenance Probe Tests, took approximately 16 or 17 sessions for each participant. Each session lasted 50 minutes.

**Interscorer agreement.** Interscorer agreement was assessed using the score sheets for participant performance on the Probe Tests. The researcher and a research assistant independently scored a random sample of 26.5% of all Probe Tests given during the study. An item by item analysis was conducted. Agreement was reached if both
Table 2

Steps of the Test-Taking Strategy

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Step(s)</th>
<th>Substeps</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIRATES 1: Prepare to succeed</td>
<td>Put your name and PIRATES on the test.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Allot time and order to sections.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Say affirmations.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Start within 2 minutes.</td>
</tr>
<tr>
<td>2: Inspect the instructions</td>
<td>Read instructions carefully.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Underline what to do and where to respond.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Notice special requirements.</td>
</tr>
<tr>
<td>3: Read, remember, reduce</td>
<td>Read the whole question.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Remember what you studied.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reduce the choices.</td>
</tr>
<tr>
<td>4: Answer or abandon</td>
<td>Answer the question.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Abandon the question for the moment.</td>
</tr>
<tr>
<td>5: Turn back</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6: Estimate</td>
<td>Avoid absolutes.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Choose the longest or most detailed choice.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eliminate similar choices.</td>
<td></td>
</tr>
<tr>
<td>7: Survey</td>
<td>Survey to ensure all questions are answered.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Switch an answer only if you’re sure.</td>
<td></td>
</tr>
</tbody>
</table>
observers marked a response as being present or if both observers marked a response as not present. The percentage of agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100.

*Fidelity of treatment.* To measure fidelity of treatment, a research assistant and an observer conducted observations and used the Fidelity of Treatment Checklist (see Appendix H) to ensure that the researcher followed the Test-Taking Strategy instructional procedures. A check indicated that a step was completed accurately while a cross indicated that a step was skipped or not completed. The two observers completed the checklist individually during 26.2% of the instructional lessons. Interobserver agreement was calculated by dividing agreements by agreements plus disagreements and multiplying by 100. When both observers recorded the same mark for a checklist item, an agreement occurred.

*Phase IV: Social Validity*

Social validity refers to the degree that efforts of behavior-change impact favorably upon consumers (Carr, Austin, Britton, Kellum, & Bailey, 1999). For social validity assessment in this study, the participants (direct) and parents (indirect) completed written questionnaires (see Appendix D and Appendix E). Treatment goals were assessed before treatment, while procedures and outcomes were assessed after treatment. For the treatment goals, the researcher conducted a survey involving parents of children with ASD about their satisfaction with their child’s education. The researcher found that parents of younger children with ASD were interested in their children’s social skill training whereas parents of older children were interested in both their children’s academic skill training and social skill training (Songlee, 2002).
The researcher also asked participants’ parents whether their sons needed instruction related to test-taking on the participant screening questionnaire. Due to these findings, the researcher decided to explore the effects of Test-Taking Strategy instruction with regard to improving academic skills of adolescents with ASD.

Analysis of the Data

Visual analysis of graphed participants’ performance was used. Specifically, the trend, slope, and level of participant’s performance data were analyzed. Trend analysis was used to determine whether participants’ performance was increasing or decreasing. The slope of the trend line was examined to determine how rapidly the change in participants’ performance occurred. Level also was examined. This included examination of the immediate change between baseline and intervention performance (i.e., last baseline data point is compared to first intervention data point). Additionally, Excel software was used to create single-subject design line graphs for this study.
CHAPTER 4

DATA ANALYSIS

The purpose of this study was to investigate the effects of test-taking strategy instruction on high-functioning adolescents with autism spectrum disorder. Data were collected to answer five research questions related to participants' abilities to learn and use the Test-Taking Strategy, participants' perceptions about the Test-Taking Strategy, and parents' perceptions of the Test-Taking Strategy. Interscorer reliability, and fidelity of treatment data also were collected. The first section of the chapter provides an overview of the collected data following the parameters of the multiple probe design. Then results related to the five research questions are provided. The chapter concludes with a summary of the results obtained in this study.

Overview of Collected Data

Data collection was staggered according to the parameters of a multiple probe design (Horner & Baer, 1978). Although not required in a multiple probe design, two participants were included in the first level of the design which adds an additional opportunity to see that the performance patterns of four participants (instead of three) were similar.
**Baseline Phase**

Baseline probe tests were administered to all four participants. The criteria used to progress to the strategy instruction for the first two participants at the first level of the multiple probe design was a minimum of three stable data points. Criteria used to determine initiation of strategy instruction for the remaining two participants was a mastery score of 90% on the Controlled Practice Probe Test obtained by participants already in the instruction phase. Based on these criteria, Participants 1 and 2 received three baseline Probe Tests prior to the implementation of the test-taking strategy instruction. Participant 3 received four baseline Probe Tests prior to the implementation of the test-taking strategy instruction and Participant 4 received six baseline Probe Tests prior to the implementation of the test-taking strategy instruction. Baseline stability was achieved for all four participants prior to the initiation of instruction.

**Instruction Phase**

The Instruction Phase included describing the strategy, modeling the strategy, and memorizing the mnemonic device steps. Controlled Practice Probe Tests were administered to monitor the effects of the intervention. The number of Controlled Practice Probe Tests each participant took varied depending on how long it took to reach mastery level performance (i.e., 90% accuracy). Participants 1 and 2 completed three Controlled Practice Probe Tests. Participant 3 completed two Controlled Practice Probe Tests and Participant 4 completed one Controlled Practice Probe Test.

Once mastery was achieved on Controlled Practice Probe Tests, instruction progressed to advanced practice and the Advanced Practice Probe Tests (previously taken classroom tests) were administered until mastery level performance was obtained.
(i.e., 85% accuracy). All four participants mastered the Advanced Practice Probe Tests with only one administration.

Following the protocol of the Test-Taking Strategy Instructor's Manual, following mastery of Advanced Practice, a Post Probe Test (i.e., test that paralleled the Controlled Practice Probe Test) was administered to ensure student mastery of the strategy (i.e., 90% accuracy). All four participants reached the mastery criterion with one administration of the Post Probe Test.

Generalization and Maintenance Phases

Following the Instruction Phase, all four participants completed two Generalization Tests to determine their abilities to apply the test-taking strategy on researcher-constructed tests covering content being covered in the course of greatest difficulty for the students. Additionally each student completed two Maintenance Probe Tests to determine whether they remembered the strategy steps two weeks after instruction ended. Student performance related to baseline, instruction, generalization, and maintenance are displayed in Figure 1 and discussed in greater detail related to the research questions in this study.

Research Questions

Test-Taking Performance

Does instruction on the Test-Taking Strategy provided to high functioning students with ASD result in mastery performance on Controlled Practice Probe Tests specifically aligned to the strategy steps?
Figure 1. The percentage of strategic responses performed by Participants 1, 2, 3, and 4.

Key: (•) Probe Tests; (▲) Controlled Practice Probe Tests; (♦) Advanced Practice Test; (x) Post Probe Tests; (■) Generalization Tests; (+) Maintenance Probe Tests.
As previously discussed, a multiple probe design was used to assess the effects of test-taking strategy instruction on high functioning students with ASD. All four participants received baseline Probe Tests. The baseline performance of Participant 1 was 49%, 47%, and 47%. Based on this stability, instruction began for Participant 1 and parallel performance probes continued. Participant 1 received 49% on the first Controlled Practice Probe Test. He received 88% and 92% on the second and third Controlled Practice Probe Tests, respectively. Thus, he reached the mastery criterion of 90% on the third Controlled Practice Probe Test. Participant 1’s performance on these Controlled Practice Probe Tests reflected an ascending trend indicating continuous improvement when instruction was initiated. Visual analysis of Participant 1’s performance data reflects a steep slope indicating improvement in a short amount of time. The level of Participant 1’s performance did not substantially change immediately. The last data point in baseline was 47% and the first instructional data point was 49%. There was, however, a dramatic change in level between the first and second instructional data point (i.e., 49% and 88% respectively).

The baseline performance of Participant 2 was 57%, 49%, and 53%. Based on this stability, instruction began for Participant 2 and parallel performance probes continued. Participant 2 received 86% and 89% on the first and second Controlled Practice Tests. He received 96% and thus reached mastery level on the third the Controlled Practice Test. Participant 2’s performance on these Controlled Practice Probe Tests reflected an ascending trend indicating continuous improvement once instruction was initiated. Visual analysis of Participant 2’s performance data reflects a moderate slope indicating gradual improvement over time. The level of Participant 2’s performance changed
immediately when the instruction began. The last data point in baseline was 53% and the first instructional data point was 86%.

Based on Participant 1 and 2 achieving the criterion for mastery, an additional baseline probe was administered to the remaining two participants. The baseline performance of Participant 3 was 35%, 44%, 40%, and 47%. Based on this stability, instruction began for Participant 3 and parallel performance probes continued. Participant 3 received 84% and 90% on the first and second Controlled Practice Tests. Thus, he reached mastery level on the second Controlled Practice Probe Test. Participant 3’s performance on these Controlled Practice Probe Tests reflected an ascending trend indicating improvement when instruction was initiated. Visual analysis of Participant 3’s performance data reflects a moderate slope indicating gradual improvement from the first to second instructional probe. The level of Participant 3’s performance changed immediately when the instruction began. The last data point in baseline was 47% and the first instructional data point was 84%.

Based on Participant 3 achieving mastery criterion on the Controlled Practice Probe Test, additional baseline probes were administered to Participant 4. The baseline performance of Participant 4 was 36%, 39%, 44%, 51%, 53%, and 42%. Based on this stability, instruction began for Participant 4 and parallel performance probes continued. Participant 4 received 90% on the first Controlled Practice Probe Test. Because mastery was achieved on the first Controlled Practice Probe Test, there was no opportunity to visually inspect the trend or slope of Controlled Practice Probe Tests. The level of Participant 4’s performance changed immediately when the instruction began. The last data point in baseline was 42% and the first instructional data point was 90%.
Thus, all four participants were able to reach mastery performance on Controlled Practice Probe Tests that were specifically aligned to the strategy steps taught. The time required to obtain mastery level ranged from one to three instructional sessions for the participants in this study. See Table 3 for a summary of these data.

Table 3

*Participants' Baseline and Controlled Practice Probe Tests*

<table>
<thead>
<tr>
<th>Participants</th>
<th>Baseline Probe Test Scores</th>
<th>Controlled Practice Probe Test Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant 1</td>
<td>49%, 47%, 47%</td>
<td>49%, 88%, 92%</td>
</tr>
<tr>
<td>Participant 2</td>
<td>57%, 49%, 53%</td>
<td>86%, 89%, 96%</td>
</tr>
<tr>
<td>Participant 3</td>
<td>35%, 44%, 40%, 47%</td>
<td>84%, 90%</td>
</tr>
<tr>
<td>Participant 4</td>
<td>36%, 39%, 44%, 51%, 53%, 42%</td>
<td>90%</td>
</tr>
</tbody>
</table>

The Post Probe Test administered at the conclusion of the instruction phase represented an additional opportunity to view student performance on a probe test that was parallel to the Controlled Practice Probe Tests (i.e., aligned with the specific strategy steps that were taught). Participants 1, 2, 3, and 4 received 90%, 99%, 93%, and 94%, respectively. All participants reached the mastery criterion of 90% on the first Posttest Probe.

Pretest percentages using the mean of baseline data and Posttest percentages using the Post Probe Tests were compared as additional evidence related to the strategy’s effectiveness with these participants. During baseline, Participant 1’s mean score
was 47.7%. On the Posttest Probe, he received 90% and thus increased his score by 42.3%. During baseline, Participant 2’s mean score was 53%. On the Posttest Probe, he received 99% and thus increased his score by 46%. During baseline, Participant 3’s mean score was 41.5%. On the Posttest Probe, he received 93% and thus increased his score by 51.5%. During baseline Participant 4’s mean score was 44.2%. On the Posttest Probe, he received 94% and thus increased his score by 49.8%. Thus, the percentage of improvement on tests that aligned closely to the strategy steps ranged from 42.3% to 51.5% for the participants in this study. See Table 4.

Table 4

Participants' Pre- and Posttest Measures

<table>
<thead>
<tr>
<th>Participants</th>
<th>Mean Scores on Baseline Probes</th>
<th>Post Probe Test Scores</th>
<th>Percent Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant 1</td>
<td>47.7%</td>
<td>90%</td>
<td>42.3%</td>
</tr>
<tr>
<td>Participant 2</td>
<td>53%</td>
<td>99%</td>
<td>46%</td>
</tr>
<tr>
<td>Participant 3</td>
<td>41.5%</td>
<td>93%</td>
<td>51.5%</td>
</tr>
<tr>
<td>Participant 4</td>
<td>44.2%</td>
<td>94%</td>
<td>49.8%</td>
</tr>
</tbody>
</table>

Does instruction on the Test-Taking Strategy provided to high functioning students with ASD result in mastery performance on classroom-type tests that do not specifically align with the strategy steps?
During the Advanced Practice stage of the test-taking instruction, all participants were assessed using a previously taken classroom test that did not specifically align with the strategy steps (i.e., Advanced Practice Test). The participants retook the test and applied the newly learned strategy steps. Participants 1, 2, 3, and 4 received 93%, 100%, 86%, and 86%, respectively. All participants reached the mastery criterion of 85% on the first Advanced Practice Test.

During the generalization phase of data collection, two additional classroom-type tests were administered to further assess students' abilities to apply the Test Taking Strategy to new classroom-type tests that did not closely align with the strategy steps. The researcher-constructed generalization tests were developed from the participants' textbooks and class materials. These tests addressed the subject areas in which the participants had academic difficulty.

Participant 1 took U.S. government and chemistry tests. He received 93% on the U.S. government test and 100% on the chemistry test. Participant 2 took English and computer science tests. He received 100% on the English test and 93% on the computer science test. Participant 3 took history and mathematics. He received 86% on the history test and 86% on the mathematics. Participant 4 took history and science tests. He received 93% on the history test and 100% on the science test. All participants reached the mastery criterion of 85% on the two consecutive Generalization Tests. Thus, all four participants demonstrated mastery performance on classroom type tests that did not specifically align with the strategy steps. See Table 5 for a summary of Advanced Practice and Generalization Test Performance.
Table 5

Participants’ Advanced Practice and Generalization Scores

<table>
<thead>
<tr>
<th>Participants</th>
<th>Advanced Practice Scores</th>
<th>Generalization Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant 1</td>
<td>93%</td>
<td>93%, 100%</td>
</tr>
<tr>
<td>Participant 2</td>
<td>100%</td>
<td>100%, 93%</td>
</tr>
<tr>
<td>Participant 3</td>
<td>86%</td>
<td>86%, 86%</td>
</tr>
<tr>
<td>Participant 4</td>
<td>86%</td>
<td>93%, 100%</td>
</tr>
</tbody>
</table>

Do high functioning students with ASD retain their test taking skills two weeks after completion of the instruction?

All participants took two Maintenance Probe Tests two weeks after instruction ended to determine whether they maintained the use of the strategy steps. Participant 1 scored 100% and 100% on the first and second Maintenance Probe Tests. Participant 2 scored 93% and 100%. Participant 3 scored 90% and 93% and Participant 4 scored 79% and 97%. Thus, Participants 1, 2, and 3 maintained the test-taking skills at mastery levels on both Maintenance Probe Tests; whereas Participant 3 did not maintain the test-taking skills at mastery level on the first Maintenance Probe Test, but did achieve mastery level on the second. See Table 6.

Participant Satisfaction

To what extent, are students with ASD satisfied with the Test-Taking Strategy?

Participant satisfaction was measured using the Participant Satisfaction Questionnaire that included a 3-point rating scale (i.e., “Not Satisfied”, “Satisfied”, “Very Satisfied.”)
Table 6

Participants' Maintenance Probe Test Scores

<table>
<thead>
<tr>
<th>Participants</th>
<th>Maintenance Probe Test # 1</th>
<th>Maintenance Probe Test # 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant 1</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Participant 2</td>
<td>93%</td>
<td>100%</td>
</tr>
<tr>
<td>Participant 3</td>
<td>90%</td>
<td>93%</td>
</tr>
<tr>
<td>Participant 4</td>
<td>79%</td>
<td>97%</td>
</tr>
</tbody>
</table>

On Question 1, participants rated satisfaction level related to whether the Test-Taking Strategy was fun and interesting; 75% (3/4) of the participants' responses on this question indicated that they were “Very Satisfied” and 25% (1/4) indicated “Satisfied.” On Question 2, participants rated satisfaction level related to their active participation in learning the strategy; 100% (4/4) of the participants' responses on this question indicated that they were “Very Satisfied.” On Question 3, participants rated satisfaction level related to their knowledge and ability to use the Test-Taking Strategy; 75% (3/4) of participants’ responses on this question indicated they were “Very Satisfied with their knowledge and could use the Test-Taking Strategy and 25% (1/4) indicated “Satisfied.” On Question 4, participants rated satisfaction level related to their ability to handle difficult tests: 50% (2/4) of participants indicated they were “Very Satisfied” and 50% (2/4) indicated they were “Satisfied.” On Question 5, participants rated satisfaction level related to whether their attitude toward tests improved; 75% (3/4) of the participants’ responses on this question indicated they were “Very Satisfied and 25% (1/4) indicated
"Not Satisfied." This student stated that he already had a great attitude toward taking tests. On Question 6, participants rated satisfaction level related to whether they felt more relaxed while taking tests: 75% (3/4) of participants’ responses on this question indicated they were “Very Satisfied” and 25% (1/4) indicated they were “Satisfied.” Question 7 (i.e., yes-no question) asked whether they would use the Test-Taking Strategy in future; 100% (4/4) of the participants answered yes. Question 8 (i.e., yes-no question) asked whether they would recommend the Test-Taking Strategy to other students; 75% (3/4) of the participants answered yes and 25% (1/4) answered not unless other students ask. See Table 7. When asked what they liked the most about the Test-Taking Strategy Instruction, comments included: “I liked the answer or abandon the question”, “I liked to use absolutants”, “getting to be the teacher part” (teaching the Test-Taking Strategy to research assistant as role play), and “the free food.”

**Parent Satisfaction**

To what extent, are parents of students with ASD satisfied with the result of the Test-Taking Strategy?

A questionnaire was used to measure the parents’ satisfaction with their adolescents’ participation in the instruction. Seven questions were rated on a 5-point scale to indicate how satisfied the parents were with the Test-Taking Strategy (i.e., Extremely Satisfied, Satisfied, Neither Satisfied nor Dissatisfied, Dissatisfied, Extremely Dissatisfied).

On Question 1, parents rated satisfaction level related to whether their adolescent knows and can use the Test-Taking Strategy; 75% (3/4) of the parents’ responses on this question indicated they were “Extremely Satisfied” and 25% (1/4) indicated “Satisfied.”

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Table 7

*Participant Satisfaction Data*

<table>
<thead>
<tr>
<th>Questionnaire Items</th>
<th>Very Satisfied</th>
<th>Satisfied</th>
<th>Not Satisfied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question 1</td>
<td>75% (3/4)</td>
<td>25% (1/4)</td>
<td></td>
</tr>
<tr>
<td>Question 2</td>
<td>100% (4/4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 3</td>
<td>75% (3/4)</td>
<td>25% (1/4)</td>
<td></td>
</tr>
<tr>
<td>Question 4</td>
<td>50% (2/4)</td>
<td>50% (2/4)</td>
<td></td>
</tr>
<tr>
<td>Question 5</td>
<td>75% (3/4)</td>
<td>25% (1/4)</td>
<td></td>
</tr>
<tr>
<td>Question 6</td>
<td>75% (3/4)</td>
<td>25% (1/4)</td>
<td></td>
</tr>
<tr>
<td>Question 7</td>
<td>100% (3/4) (yes)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 8</td>
<td>75% (3/4) (yes)</td>
<td>25% (1/4) (no)</td>
<td></td>
</tr>
</tbody>
</table>

On Question 2, parents rated satisfaction level related to whether learning the Test-Taking Strategy was fun and interesting for their adolescent; 75% (3/4) of the parents’ responses on this question indicated they were “Extremely Satisfied” and 25% (1/4) indicated “Satisfied.” On Question 3, parents rated satisfaction level related to the active participation of their adolescent; 100% (4/4) of the parents’ responses on this question indicated they were “Extremely Satisfied.” On Question 4, parents rated satisfaction level related to whether the Test-Taking Strategy helped their adolescent take tests; 75% (3/4) of the parents’ responses on this question indicated they were “Extremely Satisfied” and 25% (1/4) indicated “Satisfied.” On Question 5, parents rated satisfaction level related to whether the Test-Taking Strategy helped their adolescent have a better
attitude towards taking tests; 75% (3/4) of the parents' responses on this question indicated they were “Extremely Satisfied” and 25% (1/4) indicated “Satisfied.”

See table 8.

The parents were asked whether they would encourage their adolescent to use the Test-Taking Strategy in the future and 100% of the parents responded yes. The parents were asked whether they would recommend the Test-Taking Strategy to other parents of students with ASD and 100% of the parents responded yes. The parents also stated that the Test-Taking Strategy increased students' confidence level, and it was a very useful and great tool.

Table 8

*Parent Satisfaction Data*

<table>
<thead>
<tr>
<th>Questionnaire Item</th>
<th>Extremely Satisfied</th>
<th>Satisfied nor</th>
<th>Dissatisfied</th>
<th>Extremely Dissatisfied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question 1</td>
<td>75% (3/4)</td>
<td>25% (1/4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 2</td>
<td>75% (3/4)</td>
<td>25% (1/4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 3</td>
<td>100% (4/4)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 4</td>
<td>75% (3/4)</td>
<td>25% (1/4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 5</td>
<td>75% (3/4)</td>
<td>25% (1/4)</td>
<td></td>
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</tbody>
</table>
Comments about the test-taking strategy instruction included: “This has been a very wonderful experience for my son and he seems less anxious when taking tests. And he is able to focus more on the tests” “My son still refuse to change the order of sections but he is less anxious when he takes tests than before.” “It is very useful because he is able to follow directions and less confused when he takes tests.” “Reinforcements were very motivating for students! My son loved coming.”

Interscorer Agreement

Interscorer agreement was assessed by having a research assistant and the researcher independently score a random sample of 10 Probe Tests and three Practice Tests for a total of approximately 26.5% (13 tests) of all Probe Tests (49 tests) given during the study. The assistant and the instructor compared the tests item by item using the Test-Taking Score Sheets. Agreement was reached if both observers marked a response as being present or if both observers marked a response as not present. The percentage of agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. The observers agreed on 744 items out of 762 opportunities for an overall total percentage agreement of 97.6%. On individual tests, the percentage of agreement ranged from 94% to 100%.

Fidelity of Treatment

Fidelity of treatment checks were performed by a research assistant and an observer using a checklist to ensure that the instructor followed the test-taking strategy instruction procedures. The two observers completed the checklist individually during 26.2% of the
instructional lessons. Interobserver agreement was determined by dividing agreements by agreements plus disagreements and multiplying by 100. When both observers recorded the same mark for a checklist item, an agreement occurred. The observers agreed on all five items during each session representing 100% agreement related to fidelity of treatment.

Social Validity

Social validity refers to the degree that effects of behavior change impact favorably upon consumers (Carr et al, 1999). For social validity assessment in this study, the participants (direct) and parents (indirect) completed written questionnaires upon completion of the intervention. Treatment goals were assessed before intervention, while procedures and outcomes related to the treatment goals were assessed after intervention. The researcher asked participants’ parents whether their sons needed instruction related to test-taking on the participant screening questionnaire and 100% of the parents responded yes.

Summary of Results

Visual analysis of graphed participant performance was used to determine the effects of test-taking instruction provided to high functioning students with ASD. Specifically, the trend, slope, and level of participant’s performance data were analyzed. All four participants in this study achieved a stable baseline prior to the initiation of the instructional intervention (i.e., test-taking strategy instruction). Participant 1’s performance demonstrated a substantial treatment effect immediately following the first
instructional Probe Test. Participant’s 2, 3, and 4 demonstrated a substantial treatment effect immediately following the last baseline Probe Test. Mastery level performance on Controlled Practice Probe Tests, that aligned closely with the strategy steps, occurred quickly for all four participants (i.e., 1-3 trials). Mastery level performance on classroom-type probes (i.e., Advanced Practice Test and Generalization Tests) that did not specifically align with the strategy steps was demonstrated with only one Advanced Practice trial. Mastery level performance on both Generalization trials occurred for all four participants. Mastery levels for maintenance two weeks after instruction ended was demonstrated on the first trial for Participants 1, 2, and 3 and also was demonstrated for these three participants on the second trial. Participant 4 demonstrated mastery level for maintenance on the second trial. Thus, all four participants demonstrated the ability to learn the Test-Taking Strategy, apply the strategy to classroom-type tests, and maintain knowledge of the strategy two weeks after instruction ended (within one to two maintenance measures).

In addition to mastering the Test-Taking Strategy, participant satisfaction related to the test-taking instruction was high. Participants were satisfied with their ability to handle difficult tests because of learning to use the Test-Taking Strategy. They indicated they would use the Test-Taking Strategy in the future, as well as recommend it to other students. Similarly, parent satisfaction related to the results of the test-taking instruction was high. Parents found that the Test-Taking Strategy helped their adolescent take tests and have a better attitude towards taking tests. Parents indicated they would encourage their adolescent to use the strategy and also recommend it to other parents of students with ASD.
CHAPTER 5

DISCUSSION

The purpose of this study was to investigate the effects of test-taking strategy instruction on high-functioning adolescents with autism spectrum disorder. In this chapter, findings related to the five research questions are discussed, conclusions are stated, practical implications are shared, and recommendations for future research are provided.

Discussion of Findings

The five research questions that were answered in this study are presented below. Following each question is a review of the results and related discussion.

Test-Taking Performance

Does instruction on the Test-Taking Strategy provided to high functioning students with ASD result in mastery performance on Controlled Practice Tests specifically aligned to the strategy steps?

A multiple probe design was used to assess the effects of test-taking strategy instruction on high functioning students with ASD. Analysis of the data reveal that all four participants reached mastery level performance (i.e., at least 90%) on the Controlled Practice Probe Tests (probes that aligned with the strategy steps taught). The number of trials required to reach mastery level, however, differed across the participants.
Participants 1 and 2 required three trials to reach mastery, Participant 3 required two trials, and Participant 4 required only one trial. Another difference noted between the four participants was related to the immediacy of the intervention effect. Participants 2, 3, and 4 displayed an immediate and substantial intervention effect when instruction began as evidenced by the change in performance level from baseline to instruction. However, the level of Participant 1’s performance did not change immediately. Several plausible explanations related to noted difference among participant performance exist. These explanations relate to the individual characteristics of each participant and are discussed in the following paragraphs.

Participant 1, who required three controlled practice trials to reach mastery and who did not display an immediate treatment effect, had the most difficulty adapting to the new method for taking tests. The aspect of the strategy that he was most comfortable with was avoiding absolute words (e.g., never, always, all, none, every). Students were taught to look for these words when they did not know answers to multiple choice questions and to avoid picking options that contained these words. They were also taught to guess “false” in a true-false question that they did not know the answer to if the statement contained absolute words. Participant 1 enjoyed this part of the strategy, but he was initially resistant to several of the other components to the strategy. For example, he did not abandon any item on the test. Each test contained a number of items that no one knows the answer to because the question content is fictitious. These questions are designed to help students learn the strategy step of abandoning unknown items and returning to those items after all known items are answered. Additionally, Participant 1 was very reluctant to use the strategy step that involved changing the order of the test.
sections. Participants were taught to change the order of completing the five test sections (i.e., multiple choice, essay, true-false, matching, fill in the blank). Specifically, participants were taught to complete the easiest section of the test first and the most difficult section last. They were to order the sections using the numbers 1 to 5 (easiest to most difficult). Participant 1’s initial resistance to using some of the critical steps in the strategy as well as his over-eagerness to use the guessing technique of avoiding absolutes resulted in an initial instruction score similar to baseline scores. Immediately following the first Controlled Practice Probe, the instructor provided feedback to Participant 1. As a part of the feedback, the instructor explained that the reason for moving on to other questions and turning back to abandoned items only after all other items have been attempted is to give him a chance to find additional information on the test. The instructor also emphasized that guessing techniques were to be used as the last resort. The instructor demonstrated again how to apply each step of Test-Taking Strategy to Controlled Practice Probe Test 1. Participant 1 seemed to accept this feedback and displayed substantial improvement on the second Controlled Practice Probe.

Participant 1’s initial resistance to particular steps of the strategy may have been the result of a common characteristic of many individuals with autism: ‘insistence on sameness’ or 'perseverative' behavior. It is not uncommon for children with autism to become overly insistent on routines; if one routine is changed, even slightly, the child may become upset and tantrum. For example, the child may insist on wearing the same clothes or going to school using the same route. It has also been noted that some students with ASD cannot leave their work until the page is completed or the writing is perfectly formed and may become distressed if anything (or anyone, including the teacher)
interferes with their assignment completion (Wire, 2005). One possible reason for ‘insistence on sameness’ may be the person’s inability to understand and cope with novel situations (Edelson, 2006). This unique characteristic may negatively affect the willingness of some individuals with autism to use some of the steps of the Test-Taking Strategy (e.g., changing order of sections and abandoning items for the moment).

Other common characteristics of students with ASD include problems with organization, work completion, and application (Donnelly, 2005). Initially, Participant 1 seemed somewhat overwhelmed with the need to apply multiple steps of the Test-Taking Strategy. The newness and complexity of applying multiple steps without teacher prompting may have influenced his performance on the first Controlled Practice Probe Test.

Participant 2 also required three controlled practice trials to reach mastery, but unlike Participant 1, he displayed an immediate intervention effect. Although Participant 2 displayed dramatic improvement in his test-taking skills when the instruction began, there were a few parts of the Test-Taking Strategy that prevented Participant 2 from reaching mastery on his first two controlled practice trials. The first was his hesitancy to underline words included in the test instructions. Participants were taught to read the test instructions and underline the part of the instructions that told them how to answer the questions (i.e., what and where to respond). Participant 2 stated that his classroom teachers told students not to scratch on tests because they needed to use the tests again for other students. The instructor discussed this matter with him and convinced him that practice tests taken in the after school program would not affect his school grades.

Similar to Participant 1, the other parts of the strategy that initially prevented
Participant 2 from reaching mastery involved changing the order of the test sections and abandoning unknown items and then returning to those items after completing the known items. Participant 2 did not want to change the order of the test sections and he did not want to abandon unknown questions. He did not want to change his normal routine for taking tests and was afraid that he would forget to come back to the abandoned questions and sections. After the instructor provided feedback on his initial controlled practice performance, he reluctantly abandoned unknown questions on the second Controlled Practice Probe, but he still did not change the order of the test sections until the third Controlled Practice Probe Test.

Participant 3, who took two trials to reach mastery and who displayed an immediate change in performance level between baseline and instruction, learned to apply the strategy steps quickly. It was, however, very interesting to note that he also had difficulty with changing the order of the test sections. He was afraid that he would forget to complete some of the sections if he did not begin at the top of the test and complete the sections in sequence. Feedback from the instructor regarding the reason for completing the easiest sections first did not change Participant 3’s behavior but because he did so well on the other strategy steps, he reached mastery on the second Controlled Practice Probe test.

Participant 4 reached mastery on the first Controlled Practice Probe Test. Thus, he outperformed the other three participants in terms of how long it took to reach mastery on tests that aligned closely to the strategy steps. He demonstrated substantial improvement from baseline to the first instructional probe. It is interesting to note, however, that Participant 4 engaged in more disruptive behavior than the other three
participants. He displayed abrupt conversations and changed topics suddenly. He also indicated he was not interested in learning the Test-Taking Strategy. These behaviors made instruction difficult and necessitated a slight modification in the instructional methodology. In an attempt to increase compliance and motivation, the instructor decided to let Participant 4 teach the steps of the Test-Taking Strategy to a research assistant. At first he hesitated to go along with this idea, but then he reviewed the steps and taught the research assistant for 30 minutes. After that he was very competent using the strategy steps.

It is interesting that providing the least interested and least compliant participant an opportunity to teach the strategy steps to someone else resulted in both improved behavior and quick mastery on the Controlled Practice Probe Test. These findings seem to concur with the strong literature base that supports the use of peer tutoring (DuPaul, Ervin, Hook & McGoey, 1998). In this case, the research assistant was not actually a peer, but she was someone other than the instructor and the participant did take on a tutor-type role.

This type of peer tutoring may be effective for students with ASD because they do not intuitively want to interact with others, particularly their peer group, but they instead prefer to be alone or interact with adults. Thus, they may have difficulty working with pairs or small groups. However a good choice of partners can have a significant affect on how students with ASD cope in school (Wire, 2005). Typically, peer tutoring involves having a skilled learner tutor an unskilled learner (e.g., student with disabilities). However, in one study, researchers revealed that classwide peer tutoring, in which both students with autism and students without disabilities served as tutors, resulted in
improved reading skills and promoted peer interaction among students with and without disabilities (Kamps, Barbetta, Leonard, & Delquadri, 1994). Participant 4, in the current study, liked to talk and explore topics of interest. Teaching requires knowledge and responsibility. Participant 4 seemed to take the responsibility of teaching the research assistant seriously. It is possible that the role of teacher made him feel proud of himself as a tutor as opposed to being the tutee, thereby affecting his performance positively.

The Post Probe test administered at the conclusion of the instruction phase represented an additional opportunity to view student performance on a probe test that was parallel to the Controlled Practice Probe Tests (i.e., aligned with the specific strategy steps that were taught). Participants 1, 2, 3, and 4 reached the mastery criterion (i.e., 90%) on the first Posttest Probe. Although Participant 4 earned the second highest score of the four participants, he did not answer the essay question. The topic of the short essay on the first Posttest Probe was “My Three Favorite Recording Artists.” He did not write the essay and instead he said, “I am sorry but I do not have three favorite recording artists. I don’t have one favorite artist. I don’t even know any.” Participant 4 was only interested in reading science fiction related materials and he was not interested in other topics. The instructor may have obtained a different response from Participant 4 if she had him explore recording artists before taking the test, but she did not provide the opportunity for him to do so.

In summary, all four participants learned the strategy steps and learned how to apply the steps to probe tests that align closely with the strategy. All four participants demonstrated stable baselines prior to receiving instruction and three of the four demonstrated ascending trends during initial instruction on the Controlled Practice Probe.
Tests. The fourth participant did not have an opportunity to display ascending improvement on the Controlled Practice Probe Tests because he reached mastery on the first trial. Clearly, all four participants in this study benefited from test taking strategy instruction as evidenced by their performance on the Controlled Practice Probe Tests.

The findings and related conclusions in this study are similar to several researchers who found that test-taking strategies benefited students with and without disabilities. Beidel, Turner, and Taylor-Ferreira (1996) found that students had decreased anxiety after learning the test-taking strategies. This is consistent with the finding of Vattanapath and Jiprayoon (1999), who found that students’ attitudes toward test-taking strategies were positive. When students have positive attitudes toward the strategy, it is likely that they feel more comfortable with taking tests and thus they may feel less anxiety. All of these factors may explain the improved performance experienced by the participants in this study.

The findings in the current study are also consistent with the researchers that found that test-taking strategies can benefit students with various disabilities, such as learning disabilities, emotional and behavioral disorders and high incidence disabilities or students with poor comprehension abilities. Ritter and Idol-Maestas (1986) found poor comprehenders and participants whose comprehension was at least average had better test performance in general education settings after being taught test-taking skills.

Does instruction on the Test-Taking Strategy provided to high functioning students with ASD result in mastery performance on classroom-type tests that do not specifically align with the strategy steps?
During the Advanced Practice Stage of the test-taking instruction, all participants were assessed using a previously taken classroom test that did not specifically align with the strategy steps (i.e., Advanced Practice Test). The participants retook the test and applied the newly learned strategy steps. Participants 1, 2, 3, and 4 reached the mastery criterion (i.e., 85%) on the first Advanced Practice Test. It is important to note, that student performance on Advanced Practice Tests was determined based on ability to apply the test-taking strategy steps to real classroom type tests that do not specifically align with all of the strategy steps, not on their content knowledge. Thus, the purpose of Advanced Practice was to ensure that participants can apply the strategy on different types of tests than those used in the initial instructional sessions.

During the generalization phase of data collection, two additional classroom-type tests were administered to further assess students’ abilities to apply the test taking strategy to new classroom-type tests that did not closely align with the strategy steps. The researcher-constructed generalization tests were developed from the participants’ textbooks and class materials. These tests addressed the subject areas in which the participants had academic difficulty.

Participant 1 took U.S. government and chemistry tests. Participant 2 took English and computer science tests. Participant 3 took history and mathematics. Participant 4 took history and science tests. All participants reached the mastery criterion of 85% on the two consecutive Generalization Tests. Thus, all four participants demonstrated mastery performance on classroom-type tests that did not specifically align with the strategy steps. The construction of the English, history, and U.S. government tests was tightly controlled using identical formats for all of the Probe Tests (i.e., multiple choice,
essay, true-false, matching, fill in the blank). In contrast, the mathematics, chemistry, and computer science tests did provide multiple choices questions but did not provide opportunities to avoid absolute words (i.e., all, always, none and never) taught in the strategy because avoiding absolute words was not appropriate for these subjects. Again, as with the Advanced Practice Probes, the instructor measured the participants’ abilities to apply the test-taking strategy steps rather than the specific subject matter content.

Do high functioning students with ASD retain their test taking skills two weeks after completion of the instruction?

All participants took two Maintenance Probe Tests two weeks after instruction ended to determine whether they maintained knowledge and use of the strategy steps.
Participants 1, 2, and 3 achieved mastery (i.e., at least 90%) on both Maintenance Probe Tests demonstrating that they remembered the strategy steps and how to use the steps appropriately. Participant 4 failed to reach mastery level on the first Maintenance Probe Tests, but did achieve mastery level on the second. Participant 4 told the instructor that he did not review or practice the steps of the Test-Taking Strategy after finishing the instruction. Thus, he forgot some steps of the strategy and how to use the strategy on the first Maintenance Probe Test. For example, he did not temporarily abandon unknown items on Maintenance Test 1. For the essay question, participants were required to make a list of the information to be included in the essay question but he did not remember to make a list. He also did not put his name on the second page of the test. Therefore, the instructor told him to review the steps of the Test-Taking Strategy and that using the strategy could improve his grades at school. After taking the first Maintenance Probe
Test, he reviewed the steps of Test-Taking Strategy at home and he reached mastery on the second Maintenance test.

In conclusion, all four participants demonstrated the ability to learn the Test-Taking Strategy, apply the strategy to classroom-type tests, and maintain knowledge of the strategy two weeks after instruction ended. These findings of generalization are similar to the findings of Ritter and Idol-Maestas (1986) and the findings of Akmanoglu & Batu (2004). Ritter and Idol-Maestas (1986) found that students could use a test taking strategy outside the training setting (i.e., general education settings). This was used as one of the measures of the test-taking strategy’s effectiveness. Akmanoglu and Batu (2004) found that participants were able to generalize the skills they learned across another set of materials (e.g., calendar pages) and they also maintained the skills one, two, and four weeks after completing training.

**Participant Satisfaction**

To what extent, are students with ASD satisfied with the Test-Taking Strategy? Participant satisfaction was measured using the Participant Satisfaction questionnaire that included a 3-point rating scale (i.e., “Not Satisfied”, “Satisfied”, “Very Satisfied.”) The satisfaction level related to the test-taking strategy instruction was very high. All four participants rated all eight items on the Participant Satisfaction Questionnaire as either “Very Satisfied” or “Satisfied”. There were no “Not Satisfied” responses.

Question 2 received a unanimous “Very Satisfied” from the four participants. This represented the highest satisfaction level among the eight items. On Question 2, participants were asked to rate their satisfaction level related to their active participation in learning the strategy. Clearly, the participants were happy with their participation.
This high level of satisfaction may have emerged due to the instructor’s preparing the participants before the study. In the introductory meeting, the instructor explained that each participant’s score would not be compared with other participants’ scores. The instructor also explained that she only wanted to see how much they could improve after learning the strategy. Participants knew that practice tests did not affect their grades so they may have felt more comfortable participating in this instruction than they would have if their strategy test scores were going to affect their grades in school. Furthermore, the instructor, the research assistant, and the observer clearly explained the rationales for learning the strategy. Also, the participants received positive feedback and were encouraged to use the strategy. This may have positively influenced their feelings about participating in the strategy instruction.

Question 4 received a split rating between “Very Satisfied” and “Satisfied” among the four participants (i.e., two were very satisfied and two were satisfied). This represented the lowest satisfaction level among the eight items. On Question 4, participants rated satisfaction level related to their ability to handle difficult tests. The satisfaction level for this question may have been a little lower because of the difficulty the participants had experienced in particular subject areas. During the test-taking instruction students were told that the Test-Taking Strategy can help when taking tests but that they still needed to study. They were told that the strategy alone does not ensure better grades. They were told that the combination of studying and using the strategy would help them earn better grades. Perhaps it takes more time for students to gain confidence particularly in challenging subject areas. These students may also benefit
from learning specific study strategies (e.g., Multipass Strategy or Paired-Associates Strategy) to increase their confidence related to handling difficult tests.

On the remaining six items on the Participant Satisfaction Questionnaire, three participants rated their satisfaction level as "Very Satisfied" and one participant rated the satisfaction level as "Satisfied". On Question 1, participants rated satisfaction level related to whether the Test-Taking Strategy was fun and interesting. On Question 3, participants rated satisfaction level related to their knowledge and ability to use the Test-Taking Strategy. On Question 5, participants rated satisfaction level related to whether their attitude toward tests improved. On Question 6, participants rated satisfaction level related to whether they felt more relaxed while taking tests. Question 7 asked whether they would use the Test-Taking Strategy in future and all four participants responded yes. Question 8 asked whether they would recommend the Test-Taking Strategy to other students. Participant 2 responded not unless other students ask. Additionally, when asked what they liked the most about the Test-Taking Strategy Instruction. Participant 1 commented "I liked the answer or abandon the question"; Participant 2 "the free food."; Participant 3; "I liked to use absolutants"; Participant 4 "getting to be the teacher part".

These findings are consistent with the research of Vattanapath and Jiprayoon (1999), who found that students' attitudes toward test-taking strategies were positive. When students have positive attitudes toward the strategy, it is likely that they feel more comfortable with test-taking and thus they may feel less anxiety. In this study, when participants came back to take their first Maintenance Probe Test, they mentioned that they used some steps of the Test-Taking Strategy on their final exams at school and they had been more confident than before.
Parent Satisfaction

To what extent, are parents of students with ASD satisfied with the result of the Test-Taking Strategy?

A questionnaire was used to measure the parents' satisfaction with their adolescents' participation in the instruction. Five questions were rated on a 5-point scale to indicate how satisfied the parents were with the Test-Taking Strategy (i.e., Extremely Satisfied, Satisfied, Neither Satisfied nor Dissatisfied, Dissatisfied, Extremely Dissatisfied). In addition to rating satisfaction on five items, parents were also asked whether they would encourage their son to use the Test Taking strategy in the future and whether they would recommend the Test Taking Strategy to other parents of children with autism.

There was a high level of satisfaction among the parents of the study participants. All four parents rated all five items on the Participant Satisfaction Questionnaire as either “Extremely Satisfied” or “Satisfied”. There were no “Neither Satisfied nor Dissatisfied”, “Dissatisfied”, or “Extremely Dissatisfied” responses.

Question 3 received a unanimous “Extremely Satisfied” rating from the four parents. This represented the highest satisfaction level among the five questionnaire items. On Question 3, parents rated satisfaction level related to the active participation of their adolescent in learning the test-taking strategy. This may be because all participants could communicate with the instructor, the research assistant, and the observer with ease. The participants expressed their needs and feelings freely and the instructor responded to their needs and feelings in a positive manner. The low student-to-teacher ratio resulted in many opportunities to engage in the instructional activities (e.g., demonstration,
presentation, discussion, and making cue cards) throughout this study. The parents were aware of the amount of attention their sons could receive in this type of learning environment and were pleased about this.

On the remaining two items on the Parent Satisfaction Questionnaire, three parents rated their satisfaction level as “Very Satisfied” and one participant rated the satisfaction level as “Satisfied”. On Question 4, parents rated satisfaction level related to whether the Test-Taking Strategy helped their adolescent take tests. On Question 5, parents rated satisfaction level related to whether the Test-Taking Strategy helped their adolescent have a better attitude towards taking tests. The findings in the current study concur with those of Webb, Miller, Pierce, Strawser, and Jones (2004) who found that parents’ of high-functioning adolescents with autism spectrum disorder displayed high levels of satisfaction with social skill strategy instruction. While the current study differed from the Webb et al. study in that it involved an academic learning strategy instead of a social skills strategy, both studies revealed that parents of high functioning students with autism were satisfied with benefits from strategy instruction.

Of two additional yes-no questions, on Question 6, parents in the current study were asked whether they would encourage their adolescent to use the Test-Taking Strategy in the future and all of the parents responded yes. On Question 7, the parents were asked whether they would recommend the Test-Taking Strategy to other parents of students with ASD and all of the parents responded yes. Additionally, parents wrote comments about the Test-Taking Instruction. The parent of Participant 1 stated “This has been a very wonderful experience for my son and he seems less anxious when taking tests. And he is able to focus more on the tests” The parent of participant 2 stated “Reinforcements
were very motivating for students! My son loved coming.” The parent of Participant 3 mentioned “My son still refuses to change the order of sections but he is less anxious when he takes tests than before.” The parent of Participant 4 mentioned “It is very useful because he is able to follow directions and less confused when he takes tests.”

Overall, the satisfaction levels were high. Successful student performance during the strategy instruction probably played a significant part in the high satisfaction levels. Also it is likely that the structured nature of the strategy contributed to the students’ success.

Autism is commonly observed as a co-occurrence with Attention Deficit Disorder (ADD) or Attention Deficit- Hyperactive Disorder (ADHD) (Eaves, Ho, & Eaves, 1994; Schatz, Weimer, & Trauner, 2002). Students with ADD/ADHD and autism may have difficulty beginning tasks because the directions are not clear. Other students may fully understand the directions but forget to follow all of them. Others may have difficulty in making transitions and, as a result, get stuck in the space where one task ends and another begins (Fowler, 2002). These characteristics negatively affect students in academic areas so supplemental educational interventions become necessary. Providing structure through learning strategy instruction may ultimately help students become more organized and structured themselves. The test-taking strategy instruction provided systematic and concrete instructional steps that typically are beneficial for students with ASD. Providing structure for these individuals and helping children learn structure for themselves are at the core of successful interventions (Shapiro, DuPaul & Bradley-Klug, 1998). The Test-Taking Strategy provides systematic and concrete instructional steps that typically are beneficial for students with ASD.
Conclusions and Related Discussion

Based on the results of this study, several conclusions may be drawn. First, high functioning students with autism can learn the Test-Taking Strategy in approximately 14 hours of instructional time. Specifically, they can learn the steps of the strategy and successfully apply those steps to both tests that align closely with the strategy steps and tests that do not align carefully with the strategy steps. Thus, students can learn to use the strategy in a flexible manner and successfully generalize the strategy to different types of tests.

The second conclusion that emerged from this research is that some high functioning students with autism who master the Test Taking Strategy will maintain mastery level performance two weeks after instruction has ended. Other students, however, may need minimal review to maintain mastery level performance two weeks after instruction.

The third conclusion that emerged from this research is that the Test Taking Strategy can be taught effectively in an after-school program pending parent willingness to bring their child on a regular, consistent basis. The students were able to attend to instruction even after a day at school. The students did, however, receive a snack prior to the initiation of instruction. This seemed to serve as a nice transition from school to the after-school program.

Finally, the results from this study further indicate that consumer satisfaction was high resulting in a positive experience for the participants and their parents. Thus, it may be concluded that the Test Taking Strategy is a positive instructional intervention for high-functioning students with autism.

The findings and related conclusions in this study replicate and extend the findings of
Hughes and Schumaker (1991) and the findings of Hughes, Deshler, Ruhl, and Schumaker (1993). Hughes and Schumaker found that adolescents with learning disabilities could master the Test-Taking Strategy and Hughes, Deshler, Ruhl, and Schumaker (1993) found that adolescents with emotional and behavioral disorders could master the Test-Taking Strategy. The current study extends the findings of these two prior studies to high functioning students with autism. It is important to note, however, that the present study was conducted in an intensive 6-week after school program. Each instructional session lasted 50 minutes. The instructor and the research assistant reviewed the steps of the Test-Taking Strategy and the instructor gave individual performance feedback to each student individually before each instructional session began. It is unlikely that this level of instructional intensity occurred in the previous two studies because they were conducted within public school environments. In addition, because this research involved after school instruction, the instructor was not able to observe participants' performance using their actual general education classroom tests.

The findings in the current study also concur with those of Webb, Miller, Pierce, Strawser, and Jones (2004) who found that high-functioning adolescents with autism spectrum disorder can master strategies that include mnemonic devices and that are taught using systematic instructional procedures (i.e., describing, modeling, verbally rehearsing steps in the strategy, and providing varied levels of practice). The current study differed from the Webb et al. study in that it involved an academic learning strategy instead of a social skills strategy. Yet both studies revealed that high functioning students with autism benefited from strategy instruction.
Practical Implications

Several practical implications emerged from this research related to teaching the Test Taking Strategy to high-functioning students with autism. First, because of the difficulty that many students with autism have related to change in routines, it may be beneficial for instructors of this strategy to provide more initial instruction related to the benefits associated with reordering the sections of a test and temporarily abandoning unknown questions. It may also be helpful to supplement the strategy lessons with practice specifically related to these two strategy steps. Increased emphasis on this part of the strategy may decrease student resistance to using these steps.

A second implication derived from the results of this study involves the potential benefit of giving students with autism an opportunity to teach the strategy steps to someone else. In addition to decreasing inappropriate student behavior, this has the potential to increase student learning of the steps. Teaching the steps to someone else requires that the student understand the steps him- or herself.

A third implication derived from the results of this study involves the potential benefit of parental involvement. Parent involvement in the education process is considered important for students' success in school. During this study, the instructor discussed various issues with the participants' parents (e.g., behavior, students' progress chart). The instructor provided positive comments about the students which made the parents proud of their child. The instructor also offered support to the parents by listening to them talk about their sons. The instructor benefited from this parental involvement and gained insight about the students, their parents and their home environment.
Recommendations for Future Research

This study represents an initial contribution to literature involving the use of the Test-Taking Strategy with high-functioning adolescents with autism spectrum disorder. Reflection on the procedures used in this study, as well as the results obtained, led to the following recommendations for future study.

1. Future research related to teaching the Test Taking Strategy to students with autism should be conducted to evaluate the effectiveness of using the strategy on tests given in general education classrooms. Such research should involve collaborative efforts between the special educator and the general education teacher.

2. Future research should be conducted to explore the long-term (e.g., one month, six months) benefits of instruction in the Test-Taking Strategy.

3. Future research should be conducted to determine whether the Test-Taking Strategy can be taught in conjunction with study skills to increase the potential benefits for students.

4. Future research should be conducted to measure and compare test anxiety levels before and after learning the Test-Taking Strategy.

5. Future research should be conducted to determine whether students with autism who learn the Test-Taking Strategy in an after-school program improve their test scores and cumulative course grades in school.

6. Future research should be conducted to further investigate the effects of requiring students with ASD to change the order of completing test sections and abandoning unknown items. Methods for reducing the anxiety associated with these two steps
of the strategy should be explored.

7. Future research should be conducted to investigate the effects of test-taking strategy instruction on high-functioning adolescents' performance on standardized tests.

8. Future research should be conducted to investigate the effects of test-taking strategy instruction with a population that include females with ASD.
APPENDIX A

Participant Screening Questionnaire

To be considered for this study, your son or daughter must meet specific participation criteria. Therefore, I need to ask you seven questions.

1. Does your son/daughter have a current educational eligibility of Autism Spectrum Disorder (which includes Aspergers Syndrome)?
2. Is your son/daughter between the ages of 12-17 years old?
3. Has your son/daughter reached 4th grade reading level?
4. Does your son/daughter have a full-scale IQ score above a 100 standard score as measure within the previous three years?
5. Does your son/daughter have receptive and expressive language ability above a 70 standard score, as measured within the previous 3 years?
6. Does your son/daughter currently attend a regular education classroom for at least one period a day?
7. Are you willing to transport your son or daughter to and from the 50 minute sessions, three times per week for six weeks?
8. Does your son/daughter need instruction related to test-taking?
APPENDIX B

Test-Taking Score Sheet

Items Scored for Probe Tests:

I. General Items (e.g., PIRATES, Name, Order)

II. Instructions

III. Test Items (e.g., Answer/Abandon, Correct answer, Reduce)

IV. Essay List
APPENDIX C

Advanced Practice Score Sheet

Items Scored for Advanced Practice:

I. General Items (e.g., PIRATES, Name, Order)

II. Instruction

III. Test Items (e.g., Answers, Remembering, Reducing, Estimating)
APPENDIX D

Participant Satisfaction Questionnaire

Name: ______________________ Date: __________________

Please circle the number next to each question that best describes how satisfied you feel.

1 = Not satisfied
2 = Satisfied
3 = Very Satisfied

1. How satisfied are you that learning the Test-Taking Strategy was fun and interesting?
   Not Satisfied  | Satisfied  | Very Satisfied
   1             | 2          | 3

2. How satisfied are you that you actively participated in learning about the Test-Taking Strategy?
   1             | 2          | 3

3. How satisfied are you that you know and can use the Test-Taking Strategy?
   1             | 2          | 3

4. How satisfied are you that learning and using the Test-Taking Strategy helps you handle difficult tests?
   1             | 2          | 3

5. How satisfied are you that learning and using the Test-Taking Strategy helps you have a better attitude towards taking tests?
   1             | 2          | 3

6. How satisfied are you that learning the Test-Taking Strategy makes you more relaxed while taking test?
   1             | 2          | 3

7. Will you use the Test-Taking Strategy in future? Yes No
8. Will you recommend the Test-Taking Strategy to other students?  
   Yes  No

What did you like **most** about the Test-Taking Strategy Instruction?

Thank you
APPENDIX E

Parent Satisfaction Questionnaire

1. How satisfied are you that your adolescent knows and can use the Test-Taking Strategy?

2. How satisfied are you that learning the Test-Taking strategy was fun and interesting for your adolescent?

3. How satisfied are you that your adolescent actively participated in learning about the Test-Taking Strategy?

4. How satisfied are you that learning and using the Test-Taking Strategy helps your adolescent take tests better with his or her school?

5. How satisfied are you that learning and using the Test-Taking Strategy helps your adolescent have a better attitude towards taking tests?
6. Will you encourage your adolescent to use the Test-Taking strategy in the future?
   ______ Yes ______ No

7. Will you recommend the Test-Taking Strategy to other parents of students with ASD?
   ______ Yes ______ No

Why or Why Not? ________________________________________________________________

Do you have any comments?
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

Thank you.
APPENDIX F

Session Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Session</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Introductory Meeting</td>
</tr>
<tr>
<td>3/31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>Participant 1,2, &amp; 4 Baseline</td>
</tr>
<tr>
<td>4/3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4/4</td>
<td>3</td>
<td>Participant 3 Baseline</td>
</tr>
<tr>
<td>4/5</td>
<td>4</td>
<td>Participant 1,2, &amp; 4 Baseline</td>
</tr>
<tr>
<td>4/6</td>
<td>5</td>
<td>Participant 3 Baseline</td>
</tr>
<tr>
<td>4/7</td>
<td>6</td>
<td>Participants 1,2, &amp; 4 Baseline</td>
</tr>
<tr>
<td>3</td>
<td>7</td>
<td>Participant 1 &amp; 2 (Describe)</td>
</tr>
<tr>
<td>4/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4/11</td>
<td>8</td>
<td>Participant 3 Baseline</td>
</tr>
<tr>
<td>4/12</td>
<td>9</td>
<td>Participant 1 &amp; 2 (Model)</td>
</tr>
<tr>
<td>4/14</td>
<td>10</td>
<td>Participant 1 &amp; 2 (Model)</td>
</tr>
<tr>
<td>4</td>
<td>11</td>
<td>Participant 1 &amp; 2 (Verbal Practice)</td>
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<td></td>
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<td>4/19</td>
<td>12</td>
<td>Participant 1 &amp; 2 (Controlled Practice) &amp; Probe 1</td>
</tr>
<tr>
<td>Week</td>
<td>Session</td>
<td>Activities</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>------------</td>
</tr>
<tr>
<td>4/21</td>
<td>13</td>
<td>Participant 1 &amp; 2 (Controlled Practice) &amp; Probe 2</td>
</tr>
</tbody>
</table>
| 4/24 | 14      | Participant 1 & 2 (Controlled Practice) & Probe 3  
They reached 90% mastery level. |
| 4/25 | 15      | Participant 3 & Baseline |
| 4/26 | 16      | Participant 1 & 2 (Advance Practice or Posttest) & Probe 1  
He reached 85% mastery level.  
Participant 4 Baseline |
| 4/27 | 17      | Participant 3 (Describe) |
| 4/28 | 18      | Participant 1 & 2 (Posttest) & Probe 1  
They reached 90% mastery level. |
| 5/1  | 19      | Participant 1 & 2 (Generalization) & Probe 1  
They reached 85% mastery level. |
| 5/2  | 20      | Participant 3 (Model) |
| 5/3  | 21      | Participant 1 & 2 (Generalization) & Probe 2  
They reached 85% mastery level. |
<p>| 5/4  | 22      | Participant 3 (Model) |
| 5/6  | 23      | Participant 3 (Verbal Practice) |
| 5/9  | 24      | Participant 3 (Controlled Practice) &amp; Probe 1 |</p>
<table>
<thead>
<tr>
<th>Week</th>
<th>Session</th>
<th>Activities</th>
</tr>
</thead>
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<tr>
<td>5/11</td>
<td>25</td>
<td>Participant 3 (Controlled Practice) &amp; Probe 2</td>
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<td></td>
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<td>He reached 90% mastery level.</td>
</tr>
<tr>
<td>5/12</td>
<td>26</td>
<td>Participant 4 Baseline</td>
</tr>
<tr>
<td>5/13</td>
<td>27</td>
<td>Participant 3 (Advance Practice) &amp; Probe 1</td>
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<td>He reached 85% mastery level.</td>
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<td>5/15</td>
<td>28</td>
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<tr>
<td>5/16</td>
<td>29</td>
<td>Participant 3 (Posttest) &amp; Probe 1</td>
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<td>He reached 90% mastery level.</td>
</tr>
<tr>
<td>5/17</td>
<td>30</td>
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<td></td>
<td></td>
<td>They reached 90% mastery level.</td>
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<tr>
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<td></td>
<td>Participant 4 (Model)</td>
</tr>
<tr>
<td>5/18</td>
<td>31</td>
<td>Participant 3 (Generalization) &amp; Probe 1</td>
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<td></td>
<td></td>
<td>He reached 85% mastery level.</td>
</tr>
<tr>
<td>5/19</td>
<td>32</td>
<td>Participant 1 &amp; 2 (Maintenance Practice) &amp; Probe 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>They reached 90% mastery level.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Participant 4 (Model)</td>
</tr>
<tr>
<td>5/20</td>
<td>33</td>
<td>Participant 3 (Generalization) &amp; Probe 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>He reached 90% mastery level.</td>
</tr>
<tr>
<td>5/22</td>
<td>34</td>
<td>Participant 4 (Verbal Practice)</td>
</tr>
<tr>
<td>5/24</td>
<td>35</td>
<td>Participant 4 (Controlled Practice) &amp; Probe 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>He reached 90% mastery level.</td>
</tr>
<tr>
<td>Week</td>
<td>Session</td>
<td>Activities</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>------------</td>
</tr>
</tbody>
</table>
| 5/26 | 36      | Participant 4 (Advance Practice) & Probe  
He reached 85% mastery level. |
| 5/29 | 37      | Participant 4 (Posttest)  
He reached 90% mastery level. |
| 5/31 | 38      | Participant 4 (Generalization) & Test 1  
He reached 85% mastery level. |
| 6/2  | 39      | Participant 4 (Generalization) & Test 2  
He reached 85% mastery level. |
| 6/3  | 40      | Participant 3 (Maintenance) & Probe 1  
He reached 90% mastery level. |
| 6/6  | 41      | Participant 3 (Maintenance) & Probe 2  
He reached 90% mastery level. |
| 6/16 | 42      | Participant 4 (Maintenance) & Probe 1  
He did not reached 90% mastery level. |
| 6/19 | 43      | Participant 4 (Maintenance) & Probe 2  
He reached 90% mastery level. |
APPENDIX G

Consent, Assent, and Student Information Forms
TITLE OF STUDY: Effects of Test-Taking Strategy Instruction on High-Functioning Adolescents with Autism Spectrum Disorder

INVESTIGATOR(S): Susan P. Miller, Ph. D. and Del Her Segale, MS.

CONTACT PHONE NUMBER: 995-1100

Purpose of the Study

Your son/daughter is invited to participate in a research study that investigates the effectiveness of Test-Taking Strategy instruction on high-functioning adolescents with autism spectrum disorder. As one part of the strategy, your son/daughter will learn the first-letter mnemonic device, “PIRATES,” to increase the likelihood of remembering the necessary steps for the Test-Taking Strategy in a testing situation. “PIRATES” stands for Prepare to Succeed, Inspect the Instructions, Read, Remember, and Reduce, Answer or Abandon, Turn Back, Estimate, and Survey. Your son/daughter will also practice different types of tests that teachers commonly give in the classroom. All information will be kept in complete confidence and not shown to anyone other than those of us who are involved in teaching the strategy.

Participants

Your son/daughter is being asked to participate in the study because he/she has autism spectrum disorder and he/she may perform better in his/her classroom tests after learning the Test-Taking Strategy.

Procedures

If your son/daughter volunteers to participate in this study, the procedures will be as follows. During the next six weeks, three times per week (18 sessions in total), your son/daughter will learn the Test-Taking Strategy. Each instructional session will be 50 minutes. The instructor will demonstrate how the Test-Taking Strategy can be used when taking tests. Your son/daughter will memorize the strategy steps, participate in discussions and take practice tests. When a student reaches the mastery criterion by making 90% of the required responses, he or she will move to the next instructional stage. In generalization, the last instructional stage, students will be encouraged to use the Test-Taking Strategy each time they take a test in their general education classes or elsewhere. Finally, they will make cue cards listing the strategy steps to carry with them.

Benefits of Participation

There may be no direct benefits to your son/daughter as a participant in this study. However, we hope your son/daughter will learn the test-taking strategy and then perform better on his/her classroom and state proficiency tests. This has the potential to improve his/her academic performance in a variety of academic subject areas.
PARENT INFORMED CONSENT
Department of Special Education

TITLE OF STUDY: Effects of Test-Taking Strategy Instruction on High-Functioning Adolescents with Autism Spectrum Disorder

INVESTIGATOR(S): Susan P. Miller, Ph.D. and Dal Hee Songlee, M.S.

CONTACT PHONE NUMBER: 895-1108

Risks of Participation
The risks of this study to students are minimal. One risk is that subjects may feel uncomfortable when the instructor asks questions that they may not understand. This risk may be reduced by reminding students of the strategy steps.

Cost /Compensation
There will not be any financial cost for your son or daughter to participate in this study. Your son/daughter will not be compensated for their time. The University of Nevada, Las Vegas may not provide compensation or free medical care for an unanticipated injury sustained as a result of participating in this research study.

Contact Information
If you have any questions or concerns about the study, you may contact Dal Hee Songlee at 702-612-7808 or Susan P. Miller at 702-895-1108. For questions regarding the rights of research subjects, any complaints or comments regarding the manner in which the study is being conducted you may contact the UNLV Office for the Protection of Research Subjects at 702-895-2794.

Voluntary Participation
Your son’s/daughter’s participation in this study is voluntary. He/she may refuse to participate in this study or in any part of this study. He/she may withdraw at any time without prejudice to your relations with the university. You are encouraged to ask questions about this study at the beginning or any time during the research study.

Confidentiality
All information gathered in this study will be kept completely confidential. No reference will be made in written or oral materials that could link you or your child to this study. All records will be stored in a locked facility at UNLV for at least 3 years after completion of the study. After the storage time the information gathered will be destroyed and computer files will be erased.
PARENT INFORMED CONSENT

Department of Special Education

TITLE OF STUDY: Effects of Test-Taking Strategy Instruction on High-Functioning Adolescents with Autism Spectrum Disorder

INVESTIGATOR(S): Susan P. Miller, Ph. D. and Dal Hee Songlee, MS.

CONTACT PHONE NUMBER: 995-1108

Participant Consent:
I have read the above information and agree to have my son/daughter participate in this study. I am at least 18 years of age. A copy of this form has been given to me.

Signature of Parent ___________________________ Date ______________

Parent Name (Please Print) _______________________

Participant Note: Please do not sign this document if the Approval Stamp is missing or is expired.
ASSENT TO PARTICIPATE IN RESEARCH

Effects of Test-Taking Strategy Instruction on High-Functioning Adolescents with Autism Spectrum Disorder

1. My name is Dalhee Songlee.

2. We are asking you to take a part in a research study because we are trying to learn more about how the Test-Taking Strategy instruction affects you in your classroom tests.

3. If you agree to be in this study, you will learn the Test-Taking Strategy to help you better perform in your classroom tests. As one part of the strategy, you will learn the first-letter mnemonic device, "PIRATES," to increase the likelihood of remembering the necessary steps in a testing situation. "PIRATES" stands for Prepare to Succeed, Inspect the Instructions, Read, Remember, and Reduce, Answer or Abandon, Turn Back, Estimate, and Survey. You also practice different types of tests that teachers commonly give you in your classroom. All information will be kept in complete confidence and not shown to anyone other than those of us who involve in teaching the strategy.

4. The risks of this study are minimal. One risk is that you may feel uncomfortable when the instructor ask questions that you may not be able to answer.

5. There may be no direct benefits to you as a participant in this study. However, we hope you to learn test-taking strategy to prepare better in your classroom tests and you will be successful in academic areas.

6. Please talk this over with your parents before you decide whether or not to participate. We will also ask your parents to give their permission for you to take a part in this study. But even if your parents say "yes" you can still decide not to participate.

7. If you don't want to be in this study, you don't have to participate. Remember, being in this study is up to you and no one will be upset if you don't want to participate or even if you change your mind later and want to stop.

8. You can ask any questions that you have about the study. If you have a question later that you didn't think of now, you can ask me next time.

9. Signing your name at the bottom means that you agree to be in this study. You and your parents will be given a copy of this form after you have signed it.

Print your name ____________________ Date ____________________

Sign your name ____________________

126

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Student Information Sheet

Student Name: ___________________________ Age: ________________

Date of Birth: ___________________________ Sex: Male _____ Female _____

Grade: _______________ School Attending: ___________________________

Parents’ Names: ___________________________________________________

Address: __________________________________________________________________________

City, State,

Zip: _______________________________________________________________________________

Phone Numbers: _______________________________________________________________________

Emergency Phone: _______________ Emergency Person: _______________

Medical conditions/medication that we should be aware of in case of emergency:

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

Any other information that we need to be aware of:

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

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Student Assessment Information

Student Name: ____________________________________________________________

I.Q. Test Date: ____________________________________________________________

I.Q. Test Name: ____________________________________________________________

FSIQ: ____________________________________________________________ (standard score)

VIQ: ____________________ PIQ: ____________________________

Reading Test Date: _______________________________________________________

Reading Test Name: _______________________________________________________

Age/Grade Levels: ________________________________________________________
APPENDIX H

Fidelity of Treatment Checklist

Student: ______________________  Session #: ______________________
Observer: ______________________  Date: ______________________
Stage: ______________________  Interobserver agreement: ________

1. Instructor reviewed the previous lesson.     Y / N
2. Instructor clearly stated the purpose of lesson.     Y / N
3. Instructor had lesson materials prepared and available as stated in the Instructor's material.     Y / N
4. Instructor followed lesson script.     Y / N
5. Instructor provided feedback related to student performance.     Y / N
REFERENCES


http://www.nimh.nih.gov/autismiacc/summitsummary


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Dal Hee Songlee

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University of Nevada, Las Vegas

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Dissertation Examination Committee:
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Committee Member, Dr. Nancy M. Sileo, Ed. D.
Committee Member, Dr. Matthew J. Tincani, Ph. D.
Graduate Faculty Representative, Dr. Peggy G. Perkins, Ph.D.