CHILDHOOD LEARNING: EXAMINING ATTITUDES TOWARD SCHOOL AND LEARNING ABILITY

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A child’s ability to learn in school and school performance are affected by various factors. Variables that affect learning and academic performance in 46 children, 4 - 7 years old, were examined. Children, parents, and teachers completed questionnaires rating children’s attitudes and behavior toward school. Children completed a computerized matching-to-sample (MTS) task. The MTS trained the children to form 3 stimulus classes. One stimulus class included three arbitrary stimuli, the others contained a positively or negatively valenced stimulus, a school-related stimulus, and an arbitrary stimulus. Class formation performance was assessed. Rate of learning predicted attitudes toward school, school attitudes predicted academic performance; however a hypothesized mediation effect of attitudes was not demonstrated. No significant differences in rate of forming stimulus classes containing emotionally valenced and school stimuli were found. Future directions for intervention in the early education of students who have poor attitudes toward school are discussed.
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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGEMENTS .......................................................................................................................... iii</td>
</tr>
<tr>
<td>LIST OF TABLES AND ILLUSTRATIONS .................................................................................................. vi</td>
</tr>
<tr>
<td>INTRODUCTION ....................................................................................................................................... 1</td>
</tr>
<tr>
<td>Equation Relations</td>
</tr>
<tr>
<td>Definition</td>
</tr>
<tr>
<td>Transformation of Function</td>
</tr>
<tr>
<td>Importance of Equivalence Relations</td>
</tr>
<tr>
<td>Stimulus Equivalence and Learning</td>
</tr>
<tr>
<td>Matching-To-Sample (MTS)</td>
</tr>
<tr>
<td>Teaching New Skills</td>
</tr>
<tr>
<td>Variables that Affect Learning and School Performance</td>
</tr>
<tr>
<td>Innate Ability Variables</td>
</tr>
<tr>
<td>Demographic Variables</td>
</tr>
<tr>
<td>School Environment Variables</td>
</tr>
<tr>
<td>Academic Performance and Behavior</td>
</tr>
<tr>
<td>Attitudes toward School</td>
</tr>
<tr>
<td>Prior Learning History Affects Learning and MTS Performance</td>
</tr>
<tr>
<td>The Current Study</td>
</tr>
<tr>
<td>METHOD ............................................................................................................................................... 25</td>
</tr>
<tr>
<td>Participants</td>
</tr>
<tr>
<td>Measures</td>
</tr>
<tr>
<td>Demographics Questionnaire</td>
</tr>
<tr>
<td>Behavioral Assessment System for Children, Second Edition (BASC-2)</td>
</tr>
<tr>
<td>School Refusal Assessment Scale-Revised (SRAS-R)</td>
</tr>
<tr>
<td>School Attitude/Behavior Questionnaire (SABQ)</td>
</tr>
<tr>
<td>Matching-to-Sample</td>
</tr>
<tr>
<td>Data Collection Procedure</td>
</tr>
</tbody>
</table>
LIST OF TABLES AND ILLUSTRATIONS

Tables

1. Demographic Information ........................................................................................................... 25
2. Stimuli used in the MTS Procedure .......................................................................................... 32
3. Correlations between Variables associated with Training and Learning Rate ..................... 38
4. Mean and SD of All Variables Measured .................................................................................... 39
5. Correlation of Measures of School Attitudes and Validated Behavioral Measures .................. 41
6. Summary of Mediation Analysis ............................................................................................... 47
7. Summary of Simple Regression Analyses for Variables Predicting Academic Achievement ......................................................................................................................... 49
8. Summary of Simple Multiple Regression Analysis with Covariates for Variables Predicting Academic Achievement ......................................................................................................................... 50

Figures

1. MTS computer task layout .............................................................................................................. 32
INTRODUCTION

The concept of learning is difficult to define, and there are no real satisfactory definitions. People speak about learning in many different ways; they may speak in broad terms of gaining knowledge about something or about gaining a skill, or in more specific language. One more specific definition of learning is “a relatively permanent change in behavior resulting from experience” (Catania, 1984, p. 3). A commonly used online encyclopedia defines learning as “the acquisition and development of memories and behaviors, including skills, knowledge, understanding, values, and wisdom. It is the goal of education and the product of experience.” Miriam-Webster’s online dictionary defines learning as “knowledge or skills acquired by study or instruction, or as modification of behavior as a result of experience.” While the concept is difficult to define, most agree that learning involves gaining of knowledge or skills that will ultimately change behavior.

The concept of learning is of utmost importance for educators at every level and especially for early childhood educators. A child’s early learning experiences may shape his/her behavior toward school and future learning. Therefore, it is important to understand the concepts that underlie learning and the factors that may affect it. Individual differences in learning may be a result of some combination of genetically or maturationally determined capabilities (Carroll, 1985). Alternatively, differences in learning may be related to motivation, attitudes, feelings, intelligence, affect, self-regard, and anxiety, as well as many other factors (Brophy, 1983; Sarasson, 2004).

A child’s verbal ability can be linked to his/her learning ability in school and other educational situations (Carroll, 1985). Much of the learning that occurs within
educational settings occurs through verbal mediums. The development of cognitive and verbal relations results in learning the information received. Disturbances in language development may lead to future learning and academic failure as well as behavioral problems for children (Beadle, 1979).

Due to the fact that most learning that occurs in school settings is done through verbal mediums, it is of utmost importance that there be an effective and accurate way to measure verbal learning. Equivalence relations and class formation provide a theoretical foundation that is ideal for examining verbal learning.

Equivalence Relations

Stimulus equivalence and equivalence class formation are phenomena related to language/verbal behavior. Equivalence has been demonstrated in language-able humans, including typically developing children and children with mental retardation. Non-humans and humans who are not language competent have been unable to demonstrate equivalence class formation (Devany, Hayes, & Nelson, 1986).

Definition

When a subject is taught a relation between two stimuli, A=B, and then taught another relation, B=C, without further training he/she will be able to derive four other relations, B=A, C=B, A=C, and C=A. For example, if a child is taught that his pet "Rover" is a dog and that a dog is the same as a canine, without further training the child may say that, "Rover is a canine." When these relationships possess the properties of reflexivity, symmetry, and transitivity they are said to be part of an equivalence class
(Novak & Pelaez, 2004; Sidman, 1994). Sidman (1986) used formulas described by mathematical set theory (if A=B and B=C then A=C) to describe these properties of equivalence relations/equivalence classes. While there are relations other than equivalence relations (i.e. greater than, less than, bigger than, etc.) a full discussion of those relations is beyond the scope of this paper. Examples of equivalence relations are shown below.

- **Reflexivity:** Reflexivity is established when a relationship is maintained between a stimulus and itself, regardless of the context in which it exists (A=A). Using our same example to demonstrate this property: Rover = Rover, regardless of the context (Novak & Pelaez, 2004; Sidman, 1994). If the relationship were larger than, smaller than, superior to, or had some similar relation where direction matters, the relationship A=A could not be satisfied. For example, a stimulus cannot be larger than itself (Sidman, 1994).

- **Symmetry:** Symmetry exists when a relationship is held between two different stimuli. When the relationship A=B, is established, then the relationship B=A would also hold true. Again, following our example, a child learns that Rover is a dog; then the relationship that a dog is Rover also holds true (Novak & Pelaez, 2004; Sidman, 1994). As is the case with reflexivity, directional relationships do not satisfy the demands required for a symmetrical relationship.

- **Transitivity:** To satisfy the requirement for the property of transitivity a relationship must hold between three different stimuli. If stimulus A is related to stimulus B, and stimulus B is related to stimulus C in the same way, then stimuli A and C must also have the same relationship as the other relationships previously established. Using
a previous example, if Rover is a dog and a dog is a canine, then Rover is also a canine (Novak & Pelaez, 2004; Sidman, 1994).

Transformation of Function

The functions related to one stimulus can be transferred to another stimulus in the same equivalence class. Dougher, Augustson, Markham, Greenway, and Wulfert (1994) demonstrated transfer, or transformation, of function when they trained participants to form 2 four-member equivalence classes with arbitrary stimuli. After the classes were trained, some additional conditioning took place. A stimulus from one of the four-member equivalence classes was presented in combination with a shock, while a stimulus from the other class was presented without shock. Skin conductance was measured for each subject when the shock was presented and when the shock was not presented. Then the subject’s skin responses were tested when other stimuli from each of the two equivalence classes were presented. Results demonstrated that persons emitted greater skin conductance when presented with other stimuli in the same equivalence class as the stimulus paired with the shock. The response to the original stimulus was transferred to other stimuli in the same equivalence class.

The same phenomenon often occurs with words, in that words take on the same properties and functions as the objects that they label. Using our same example again, the child has associated “Rover” with dogs. Subsequently if the child is bitten by another dog, he may become afraid when learning to read about “Rover,” the dog in class, because the name “Rover” is in an equivalence class with other dogs. The same may be true, generally with school-related stimuli. If a child has a bad experience with a
teacher or bully, the frustration, fear or other emotions that the child has then associated with that bad experience may be transferred to other experiences that are in the same class as “school,” such as learning and academics.

For example, Johnny is in Ms. Smith’s preschool class. Ms. Smith is a very strict disciplinarian, and each time Johnny sees her he sits up straight and stops talking, because he has come to equate the presence of Ms. Smith (and her disciplinary practices) with the behaviors of sitting up straight and being quiet. As the child learns the word “teacher” and that Ms. Smith is his teacher, he will form a relationship with the word “teacher” and Ms. Smith, his actual teacher. The child may then equate the word “teacher” with Ms. Smith, discipline, and his own behavior of sitting up straight and quietly. The word has taken on some of the functions of the actual teacher, in that at the mere mention of the word, the child may sit up straight and quiet down. This ability for words to virtually function as objects can greatly facilitate learning normal adaptive functioning. However, it can become a problem for children in school situations if they attach negative feelings or behaviors to some school-related stimuli. If a child has negative feelings and behaviors directed toward his teacher, he may experience negative emotions and act out at the mention of her name. The problem may be further complicated if the child has “teacher” in the same equivalence class as “school” or something similar. “School” could take on the same negative functions as “teacher,” and this could further extend to any other words in the same class as “school” or “teacher.” The child may act out at the mention of school, homework or other related topics.
Importance of Equivalence Relations

Sidman (1994) stated that establishing an equivalence relation is a method for generating new cognitive performances without directly teaching them. The more that we are able to understand equivalence relations, the better we will understand creativity/originality and, subsequently, gain the ability to predict and generate other behaviors from specific sets of circumstances. Equivalence relations underlie a person’s cognitive development, advanced reasoning abilities, language comprehension and verbal behavior, as well as other complex human behaviors (Hayes, Gifford, & Townsend, 2001).

Language comprehension and verbal behavior. Some may define verbal behavior as the action of speaking; however, this does not provide a full explanation of verbal behavior. An explanation that provides a more complete description is the action of relating and creating classes of events or stimuli (Hayes, et al., 2001). It is characterized by the correspondence or equivalences that are established within our language. Our verbal communities create correspondence between things and their names. A person can describe thoughts and feelings, and these descriptions are behavior; verbal behavior may be unique but it is still behavior (Catania, 1984). From a very young age, children are taught equivalence relations in the form of language acquisition. For example, a child is shown a dog and taught that the word “dog” represents the animal they are shown. The word “dog” and the actual dog are then bound together in a relation of equivalence.

Equivalence relations lie at the heart of human language comprehension and verbal behavior. Formation of stimulus classes is fundamental to linguistic competence,
because this process makes it possible for words to mediate the emergence of new behavior that has never been directly taught (Sidman, 1977). Relations can be directly taught through contact with the environment, but relations may also form indirectly through verbal mediums. In other words, even if a person has never been in direct contact with a stimulus, she can create a relationship with that stimulus and other stimuli with which she has been in direct contact. For example, a child can be taught verbally what “hot” is and what it means to get burned; she does not have to touch a stove to know that it is hot and that it burns. Through equivalence we directly learn one concept, and learning that one concept results in indirectly learning others. It is as if we automatically know other relations. If we look at our formula again, by learning that A=B and A=C, we automatically know that B=A, C=A, B=C, and C=B. When she has learned that a stove is hot, and that a stove burns, then a child will know that hot things burn. In fact, verbally mediated knowledge allows for humans to know things that are unrelated to anything that they have directly experienced, or even related to anything that they have witnessed.

The number of relationships that emerge, and are not directly trained increases with each additional relationship that is trained. As previously stated, if two relationships are directly trained, four more relationships will emerge. If one more stimulus is added and one more relationship is directly trained, then the total number of relationships that will be formed is 12. The more relationships that are directly trained, the larger the stimulus class and the more relationships that emerge. This can be especially useful - or problematic - when transformation of function is considered. If one stimulus acquires a negative function then all of the relationships tied to that stimulus may also take on
that negative function. However, if a stimulus has taken on a positive function then all relationships tied to that stimulus may (depending on the context) subsequently take on positive functions. Through this class expansion people can learn to adaptively - or maladaptively - interact with numerous stimuli in environments to which they have never been exposed.

Sidman (1994) stated that equivalence relations help to provide a behavioral foundation for everyday associations between “words and things, what we say and what we do, and between rules and contingencies” (Sidman, 1994, p.123). The social-verbal community of the child reinforces the correct usage and correspondence of words and labels. Correspondence refers to giving stimuli the same labels the social-verbal community has given them. When a child uses the correct name for an item, others reinforce this behavior. For example, others would deliver reinforcement when a child called a pen a “pen”; however, if a child called a pen a “rope” (or anything else), no reinforcement would be given. The same associations are strengthened by our social verbal communities reinforcing behaviors such as rule following. A rule is verbally stated and the behavior of the child is reinforced by others for following the rule. Skinner (1966) suggested that problems of learning may be similar those of evolution. The emergence and maintenance of behaviors in a person’s lifetime are similar to the natural selection of survival of individuals within a species. Those behaviors that help a person to survive are maintained. However, for some individuals certain learned behaviors may not be adaptive and conducive to future learning. Behaviors that are not adaptive, are rigid, or are not applied in appropriate situations may actually hinder future learning and growth (Skinner, 1966).
Cognitive development and behavior. Novak and Palaez (2004) stated that equivalence relations are a common means of developing complex hierarchal behavior-environment relationships. Some relationships with the environment are directly trained, and others emerge as a result of the directly trained relationships. As children grow and mature, histories of environmental contingencies are formed. In addition, relationships emerge that are derived from exposure to different contingencies that have not been directly trained. Children learn many things through direct training and contact with their environment. As in the example with dogs, a child may be directly trained to fear dogs because a dog once bit him. However, through verbal mediums, other relations may be formed indirectly as a result of the child being bitten by a dog, or even because an adult told the child that some dogs bite and that dog bites hurt.

Equivalence relations influence our behavior and interactions with our environment. As a word/object becomes equivalent (i.e., meaning of the word or object) to its stimulus, the reaction of a person to that stimulus can be transferred to the word/object, as explained by the transfer of function. The implications of this are far-reaching, because thereby a person can display the ability to behave adaptively within an environment without having previously been exposed to it (Sidman, 1986). Prior learning and equivalence class formation affect behavioral responses to stimuli. Roche and Barnes (1997) clearly demonstrated this phenomenon. Participants were shown nonsense syllables immediately followed by sexually explicit film clips or nonsexual (nature) film clips, and skin resistance responses to the syllables and clips were recorded. Using those same nonsense syllables, the subjects were later trained to form equivalence class. Skin responses were then measured for all stimuli in each
equivalence classes. Participants showed increased skin resistance responses to those stimuli in the same class with the stimulus that had been paired with sexually explicit film clips. The participants’ prior learning of pairing a stimulus with sexually explicit films transformed their response to other stimuli in the same equivalence class. Deriving relationships among stimuli without specifically training of those relationships underlies skills such as speaking, thinking, reading, spelling and performing mathematics. Increased ability to derive relations is positively correlated with general intelligence, problem solving, and analogy (Strand, Barnes-Holmes, & Barnes-Holmes, 2003).

Sidman (1994) conducted preliminary studies on the intellectual development and re-learning of persons who had suffered traumatic brain injuries. Positive results were found as subjects progressed through recovery in that the ability to create and expand equivalence classes was correlated with recuperation. Preliminary findings showed that as one participant progressed through the recovery process, his ability to form equivalence classes, as well as ability to add greater numbers of stimuli to such classes, increased.

**Stimulus Equivalence and Learning**

Stimulus equivalence is the process of learning relationships. Equivalence relations are, therefore, a fundamental unit in learning, especially the basic learning that occurs in young children. For example, stove = hot = burn or b-o-o-k = “book” = actual book. Children learn that a stove is hot and burns, and they learn to read the word “book” and understand that the word is the same as an actual book through equivalence relations. To learn to read and write is to learn equivalence between visual and acoustic
modes of language (Catania, 1984). While equivalence relations cannot explain all
learning that develops, the behavior does explain much of the basic and fundamental
learning that develops in young children. Therefore, equivalence relations are the
foundation that underlies all other types of learning.

Matching-to-Sample (MTS)

Stimulus equivalence is usually studied (taught and measured) using a matching-
to-sample (MTS) procedure. These studies are most often conducted on a computer. In
a visual sample a stimulus is presented at the top of the screen. A set of three
comparison stimuli are shown at the bottom of the screen. The participant is required to
choose the stimulus at the bottom of the screen that “goes with” or “is the same as” the
stimulus at the top of the screen. Participants’ behavior is reinforced for making the
correct selection. The experimenter assigns correct selections prior to the procedure.
There are several ways to do this, but a common procedure trains the relationship A to
B stimuli, then A to C stimuli, and tests relations that emerge between B and C stimuli.
The participant is taught when presented with stimulus A1 and comparison stimuli B1,
B2, and B3, to select stimulus B1 and not B2 or B3. The participant is then given the
same comparison stimulus A1 and a different set of comparison stimuli, C1, C2, and
C3. Likewise the participant will be taught to select the C1 stimulus. After the participant
is directly taught these relationships, he/she is tested to determine if equivalence
classes have been formed and if the learner is able to derive various relationships. The
three properties of stimulus classes, reflexivity, symmetry, and transitivity, are present in
the task. The property of reflexivity is assumed when the subject, presented with the A1
stimulus, would select A1 from a group of A stimuli, Symmetry is trained when the participant is taught to group the stimuli together, A1 with B1 or A1 with C1. Transitivity is then tested by presenting the subject with a C stimulus and with B comparisons. Selecting B1 from group of B stimuli when C1 is presented and C1 from a group of C stimuli when B1 is presented would be evidence of transitivity. If all relationships are demonstrated the participant has formed an equivalence class which is a basic unit underlying many learning processes and academic success.

The MTS procedure was first administered to adult subjects, and subsequently has been administered numerous times to children. Boelens and Van Den Broek (2000) conducted a study examining symmetric responding in 5- and 6-year-old children. These children demonstrated the ability to form symmetric relations with arbitrary stimuli via an MTS task. Saunders, Drake, and Spradlin (1999) showed that full equivalence classes could be formed with pre-school-aged children. Furthermore, participants as young as 2 years old have been able to demonstrate symmetric responding and the formation of equivalence classes after participating in a matching-to-sample procedure (Boelens, Van Den Broek, & Van Klarenbosch, 2000; Smeets, Barnes-Holmes, & Cullinan, 2000).

**Teaching New Skills**

Stimulus equivalence and MTS tasks have been used frequently in past research to teach new skills such as reading, oral naming, auditory recognition, and spelling. The study most often recognized for MTS training was a study conducted by Sidman in 1971. Sidman recruited a 17-year-old boy with mental retardation who had substantial
experience with MTS training. Prior to the experiment he was able to match pictures, colors, printed numbers to picture names, and various other stimuli. He demonstrated good auditory comprehension and picture naming, but was unable to demonstrate any oral reading or comprehension. He was unable to match correctly when names were presented visually vs. spoken; he could name pictures aloud, but could not match printed words.

Sidman taught the boy to match spoken words to printed words from an array of choices. Correct responding was reinforced and no consequence was delivered for incorrect responding. The boy was also required to name pictures and words aloud when they were presented and to match printed words to spoken names. Upon completion of the matching-to-sample training, the boy’s reading comprehension and oral reading were retested, and results indicated that these abilities had improved significantly. The boy was then able to match pictures to words and words to pictures without further training. Sidman was able to establish new oral reading and comprehension skills, not by direct training, but through the expansion of skills that the young man had acquired before the experiment.

De Rose, De Souza, and Hanna (1996) conducted a similar study wherein first grade children were taught reading and spelling through an MTS procedure. The children were given printed words, dictated words, and pictorial representations of those words. Each child was required to make the correct matches/associations in each trial before moving on to the next trial. After completing the trials, the children were tested for reading and spelling performance on the words that were trained. In addition, they were tested to determine if they had acquired any generalized reading and spelling
performances. Students demonstrated the ability to acquire reading and spelling of words that were directly trained and also, to a lesser extent, the ability to read and spell generalized words. Mackay and Sidman (1984) found that equivalence classes could be established by teaching participants to construct words using movable letters. In essence, by teaching participants to spell, later they were able to form equivalence classes with those same words. De Rose et al. (1996) stated that equivalence relations integrate both reading and spelling performances.

Previous research has demonstrated that students have been able to learn new skills through the formation of equivalence relations. As previously discussed, participants have been able to learn reading and spelling performances by creating equivalence relations through the MTS task (De Rose et al., 1999; Melchiori, Souza, & De Rose, 2000; Sidman, 1971). The ability to create classes of stimuli involving both trained and untrained relationships underlies success in a variety of academic subjects. The ability to derive relations plays a central role in a person’s problem-solving, logic and mathematical abilities, and academic achievement, and is strongly correlated with general intelligence (Strand, Barnes-Holmes, & Barnes-Holmes, 2003).

Variables that Affect Learning and School Performance

Wang, Haertel, and Walberg (1990) conducted a meta-review of research on variables related to learning. Numerous factors affected outcomes including school variables, classroom instruction, and student variables. Student variables will be discussed as these are most relevant to the study that will be conducted. The meta-review found that demographic variables, educational history, social and behavioral
variables, motivation, cognitive (knowledge), comprehension, and psychomotor variables all contributed to student outcomes. Further studies have replicated the findings of Wang et al., indicating that intelligence, demographic variables (e.g., socioeconomic status or SES, family environment), age, environmental variables, motivation behavior, attitudes, feelings, and prior learning histories can impact outcomes related to learning (Bryant, Schulenberg, Bachman, O'Malley & Johnston, 2000; Demirbas & Yagbasan, 2006; Marjoribanks, 2001; Morrison, Griffiths, & Alberts, 1997; Price, 2002; Sarasson, 2004; Stevenson, 1972).

**Innate Ability Variables**

Intelligence tests are good for predicting a child's ability to apply learned behaviors. These tests require children to apply prior learning to answer questions and carry out a variety of tasks. Therefore, these can be good predictors of children’s learning ability: if the children did not learn the information they would not be able to carry out the learning task or test (Stevenson, 1972). Children's learning abilities can be evaluated in relation to the abilities of other children about their ages. Children who demonstrate superior learning capabilities will demonstrate superior answers on the tests of intelligence, which may predict future ability to learn. Additionally, some differences in learning may be genetically predetermined, such that some people may have an inherent capacity for higher learning ability (Carroll, 1985).

**Demographic Variables**

Various environmental and family predictors have been shown to predict higher
verbal achievement and, therefore, higher learning ability. Socioeconomic status, language ability, gender, and parenting are some variables that determine the extent to which a child has been exposed to language (Carroll, 1985). The literature concerning gender and early learning achievement is mixed and, therefore, will not be examined in depth here. The more early and diverse exposure a child has to language, the greater his/her verbal ability will be. Children from higher SES families and families wherein parents are more involved with children will develop greater verbal repertoires. A study of school-related outcomes in Australian adolescents found that early family learning experiences and reading achievement demonstrated the greatest differentiation in outcomes (Marjoribanks, 2001). In an earlier study Marjoribanks (1987) classified children in different family groups. The family groups were defined by familial social status, and “parents getting-ahead or getting-by orientation” (p.171). Differences were found in children’s performances on word comprehension and knowledge, attitudes toward school and academic achievement. Marjoribanks suggested that the family plays a critical role in influencing a child’s relations between attitude and academic performance. Brophy (1983) suggested that learning may depend on the degree to which a child is taught to value learning opportunities and enjoy the process of learning. These values are likely taught to children by parents, siblings, teachers, and other important people early in their life.

Morrison, Griffith, and Alberts (1997) studied the impact of the age of entrance into formal schooling on various academic outcomes. Achievement of first graders in math and reading was tested at the beginning of the year and again at the end of the year. At the end of first grade, achievement levels of younger first graders were lower
than that of older first graders. In-school assessments would suggest that younger children are not learning as much or at the same level as older children in the same grade. To date, no studies that measured the innate learning ability of younger and older children in the same grade were found.

**School Environment Variables**

The classroom environment and teacher’s approach to learning can have large impact on the learning and academic outcomes of the children in those classrooms. Perry (1998) studied how classroom contexts affected students' learning and achievement abilities. Perry found that students in classrooms that were child-centered, and in which self-regulated learning was encouraged, demonstrated greater learning skills. On the other hand, children in classrooms where the approach to learning was more teacher-directed were found to assume approaches to learning associated with handicapped learning styles. Ak and Sayil (2006) have suggested that children who are educationally disadvantaged can be helped through curricula and school environments that promote healthy educational development. In other words, the school environment/curriculum can help children to attain educational achievement equivalent to the average achievements of others their age.

Numerous other environmental factors have also been found to influence a child’s ability to learn. Quality of classroom instruction, teacher and student interactions, school district variables, curriculum design, teacher motivation, classroom climate, peer-group, and school policies are some of the other environmental variables that have been found to influence learning outcomes (Wang et al, 1990).
Learning is most commonly measured through testing that occurs in school settings. However, test scores and grades reveal little about the specifics of learning and the role of the various factors in the learning process (Sarasson, 2004). A child may have the innate ability to learn but may be underachieving academically for numerous reasons. On the other hand, it has been found that many of the same variables that affect the basic learning process can also affect academic achievement and performance outcomes. Regardless of learning capacity or ability, if a child has had previous academic difficulties and failures, he/she may be less motivated toward future academic achievement and display poorer attitudes toward academics (Demirbas et al., 2006). Therefore, prior academic success can have positive implications for future learning according to Catania, 1984. “Research findings over many years have consistently indicated that young people who do well in school tend to be interested in learning” (Weiner, 1992, p. 260).

Many of the factors affecting academic achievement can also affect learning. Given this association, it is likely that there are associations between a child’s behavior and academic performance. Also, there may be correlations between learning and other behavior. In a study of elementary students’ school achievement, results indicated that lower school achievement has also been associated with children exhibiting more problem behavior (Ak & Sayil, 2006). Bryant, Schulenburg, Bachman, O’Malley, and Johnston (2000) demonstrated similar findings in a study that examined relationships between academic achievement, school bonding, and school misbehavior. Results suggested that students whose early school experiences included misbehavior and
failure demonstrated decreases in academic achievement in the future. A study of 101 elementary school students moving into junior high school demonstrated similar outcomes. Students were interviewed about their feelings toward school, academics, peer relations, and about the transition between elementary and junior high school. A child's academic achievement was judged from their report card grades and on teacher ratings of the child's behavior. Negative correlations were found between academic performance and problem behavior (Berndt & Mekos, 1995).

Attitudes toward School

A child’s motivation, attitude, temperament, and feelings toward school can also affect their learning and educational outcomes. Various studies have demonstrated that the way children learn can affect their ability to achieve academically. These studies have shown that children’s attitudes toward school have demonstrated positive correlations with school achievement (Ak & Sayil, 2006; Marjoribanks, 1992; Price, 2000).

Children who have positive attitudes toward school demonstrate more positive learning outcomes and academic achievements (Ak & Sayil, 2006; Weiner, 1992). Macmillan, Widaman, Balow, Hemsley, and Little (1992) conducted an analysis of four aspects of school attitudes of 1,140 students. Results indicated that students classified as “regular class” students expressed more positive attitudes toward reading and social studies than did “learning handicapped” children did. It is likely that children who experience difficulties in learning hold more negative attitudes toward all academic subjects and school environments. It is also possible that children who have difficulty
learning in specific academic areas may hold negative attitudes toward that subject, but if they have fewer learning difficulties in another area, they may not have negative feelings toward that academic area. A qualitative study working with two 6-year-old girls found that emotions have an impact on the learning process (Price, 2000). Price made the observation that when individuals are being creative, they are happy.

Prior Learning History Affects Learning and MTS Performance
Peoples, Tierney, Bracken, and Mackay (1998) trained 12 participants, ages 22 to 33, to associate nonsense syllables with opposite words such as “good” and “bad” and synonyms of those words. Forty positive and 40 negative words were gathered, and 4 nonsense syllables were created. In the first part of the task, the participants were trained, using a paired associates learning procedure, to associate nonsense stimuli either with positive or negative words. Each nonsense syllable was presented on a computer screen and then a “good” or “bad” word was displayed at the bottom of the screen. Two of the nonsense stimuli were followed by “bad” words and two were followed by “good” words. Each nonsense syllable was paired with 80 adjectives; for example, stimulus one was paired with each of the positive words two times. In the second part of the task, participants were trained to form equivalence classes using an MTS procedure. Equivalence classes consisted of the syllable previously paired with good words, a syllable with no prior training, and a syllable previously paired with bad words. Participants were first reinforced 100% of the time that they made the correct pairings. Participants were then tested for symmetry and transitivity. Participants demonstrated less difficulty forming transitive links with novel stimuli than with those
that appeared in the prior learning tasks. They were unable to form transitive relationships with classes that contained a stimulus that had been paired with a good syllable and a stimulus that had been paired with a bad syllable. Due to the fact that they were unable to form transitive links they were also unable to form equivalence classes. The prior learning, to which the participants were exposed, interfered with their ability to form new equivalence classes in the MTS task.

Watt, Keenan, Barnes, and Cairns (1991) demonstrated that a person’s social history can also interfere with their equivalence responding. Protestant and Catholic names were paired with various nonsense syllables. Those nonsense syllables were then used in an MTS task in which individuals were trained to form equivalence classes between the nonsense syllables. Individuals who had no prior history with the names were able to form equivalence classes. However, many persons from Catholic and Protestant backgrounds were unable to form equivalence classes that required them to pair nonsense syllables associated with Catholic names with those associated with Protestant names. Apparently, a person’s prior learning and/or social history can impact their ability to learn new relations and behaviors.

Plaud (1995) trained participants to create 3-member stimulus classes. Some of the stimulus classes consisted of flower-related words and some of the stimulus classes consisted of snake-related words. He then administered a snake questionnaire to determine whether or not a fear of snakes existed for each participant. Plaud found that those subjects who reported more fear of snakes took more training trials on the snake-related words than those participants who reported less fear of snakes. From this study it appears that feelings and emotions previously associated with the stimuli can affect
formation and learning of new stimulus classes that include those stimuli. As mentioned earlier, emotions and functions related to one stimulus can then be transferred to another stimulus in the same class. The result might be an increased difficulty with learning and forming equivalence relations with any member of the stimulus class that was paired with any stimulus in the emotionally relevant class. For example, if a child had associated negative feelings with school, and school was in the same equivalence class as his teacher and mathematics, then those negative feelings associated with school may also be associated with mathematics and his teacher. Subsequently it may become more difficult for that child to become motivated for and do well in that mathematics course, or anything other academic subjects in the same equivalent class.

The Current Study

Childhood learning and school experiences will shape the academic future of our children. An examination of the factors that affect learning is, therefore, of great value to parents, teachers, and educators. As previously mentioned, learning as measured by an MTS performance can be affected by a child’s attitudes about school, prior learning, behavior, and demographic factors. Children’s learning was examined in light of their attitudes toward school.

The following hypotheses were tested.

Hypothesis 1: Rate of formulating a stimulus class with arbitrary stimuli would positively correlate with a child’s positive attitude about school and appropriate behavior at school, as reported by both the child and the teacher.

This was examined by running correlations between the reports of both attitudes and behavior with MTS performance for the first class, which contains all arbitrary
stimuli. More specifically, performance in the testing phase was used to examine the formation of the arbitrary class (Class 1).

Hypothesis 2: Rate of formulating arbitrary stimulus classes, measured in the same way as in Hypothesis 1, would predict a child’s academic performance.

Hypothesis 3: Children with better academic performance would demonstrate a stronger positive correlation with the rate of formulating stimulus classes that contain school stimuli associated with positive words than the rate of formulating stimulus classes that contain school stimuli associated with negative stimuli.

   This was examined in two ways: the rate of learning directly trained symmetrical relations that paired school stimuli with valenced stimuli was examined, and the testing phase which examines the formation of classes that contain these stimuli and arbitrary stimuli derived in response to them.

Hypothesis 4: Children who have positive attitudes toward school would demonstrate a better rate of response when they are taught to formulate stimulus classes that associate school stimuli with positive stimuli than the rate of response when they are taught stimulus classes that associate school stimuli with negative stimuli.

   The opposite was also hypothesized to occur, such that children with negative attitudes toward school would demonstrate a better rate of response in formulating stimulus classes that associate school stimuli with negative stimuli.

Hypothesis 5: A child’s attitudes about school would mediate the relationship between their ability to learn (as measured by rate of learning in the testing phase, across classes, on the MTS task) and academic performance such that a child with positive attitudes toward school would demonstrate a better academic performance when ability is equal.

   This was examined with the same MTS variables as in Hypothesis 3, along with report of attitudes as the independent variable.

Hypothesis 6: Kindergarten children would demonstrate a better rate of stimulus class formation than children in preschool.

   This was measured by using the testing phase performance, across classes, with
grade as the independent variable.

Hypothesis 7: Older children, regardless of preschool or kindergarten status, would demonstrate a better rate of stimulus class formation than children who are younger.

This was also measured by examining testing performance, across class, as it related to age.

Hypothesis 8: Children’s attitudes toward school would predict academic performance and behavior.
METHOD

Participants

A power analysis for multiple regression analyses, conducted with the G-Power program, revealed that a sample size of 42 would ensure an 80% likelihood of detecting an effect size of 0.2 ($p \leq .05$), which had been reported in previous studies on matching-to-sample tasks (MTS). The sample for this study consisted of 46 children from pre-kindergarten ($n=25$) and kindergarten ($n=20$) classes in 4 different schools, Hodge Elementary ($n=14$), Newton Rayzor Elementary ($n=22$), Primrose ($n=8$), and the Kid’s Corrall ($n=2$), in the Denton, Texas Area. Children ages 4 years old ($n=13$), 5 years old ($n=20$), 6 years old ($n=11$), 7 years old ($n=1$), and 8 years old ($n=1$) participated in the study. There were more males ($n=28$) than females ($n=18$) in this particular sample. See Table 1a for a complete reporting of demographics variables.

Table 1

Demographic Information

<table>
<thead>
<tr>
<th>Demographic Variable</th>
<th>$n$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age ($n=46$)</td>
<td></td>
</tr>
<tr>
<td>4 years old</td>
<td>13</td>
</tr>
<tr>
<td>5 years old</td>
<td>20</td>
</tr>
<tr>
<td>6 years old</td>
<td>11</td>
</tr>
<tr>
<td>7+ years old</td>
<td>2</td>
</tr>
<tr>
<td>Grade ($n=45$)</td>
<td></td>
</tr>
<tr>
<td>Pre-K</td>
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</tr>
<tr>
<td>Kindergarten</td>
<td>20</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
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<tr>
<td>Gender ($n=46$)</td>
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</tr>
<tr>
<td>Male</td>
<td>28</td>
</tr>
<tr>
<td>Female</td>
<td>18</td>
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</table>

*(table continues)*
Table 1 (continued).

<table>
<thead>
<tr>
<th>Demographic Variable</th>
<th>n</th>
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<tbody>
<tr>
<td><strong>School</strong></td>
<td></td>
</tr>
<tr>
<td>Hodge</td>
<td>22</td>
</tr>
<tr>
<td>Newton Rayzor</td>
<td>14</td>
</tr>
<tr>
<td>Primrose</td>
<td>8</td>
</tr>
<tr>
<td>Kid’s Corrall</td>
<td>2</td>
</tr>
<tr>
<td><strong>Ethnicity (n=30)</strong></td>
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</tr>
<tr>
<td>European American</td>
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</tr>
<tr>
<td>African American</td>
<td>3</td>
</tr>
<tr>
<td>Native American</td>
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</tr>
<tr>
<td>Asian</td>
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</tr>
<tr>
<td>Hispanic</td>
<td>5</td>
</tr>
<tr>
<td>Bi-racial</td>
<td>3</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
</tr>
<tr>
<td><strong>Parents Living @ Home (n=30)</strong></td>
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<tr>
<td>Both Parents at Home</td>
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</tr>
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<td>One Parent at Home</td>
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<td><strong>Developmental Problems (n=30)</strong></td>
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<tr>
<td>Yes</td>
<td>4</td>
</tr>
<tr>
<td>No</td>
<td>26</td>
</tr>
<tr>
<td><strong>Income (n=29)</strong></td>
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</tr>
<tr>
<td>0 - $20,000</td>
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</tr>
<tr>
<td>$20,001 - $40,000</td>
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</tr>
<tr>
<td>$40,001 - $60,000</td>
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<td>4</td>
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<tr>
<td>$100,000 +</td>
<td>4</td>
</tr>
</tbody>
</table>

**Measures**

A series of questionnaires were used to examine the child’s behavior and attitudes about school from the child, parent and teacher perspectives. A questionnaire was also given to parents to gather demographic information.
**Demographics Questionnaire**

The parents or guardians of the participants completed a brief demographic questionnaire to determine the age, gender, diagnosis of learning disabilities (if any), developmental history and ethnicity of the child, as well as socioeconomic status (SES) of the family and whether the child has both parents residing in the home.


The BASC-2 is an assessment scale that measures the child’s observable behavior as well as numerous positive and negative aspects of behavior and personality. The BASC-2 is has a child self-report form as well as teacher and parent report forms. For the purposes of this study, only the parent rating scale was used. The scale is divided into age-appropriate forms, and parents completed the appropriate form for the corresponding age of their child. In this study, the preschool rating form covering ages 2-5 and the child rating form covering ages 6-11 were used. The items for each form are rated in a Likert-type format ranging from *never* to *almost always*. The preschool scale contains 134 items and the child scale contains 160 items. Each scale takes an average of 10 to 20 minutes to complete (Reynolds & Kamphaus, 2004).

The BASC-2 was normed on a sample of 4,800 parents from 375 testing sites around the U.S. The children ranged from ages 2 to 21, and the sample was controlled for sex, race, geographic region, socioeconomic status (SES), and special populations. The preschool scale evidenced a high alpha reliability for ages 4-5 in general population (coefficients ranging from .87 to .93). The preschool rating scale also had acceptable
levels of interrater (.66 to .84) and test-retest reliabilities (.81 to .86). Validity was
determined by comparing BASC-2 profiles to children with clinical DSM-IV diagnoses. It
was discovered that children with clinical diagnoses demonstrated distinct BASC-2
profiles (Reynolds & Kamphaus, 2004). It is important to note that the information
obtained from each normative sample is not inherent to each measure, but rather the
data obtained are specific to that particular time and for that particular population.
Therefore, the data obtained from other populations may be different. In this sample, the
BASC-2 questionnaires were entered directly into the BASC-2 scoring software and as
a result the internal consistency reliability could not be calculated.

School Refusal Assessment Scale-Revised (SRAS-R) (Kearney, 2002)

The School Refusal Assessment Scale is a 24-item Likert-type scale. The scale
contains two forms: a child self-report and a parent report. The scales was originally
normed on children as young as 6 years old, however, for the purposes of this study,
parents of children as young as age 4 and in preschool were asked to complete the
survey. Given that the children being recruited for this study were young (many younger
than 6), only the parent report was used. Responses to items range from never
(indicating that the child never behaves in a certain way) to always (indicating that the
child always behaves in a certain way). The scale examines school refusal across four
different domains: 1- the child avoids school related stimuli that provoke a negative
feeling; 2- the child seeks an escape from aversive social situations; 3- the child seeks
to avoid school to gain attention from others; and 4- the child seeks to avoid school to
gain tangible reinforcement outside the school setting (Kearney, 2002). In this study,
each of the domains were correlated with and used to validate the measure of a child’s attitudes toward school.

The SRAS-R was normed on 115 youth, ages 8-17, housed in a juvenile detention facility (partly for some difficulties attending school), and another 53 youth, ages 6-16, referred to a university outpatient clinic for school refusal behavior were also used. The norm population consisted of over 60% male children but was racially diverse. The SRAS-R demonstrated acceptable test retest reliabilities at 7- to 14-day intervals. The test retest correlations were calculated for each of the subscales listed above individually (the correlation coefficients were .63, .67, .78, and .61, respectively). Interrater reliabilities for each scale were also conducted (the reliability coefficients were .57, .49, .64, and .46, respectively). The revised scale scores were correlated with the scores of the original scales to determine the concurrent validity; significant correlations were found to the original scale and the concurrent validity was determined to be at an acceptable level ($r=0.68$) (Kearney, 2002). This sample demonstrated acceptable internal consistency reliability ($\alpha=0.87$). The internal consistency reliabilities were also calculated for each of the domains measured ($\alpha=0.81, 0.45, 0.73, \text{ and } 0.87$ respectively) reliabilities were acceptable for the scales measuring each domain, excluding the scale measuring escape from aversive situations.

**School Attitude/Behavior Questionnaire (SABQ)**

The final scale used was designed specifically for the purposes of this study. A review of the research literature found no school attitude questionnaires that measured the school attitudes of children as young as preschool and kindergarten. Thus, creation
of such a scale was necessary. It was also necessary to develop a scale that teachers could answer in a timely manner that was long enough to gather a sufficient amount of information about the child’s attitudes regarding school and behaviors while in school. So, a teacher version of the same measure was created. The School Behavior Checklist, Behavioral Assessment Scale for Children, Child Behavior Checklist, and Teacher Rating of Academic Achievement Motivation Scale were reviewed (Achenbach, 1991; Miller, 1977; Reynolds & Kamphaus, 2004; Stinnett & Oehler-Stinnett, 1991).

Common questions, themes, and ideas were drawn from these measures and were used in the development of the items for this questionnaire. The SABQ questionnaires were further reviewed and revised by a panel of experts. Three forms were created for the purposes of this study. The child form asks the child how they feel about school. Children responded by saying “Yes” or “No.” Parent and teacher forms of the questionnaires were also utilized, asking the parents and teachers to respond to the questions in terms of how they think that the child would have responded. The questions on the parent and teacher forms are the same as the questions on the child questionnaire. Parents and teacher forms also used the same “yes/no” format. Each form has 26 questions; however, the teacher report form has 15 additional questions asking about the child’s behavior while at school. Teachers were asked to respond to these questions in Likert-type responses, with four response options. Kuder-Richardson reliabilities were calculated for each version of the SABQ and the child version (K-R 20 = .65), the teacher version (K-R 20 = .81) and the teacher behavior version (K-R 20 = .89) demonstrated acceptable levels of reliability, however the reliability was not at an acceptable level for the parent version of the measure (K-R 20 = .10).
**Matching-to-Sample**

The ability of a child to form stimulus classes was measured using a computerized matching-to-sample (MTS) procedure. The computer task was designed to teach the child two relationships (A=B and A=C) by presenting the A1 stimulus, for example, and teaching the child to choose the B1 stimulus in the presence of other B stimuli and then presenting the A1 stimulus and teaching the child to choose the C1 stimulus. The computer then tested transitivity by testing if the child was able to choose the correct C stimulus from an array of C stimuli when presented the corresponding B stimulus and vice-versa.

The program attempted to teach the child to form three stimulus classes, A1=B1=C1, A2=B2=C2, and A3=B3=C3. The A1=B1=C1 stimulus class consisted of three arbitrary symbols. The A2=B2=C2 stimulus class consisted of a school related picture (A2), the word “good” with a smiley face (B2), and an arbitrary symbol (C2). The A3=B3=C3 stimulus class consisted of a school related picture (A3), a frowning face with the word “bad” (B3), and an arbitrary symbol (C3). (See Table 2 for pictures of stimuli used and Figure 1 for a display of the computer setup of the MTS procedure).

Instructions for this task were read to each child as they began the procedure. “Hello, thank you for coming and playing this computer game. The game goes like this; you will be shown one picture at the top of the screen and three different pictures at the bottom. Your job is to choose one of the pictures at the bottom of the screen. During the beginning of the game you won’t know which pictures to pick, but the computer will tell you if you are right or wrong. Later in the game, the computer will stop telling you
whether you are right or wrong and you will just have to pick the answer. Do the best that you can."

Table 2

*Stimuli Used in the MTS Procedure*

<table>
<thead>
<tr>
<th></th>
<th>Equivalence Class</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td><img src="image1.png" alt="Image of A" /></td>
<td><img src="image2.png" alt="Image of B" /> Good</td>
<td><img src="image3.png" alt="Image of C" /></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td><img src="image4.png" alt="Image of D" /></td>
<td><img src="image5.png" alt="Image of E" /> Bad</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td><img src="image6.png" alt="Image of F" /></td>
<td><img src="image7.png" alt="Image of G" /></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Figure 1. MTS computer task layout.*
The MTS task occurred in seven different phases, each phase teaching or testing a different property of the stimulus class. The stimuli were presented in blocks, so that each of the three comparison stimuli was presented four times, in pseudo-random order, until criterion of 11 or more correct out of 12 was met. The first phase of training consisted of computer training the child to match the A1, A2, and A3 stimuli to the B1, B2, and B3 stimuli. Each time the child correctly matched the stimuli (A1 to B1) the correct response was reinforced. The computer “cheered,” a smiley face appeared and the examiner gave the child a small candy. At first the child did not know which to pick but after making selections and receiving reinforcement for correct choices he/she was able to learn which stimuli are paired with each other. The second phase tested for the symmetry relations of the relationships taught in phase one. In other words, the B stimuli were used as the samples and the A stimuli were the comparisons from which to choose. The third phase of training was much like the first, only training to match A1, A2, and A3 stimuli to C1, C2, and C3 stimuli rather than the B stimuli Again, as in the first phase of training, each time the child made the correct selection he/she was reinforced. The fourth phase of training tested for the symmetry relation of the relationship taught in phase three (i.e., C to A). The fifth phase of training included a mixture of the relationships taught in the first and third phases, and reinforcement was given for each correct response. The sixth phase of training tested for a mixture of symmetry relations to the relationships taught in the first and third phases, but no reinforcement was given in this phase. In each of the three training phases the child was required to make correct selection of the stimuli 80% of the time before moving on to the next phase.
The seventh and final phase of training was a test phase. The property of transitivity was tested. This phase was a mixed phase where the B1, B2, or B3 stimuli were presented and the child was given the choice of the C1, C2, and C3 stimuli, or vice-versa. Each of the B and C stimuli was presented two times. As this final phase is a testing phase, none of the trials or selections was reinforced, and there were no completion criteria. There were a total of 12 trials in this final phase of the task.

The computer program collected information on three variables associated with the MTS procedure. The number of trials required to meet criterion in the stage during each of the phases where they are being directly trained to respond to each item, the latencies required to respond to each item; and the percent correct in each phase of the MTS procedure were examined. For each phase, the total number correct was divided by the total time spent to create a rate of learning variable.

Data Collection Procedure

Each child was given an informed consent form to take home, and teachers were asked to send a follow-up reminder home so that children would return the forms. When children returned informed consent forms, a packet of measures containing the demographics questionnaire, SRAS-R, BASC-2 (parent version), and the SABQ (parent version), was sent home for parents to complete. Notes were also sent home reminding parents to complete the packet and to have the child return it to the teacher. Of the 46 children who participated in the study, 30 parents completed and returned the packet of measures. Along with the parent forms, each teacher who completed an informed consent form was asked to complete the teacher version of the SABQ. Each child was
assigned an exclusive identification number. This number was assigned to the data collected by the computer task, as well as to the questionnaires provided by the children, teachers, and parents. A master list was kept in order to combine child, parent, and teacher information. This list was subsequently destroyed. All data with any identifying information, including copies of signed Informed Consent Forms, and questionnaires are currently stored in a locked cabinet in a locked room in Dr. Amy Murrell’s research lab (328) in Terrill Hall at the University of North Texas. Research assistants with access to this research lab have been thoroughly trained in procedures necessary to protect participant confidentiality.

Data was collected individually with each child in a quiet place in each school. Children came from their classrooms to the library or an empty classroom in the school. To reduce the experimental variability all data was collected by the same experimenter. Written instructions were read to each child before the procedure began. The experimenter assisted the child in filling out the child version of the SABQ questionnaire by asking the child questions and recording the appropriate responses. The experimenter then showed the child each of the pictures that would be used in the MTS procedure and asked the child to name each picture. The MTS procedure was then explained to the child and the experimenter remained with the child to deliver a small piece of candy as reinforcement for each correct answer. When the child answered correctly the experimenter said, “That’s right the _____ does go with the _____.” and then gave the child a small piece of candy. When the child responded incorrectly the examiner stated “The ______ does not go with the _____,” and no reinforcement was given. The MTS task lasted 30 to 45 minutes, and the questionnaires administered by
the experimenter took between 5 to 10 minutes. The total time required for participation was not more than 1-hour.
RESULTS

Preliminary Analyses

Prior to the analysis, missing data were examined, at the item level, on a measure by measure basis. Patterns of missing data were looked at, and it was determined that missing data were random and no patterns existed for the missing data. Most of the data that was missing came from the SRAS, and after examining answers to corresponding questions the missing values were set to zero, as was the most common response for the questionnaire, and aligned with their other responses.

Demographic variables were also examined to determine their impact on learning tasks and academic performance. Bivariate correlations were conducted between each rate of learning variable and academic performance as well as rate of learning variables and demographic variables. When the correlations were examined, whether or not a child had both parents in the home, household income, and whether or not the child achieved developmental milestones at typical ages were correlated with academic performance of children. Whether or not children were able to achieve developmental milestones at typical ages was also correlated with total rate of learning, the rate of learning of the each individual class, and rate of training stimulus classes containing school/good stimuli and school/bad stimuli (see Table 3). Therefore, these variables were statistically corrected for in all further analyses.
<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Total Rate of Learning ((n=46))</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>2. Rate of Learning Arbitrary Class ((n=46))</td>
<td>0.607*</td>
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<tr>
<td>3. Rate of Learning School/Good ((n=46))</td>
<td>0.605*</td>
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<tr>
<td>4. Rate of Learning School/Bad ((n=46))</td>
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<td>0.117</td>
<td>0.119</td>
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<tr>
<td>5. Rate of Training School/Good ((n=46))</td>
<td>0.108</td>
<td>-0.098</td>
<td>0.163</td>
<td>0.197</td>
<td>-</td>
<td></td>
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<td></td>
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<tr>
<td>6. Rate of Training School/Bad ((n=46))</td>
<td>0.206</td>
<td>0.019</td>
<td>0.325*</td>
<td>0.093</td>
<td>0.339*</td>
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</tr>
<tr>
<td>7. Academic Performance ((n=43))</td>
<td>-0.136</td>
<td>-0.107</td>
<td>-0.063</td>
<td>0.093</td>
<td>-0.212</td>
<td>-0.098</td>
<td>-</td>
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<tr>
<td>8. Parents living at Home ((n=30))</td>
<td>-0.032</td>
<td>0.127</td>
<td>-0.001</td>
<td>-0.07</td>
<td>0.021</td>
<td>0.156</td>
<td>0.391*</td>
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<td>9. Household Income ((n=30))</td>
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<td>-0.621*</td>
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<tr>
<td>10. Developmental Problems ((n=30))</td>
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<td>-0.125</td>
<td>-0.056</td>
<td>0.391*</td>
<td>-0.275</td>
<td>-0.231</td>
<td>0.467*</td>
<td>0.207</td>
<td>-0.282</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 3

Correlations between Variables Associated with Training and Learning Rates
Means and standard deviation were also examined for each scale used in the study. Each variable of interest was examined to determine if distributions were normal (see Table 4). The SABQ questions that were negatively worded were recoded and the questions were summed to create an SABQ score for each version. The questionnaire was then analyzed to determine its reliability, validity, and presence of outliers. Forty-six participants participated in the study and all 46 children completed the child self-report version. Forty-three teachers completed the teacher version, and 30 of the children’s parents completed the parent version of the measure. The child version ($K-R_{20}=.65$), the teacher version ($K-R_{20}=.81$) and the teacher behavior version ($K-R_{20}=.89$) of the measure demonstrated acceptable levels of reliability, however the reliability was not at an acceptable level for the parent version of the measure ($K-R_{20}=.10$). Due to the extremely low internal reliability of the parent version it was not used to test any hypotheses.

Table 4

*Mean and SD of all Variables Measured*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher SABQ</td>
<td>1.618</td>
<td>.906</td>
<td>43</td>
</tr>
<tr>
<td>Pre-K</td>
<td>1.57</td>
<td>.85</td>
<td>24</td>
</tr>
<tr>
<td>Kindergarten</td>
<td>1.71</td>
<td>3.51</td>
<td>18</td>
</tr>
<tr>
<td>Child Self-Report SABQ</td>
<td>1.71</td>
<td>.808</td>
<td>46</td>
</tr>
<tr>
<td>Pre-K</td>
<td>1.56</td>
<td>.62</td>
<td>25</td>
</tr>
<tr>
<td>Kindergarten</td>
<td>1.98</td>
<td>.90</td>
<td>20</td>
</tr>
<tr>
<td>Teacher Report of Behavior</td>
<td>3.334</td>
<td>1.262</td>
<td>43</td>
</tr>
<tr>
<td>Pre-K</td>
<td>3.28</td>
<td>1.34</td>
<td>24</td>
</tr>
<tr>
<td>Kindergarten</td>
<td>3.51</td>
<td>1.12</td>
<td>18</td>
</tr>
</tbody>
</table>

*(table continues)*
Table 4 (continued).

<table>
<thead>
<tr>
<th>Measure</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRAS-R – avoidance</td>
<td>.59</td>
<td>.64</td>
<td>30</td>
</tr>
<tr>
<td>SRAS-R – escape</td>
<td>.54</td>
<td>.59</td>
<td>30</td>
</tr>
<tr>
<td>SRAS-R – attention</td>
<td>1.37</td>
<td>1.12</td>
<td>30</td>
</tr>
<tr>
<td>SRAS-R – reinforcement</td>
<td>2.61</td>
<td>1.06</td>
<td>30</td>
</tr>
<tr>
<td>BASC – Int. Composite</td>
<td>49.00</td>
<td>13.82</td>
<td>30</td>
</tr>
<tr>
<td>BASC – Ext. Composite</td>
<td>50.37</td>
<td>9.98</td>
<td>30</td>
</tr>
<tr>
<td>BASC – Behavioral Symptoms Index</td>
<td>48.67</td>
<td>11.67</td>
<td>30</td>
</tr>
<tr>
<td>Total Rate of Learning</td>
<td>.043</td>
<td>.020</td>
<td>41</td>
</tr>
<tr>
<td>Rate of Learning – Arbitrary Class</td>
<td>.048</td>
<td>.034</td>
<td>42</td>
</tr>
<tr>
<td>Rate of Learning – School/Good</td>
<td>.041</td>
<td>.035</td>
<td>42</td>
</tr>
<tr>
<td>Rate of Learning – School/Bad</td>
<td>.039</td>
<td>.034</td>
<td>42</td>
</tr>
<tr>
<td>Rate of Training – School/Good</td>
<td>.078</td>
<td>.023</td>
<td>46</td>
</tr>
<tr>
<td>Rate of Training – School/Bad</td>
<td>.069</td>
<td>.022</td>
<td>46</td>
</tr>
</tbody>
</table>

Bivariate correlation analyses were also conducted between the teacher and child versions of the SABQ and all other self-report measures included in the study. The teacher version of the SABQ and the teacher behavioral questions were significantly correlated with internalizing BASC-2 scores, BASC-2 behavioral symptoms index scores, and scores of the SRAS-R for avoiding and escape (see Table 5a). The teacher and child versions of the SABQ and teacher behavioral questions were also all correlated with each other. When examining the skewness and kurtosis, a moderate positive skewness was detected and a square root transformation was completed in order to make the distribution approximate normality. Skewness and kurtosis were examined again after the transformation and using a conservative alpha level ($p<.01$) no outliers were detected (Tabachnik and Fidell, 1996).
Table 5

*Correlation of Measures of School Attitudes and Validated Behavioral Measures*

<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. BASC-Int ( (n=30) )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. BASC-Ext ( (n=30) )</td>
<td>.69*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. BASC-BSI ( (n=30) )</td>
<td>.91**</td>
<td>.76**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. SRAS-Avd ( (n=30) )</td>
<td>.50**</td>
<td>.45*</td>
<td>.64**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. SRAS-Escp ( (n=30) )</td>
<td>0.32</td>
<td>.41*</td>
<td>.48**</td>
<td>.82**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. SRAS-Attn ( (n=30) )</td>
<td>0.22</td>
<td>0.27</td>
<td>0.34</td>
<td>.69**</td>
<td>.51**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. SRAS-Reinf ( (n=30) )</td>
<td>.44*</td>
<td>.59*</td>
<td>.52**</td>
<td>.52**</td>
<td>.57**</td>
<td>.50*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Child SABQ ( (n=46) )</td>
<td>-0.16</td>
<td>0.33</td>
<td>0.05</td>
<td>0.04</td>
<td>0.19</td>
<td>0.2</td>
<td>-0.04</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Teacher SABQ ( (n=43) )</td>
<td>.52**</td>
<td>0.27</td>
<td>.49*</td>
<td>.40*</td>
<td>.41*</td>
<td>0.27</td>
<td>0.33</td>
<td>.30*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Teacher Behavior Report ( (n=43) )</td>
<td>.51**</td>
<td>0.22</td>
<td>.46*</td>
<td>.43*</td>
<td>.44*</td>
<td>0.11</td>
<td>0.21</td>
<td>.36*</td>
<td>.78*</td>
<td></td>
</tr>
</tbody>
</table>
Hypothesis Testing

When testing hypotheses that examine formation of stimulus classes, composite variables were created from the data collected from the matching-to-sample task. The number of correct responses per phase was summed, and total time needed to reach criterion in each phase was calculated. Rate of learning was calculated by dividing the number of correct responses by the total time to reach criterion. This variable was created for each of the stimulus classes, for all phases of testing and training.

Hypothesis 1

The first hypothesis, that stated the rate of learning relations between arbitrary stimuli would positively correlate with a child’s attitudes about school, was tested using bivariate correlations of rate of learning and teacher and child reports of attitudes about school. First, a bivariate correlation of the relationship between the formulation of a stimulus class, as measured by rate of learning calculated for the transitivity testing phase of the MTS arbitrary class and measure of attitudes toward school as reported on by the teacher on the SABQ was conducted. A weak correlation that was not significant was found ($r = -0.253, p > 0.05$). Child reports of their own attitudes about school were also correlated with rate of learning. This correlation was also not significant; $r = -0.088, p > 0.05$). Ability to form stimulus class using only arbitrary stimuli was not related to either child or teacher reports of attitudes about school. The data did not support hypothesis 1.

For all of the following regression analyses conducted, the following assumptions were examined to determine if the data values meet the requirements necessary to accurately conduct the statistics. The assumptions of linearity and homoscedasticity
were examined for each regression equation with a series of scatterplots. Outliers were examined with scatterplots to determine if there were any values that are influencing the regression outcome. There were no violations and thus no corrections needed to be made.

**Hypothesis 2**

The second hypothesis, that the rate of formulating an arbitrary stimulus class would predict a child’s academic performance, was tested using a simple linear regression. The regression was calculated predicting the child’s academic performance, as measured by teacher report of grades, based on their rate of learning an arbitrary stimulus class. The rate of learning an arbitrary stimulus class was again calculated using performance on the arbitrary class in the final transitivity phase. The regression equation revealed that the rate of learning did not predict academic performance. The rate of learning of an arbitrary stimulus class did not account for a significant proportion of the variance of academic performance ($F (1,37)=.429, p>.05, R^2=.011$). Thus, the hypothesis was not supported.

**Hypothesis 3**

The third hypothesis stated that children with better academic performance as defined by teacher report of grades would demonstrate a stronger positive correlation with the rate of learning for stimulus classes that contain school stimuli associated with positive words than the rate of learning for stimulus classes that contain school stimuli associated with negative words. Bivariate correlations were conducted to examine the
relationship of rate of learning a stimulus class containing positive stimuli with academic performance and the rate of learning a stimulus class containing negative stimuli with academic performance. A nonsignificant negative correlation was found for the relationship between stimulus classes with school-good stimuli and academic performance \( (r = -0.212, p > 0.05) \). A weak and non-significant correlation was found for the relationship between stimulus classes with school-bad stimuli and academic performance \( (r = -0.098, p > 0.05) \). A Z-test for two correlation coefficients was conducted to determine if the two correlations were significantly different from one another. Results of the Z-test revealed that the correlations were not significantly different at an alpha level of 0.05 \( (z = -0.37) \). Since the Z-test is not extremely powerful for small sample sizes, a bootstrap analysis of correlation coefficients was originally proposed to better determine if a significant difference existed between the samples. Upon further investigation of the bootstrap analysis it was determined that a bootstrap analysis of correlation coefficients would not provide any additional useful information. The bootstrap would draw pairs of variables from the sample, the variables would then be replaced and another pair of variables would be drawn and replaced. This can be done an infinite number of times, but the overall mean of the bootstrapped correlations would be the same as the mean of the sample. Thus, the results of the comparison of the original coefficients were used to determine that this hypothesis was not supported.

**Hypothesis 4**

The fourth hypothesis stated that children with positive attitudes toward school (as measured by self-report on the SABQ) would demonstrate a better rate of learning
that required them to associate school stimuli with positive stimuli than the rate of learning when they were taught to associate school stimuli with negative stimuli. The opposite was also hypothesized to occur, in that children with negative attitudes toward school would demonstrate a better rate of response in formulating stimulus classes that associate school stimuli with negative stimuli. Bivariate correlations were used to analyze the relationships between attitudes about school and differential rate of formulation of stimulus classes that associate school stimuli with positive or negative stimuli. There was a weak and non-significant negative correlation between child report of school attitudes and rate of learning stimulus classes that contain school stimuli paired with negative stimuli ($r = -0.171, p > .05$). There was also a weak and non-significant negative correlation between child reports of school attitudes and the rate of learning a stimulus class that contained a positive stimuli paired with a school stimulus ($r = -0.209, p > .05$). The same correlations were conducted examining the relationship between teacher report of children’s attitudes about school and the stimulus classes containing school with good stimuli and school with bad stimuli. The correlation was weak and not significant for the relationship between attitudes and the school-good stimulus class ($r = -0.131, p > .05$); the finding was also weak and not significant for the relationship between attitudes and the school-bad stimulus class ($r = -0.061, p > .05$). A Z-test for two correlation coefficients was conducted to determine if the two correlations were significantly different from one another. Results of the Z-test revealed that the correlations were not significantly different at an alpha level of .05 for the comparison of correlations using child reports of attitudes ($z = -0.129$) or the comparisons using teacher reports of children’s attitudes ($z = -0.224$). Again as explained in hypothesis 3 a bootstrap
analysis was proposed but not utilized for the same reasons previously explained. There was not data, therefore, to support this hypothesis.

*Hypothesis 5*

The fifth hypothesis stated that a child’s attitudes about school (as measured by the SABQ) would mediate the relationship between their ability to learn (as measured by the overall latency and number of correct responses on the MTS in the final testing/transitivity phase) and academic performance as measured by teacher report such that a child with positive attitudes toward school would demonstrate a better academic performance when ability is equal. As per Baron and Kenny’s (1986) suggested approach to test for mediation effects, the first analysis conducted was a linear regression predicting a child’s academic performance based on his/her rate of learning. Results indicated that a child’s rate of learning did not predict a his/her academic performance ($R^2=.019$, $F(1,36) = .682$, $p > .05$). A child’s academic performance was not significantly predicted by their rate of learning and therefore violated the first condition necessary to establish a mediation effect. A second linear regression was conducted, predicting residualized SABQ-C scores and SABQ-T (the hypothesized mediator) from rate of learning. Results indicated rate of learning predicted a child’s attitudes toward school as reported by the teacher ($R^2=.209$, $F(1,36) = 9.54$, $p < .05$). However the rate of learning did not significantly predict the child’s self-report of attitudes toward school ($AdjR^2=.014$, $F(1, 39) = 1.588$, $p =.215$), which violated the second condition necessary to establish a mediation effect. A third linear regression was conducted utilizing only SABQ-T scores to predict academic
performance. Results indicated that a child’s attitudes, as reported by the teacher, contributed significantly to the variance in academic performance ($F (1,41) = 27.70$, $p<.05$, $R^2=.403$). The analysis was terminated at that point because the conditions necessary to establish a mediation effect, as per Baron and Kenny (1986), had been violated. Correlations between all variables used in the analyses can be found in Table 6. This hypothesis was partially supported.

Table 6

**Summary of Mediation Analysis (n=42)**

<table>
<thead>
<tr>
<th>Regression</th>
<th>$R^2$</th>
<th>$F$</th>
<th>$B$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- Rate of learning predicting academic performance.</td>
<td>.019</td>
<td>.682</td>
<td>-.136</td>
<td>.414</td>
</tr>
<tr>
<td>2- Rate of Learning Predicting Attitudes (SABQ-T)</td>
<td>.209</td>
<td>9.54</td>
<td>-.458</td>
<td>.004</td>
</tr>
<tr>
<td>3- Rate of Learning Predicting Attitudes (SABQ-C)</td>
<td>.014</td>
<td>1.59</td>
<td>-.198</td>
<td>.215</td>
</tr>
<tr>
<td>4- Attitudes (SABQ-T) Predicting Academic Performance</td>
<td>.403</td>
<td>27.70</td>
<td>.635</td>
<td>.000</td>
</tr>
</tbody>
</table>

**Hypothesis 6**

The sixth hypothesis, kindergarten children would demonstrate a better rate of stimulus class formation, measured by overall (across stimuli class) rate of learning, than children in preschool was tested using a simple linear regression. The regression was calculated predicting a child’s rate of learning based on their grade level. The regression equation revealed that a child’s grade level did not predict a child’s rate of learning ($F (1,39)= .597$, $Adj R^2= -.010$, $p=.444$). Grade level did not account for a
significant proportion of the variance in rate of learning, so this hypothesis was also not supported.

_Hypothesis 7_

The seventh hypothesis stated that older children, regardless of preschool or kindergarten status, would demonstrate a better rate of stimulus class formation, measured by overall (across stimuli class) rate of learning, than children who are younger was tested using a simple linear regression. The regression was calculated predicting a child’s rate of learning based upon their age. The regression equation revealed that a child’s age level calculated in months did not predict a child’s rate of learning ($F(1,24)= .001$, $Adj \, R^2=-.042$, $p=.971$). Age did not account for a significant proportion of the variance in rate of learning, thus not finding support for this hypothesis. A post-hoc power analysis was conducted for this regression given the small number of participants; results indicated ($1-\beta = .05$) an appropriate level of power was not achieved to detect whether or not an effect was for the influence of a child’s age on their rate of learning.

_Hypothesis 8_

The sixth hypothesis, children’s attitudes toward school would predict academic performance and behavior, was tested using a simple linear regression. The regression was calculated to predict the child’s academic performance based on their attitudes about school. The regression revealed that better attitudes toward school as reported by both the child and the teacher predicted better academic performance. Teacher’s
perceptions of children’s attitudes toward school accounted for a significant proportion of the variance in academic performance \( (F(1,41)=27.70, p<.05, R^2=.403) \). Children’s report of attitudes about school also accounted for a significant proportion of the variance of academic performance \( (F(1,41)=4.60, p<.05, R^2=.101) \). See Table 7 for a summary of the variances accounted for by each predictor.

Table 7

<table>
<thead>
<tr>
<th>Variable</th>
<th>( R^2 )</th>
<th>( F )</th>
<th>( \beta )</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>SABQ-T</td>
<td>.403</td>
<td>27.70</td>
<td>.635</td>
<td>.000</td>
</tr>
<tr>
<td>SABQ-C</td>
<td>.101</td>
<td>4.60</td>
<td>.310</td>
<td>.038</td>
</tr>
</tbody>
</table>

The impact of child’s attitudes toward school on their academic performance was further analyzed utilizing household income, developmental milestones, and parents living in the home as covariates. As was stated earlier these variables were also shown to correlate significantly with academic performance. When teacher’s perceptions of children’s attitudes were examined with the aforementioned covariates as predictors, the regression model (Model 1) accounted for a significant proportion of the variance in academic performance \( (F(1,25)=8.450, p<.05, R^2=.617) \). When each variable was examined to determine it’s individual impact on academic performance, teacher report of child attitudes continued to account for a significant portion of the variance of academic performance \( (p<.05) \). A post-hoc power analysis was conducted for this regression given the small number of participants; results indicated \( (1-\beta = .99) \) an acceptable level of power for the analysis conducted.
Child’s self-report of attitudes toward school were then examined with the same covariates as mentioned previously as predictors of academic performance. As before, the regression model (Model 2) continued to account for a significant proportion of the variance in academic performance ($F(1,46)=3.2$, $p<.05$, $R^2=.379$). Each of the variables was then examined to determine the specific impact on academic performance. Children’s self-report of attitudes toward school did not account for a significant proportion of the variance when analyzed in conjunction with the covariates. See Table 8 for a summary of the two regression models.

Table 8

**Summary of Simple Multiple Regression Analysis with Covariates for Variables Predicting Academic Achievement ($N=25$)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$B$</td>
<td>$SE B$</td>
<td>$B$</td>
</tr>
<tr>
<td>SABQ-T</td>
<td>-.169</td>
<td>.087</td>
<td>-.349</td>
</tr>
<tr>
<td>SABQ-C</td>
<td>.128</td>
<td>.111</td>
<td>-.264</td>
</tr>
<tr>
<td>Income</td>
<td>.084</td>
<td>.313</td>
<td>.048</td>
</tr>
<tr>
<td>Developmental Delays</td>
<td>.220</td>
<td>.337</td>
<td>.102</td>
</tr>
<tr>
<td>Parents @ home</td>
<td>.459*</td>
<td>.118*</td>
<td>.586*</td>
</tr>
<tr>
<td>$R^2$</td>
<td>.617*</td>
<td></td>
<td>.379*</td>
</tr>
<tr>
<td>$F$</td>
<td>8.45*</td>
<td></td>
<td>3.2*</td>
</tr>
</tbody>
</table>

*p<.05
DISCUSSION

The purpose of this study was to examine the factors that affect learning and academic performance in early school-aged children, specifically, looking at children’s attitudes toward school, demographic variables, and behavior. The results of hypothesis testing, clinical implications, limitations of the current study and future directions of this area of research will be discussed.

Hypothesis 1

The hypothesis that the rate of learning would positively correlate with a child’s positive attitudes about school, was not supported by the results of the current study. Children’s learning ability (as measured by MTS performance) was not related to their attitudes about school. There was no evidence that greater learning ability was related to better attitudes toward school and better behavior while at school. The results of this study depart from previous literature that demonstrated that students with positive attitudes toward school were found to be more successful at learning tasks (Ak & Sayil, 2006). Macmillan et al. (1992) also reported that children who experience learning difficulties will likely hold more negative attitudes toward school. This effect was not readily evident in the current sample.

Zill and West (2001) explained that many pre-kindergarten and kindergarten children who have recently started school may still have highly positive attitudes toward school. The largely positive attitudes of children who have recently started school may be one explanation for the findings diverging from previous literature. These mainly positive attitudes toward school likely contributed toward little variability in the reports of
child attitudes toward school. Additionally, children in the Macmillan et al. (1992) study were “learning handicapped” or were already shown to have significant difficulties with learning and as a result held negative attitudes toward school. The children in the current study were “average” kindergarten and pre-k children. Most children were identified as average to above average in academic performance. It may be the case that for young children negative attitudes develop as a result of an identified learning handicap. While there were few children who had identified and labeled learning difficulties, the result may not have been detectable in this sample.

Hypothesis 2

The hypothesis that stated, the rate of learning would predict academic performance. In that a greater learning ability failed to predict better academic performance, this hypothesis was not supported by the results. The performance on the final testing phase of the arbitrary stimulus class on the MTS task was assumed to measure innate learning ability. Children who were able to learn the correct relations quickly and appropriately pair one arbitrary stimulus with another arbitrary stimulus did not demonstrate better academic performance than children who were not able to quickly learn an arbitrary stimulus class. Previous literature showed that many of the same variables that affect basic learning processes also affect academic achievement (Demirbas, 2006).

Thus, it was reported that children who have a greater ability to learn and perform a new task quickly and accurately would also perform better academically. The reason that children who performed better on the learning task did not perform better
academically may be explained by a few factors. One reason is that children in the current study had significant difficulty learning the task sufficiently so that they could accurately complete the testing or transitivity phase of the task. In previous literature children received training in equivalence relations over a period of days and numerous sessions, while in the current study only one training session was completed. If children had been trained sufficiently so that a higher percentage were able to make the transitive connections of the equivalence relations, there would have likely been some difference in academic performance for children who had a lower rate of learning. There was also little variability in children’s academic performance as reported by the teachers. Children at this age often do not receive traditional grades, and teachers were asked to give subjective reports of children’s grades (Above Average – A/B student, Average – C student, Below Average – D/F student).

Hypothesis 3

The hypothesis that a better academic performance would demonstrate a stronger positive correlation with learning stimulus classes that contain school stimuli associated with positive words/pictures than would the rate of learning stimulus classes that contain school stimuli associated with negative words/pictures was not supported by results of the current study. The results showed no difference in the relationship to academic performance for children who more accurately and quickly form the relationship between school and good. A child's prior learning history can affect their academic performance. Previous studies have demonstrated that previous experience with stimuli can affect a child’s ability to form new stimulus classes. Plaud (1995)
demonstrated that emotions previously associated with a stimulus can affect the formation of a new stimulus class that contains that same stimulus. Therefore, it was hypothesized that children who have previously had positive experiences with school would more quickly form relationships between school stimuli and positive stimuli, and, conversely, that children who have negative experiences with school would more quickly form relationships between school stimuli and negative stimuli. If children have negative experiences with school then transformation of functions suggests that those poor attitudes would likely transfer to other aspects of school. For example, they may transfer those poor attitudes to assignments, tests, other children at school, which may result in poor academic performance. People who have negative emotions associated with a stimulus class may display a depressed learning ability for anything associated with that class (Peoples et al., 1998; Watt et al., 1991). Therefore, these results were unexpected and surprising.

A potential explanation for the divergence may be that the stimuli used in the MTS task were not specific enough to elicit an emotional response in children who have previously had positive or negative learning experiences with school. If children did not have an emotional reaction to the stimuli, or if the stimuli were not representative of school for the children, they would likely not have had any differences in rate of learning between stimulus classes. Another possible reason may be that there may not have been enough children in pre-k and kindergarten who have had negative experiences with school to have a valid sample.
Hypothesis 4

The results of the current study did not support the hypothesis that children with positive attitudes toward school would demonstrate a better rate of learning stimulus classes that associate school stimuli with positive stimuli than the rate of learning when they were taught to associate school stimuli with negative stimuli. Children with positive attitudes toward school did not learn relationships between school stimuli and positive stimuli at a faster rate or with higher accuracy than the relationships of school stimuli and negative stimuli. Previous literature would suggest that children with positive attitudes toward school would more quickly associate school with positive stimuli than with negative stimuli. Children who have difficulty with learning have more negative attitudes toward academic subjects and school environments (Macmillan et al., 1992; Weiner, 1992). The opposite has also been shown to be true in that children who have more positive attitudes toward school would have an easier time learning.

As was stated earlier, children who have recently started school still have mostly positive attitudes toward school (Zill & West, 2001), which may be one explanation of the results that did not confirm the hypothesis. The resulting constricted variability in reports may have made a significant difference, if one exists, very difficult to detect. Children may also have some difficulty distinguishing between stimuli and specific features of the stimuli presented in the MTS task (Mondloch & Thomson, 2008). On the other hand it may likely be the case that there are not actual differences between children's ability to learn relationships between school and good stimuli or school and bad stimuli.
Hypothesis 5

It was hypothesized that a child’s attitudes about school would mediate the relationship between their learning ability and academic performance, such that positive attitudes toward school would result in better academic performance. The outcomes only partially supported that hypothesis and indicated that a child’s learning ability was predictive of their attitudes toward school, but not performance. The predictive pathway was supported by previous research that demonstrates a child’s learning history can have an impact and direct correlation with their academic performance (Hauser-Cram, Durand, & Warfield, 2007). A child who demonstrated an increased learning ability also demonstrated more positive attitudes toward school. These results however, did not indicate that a child's learning ability was predictive of their academic performance. Previous literature stated that children who learn more quickly and with greater ease also do better academically (Carroll, 1985). As stated earlier, children had difficulty learning the relations sufficiently with the limited training. Additionally, the reports of academic performance were subjective. The results of the current study suggest that a child’s attitudes about school do not mediate the relationship between learning ability and academic performance. However, further research with additional training sessions could yield differential results.

Hypotheses 6 and 7

The results did not support the hypothesis that kindergarten children would demonstrate a better rate of learning than children in preschool. Results indicated that a child's grade status, kindergarten or pre-kindergarten, did not predict their ability to
learn. Previous literature suggests that genetics contribute to intellectual and learning ability, and that it does not change over time (Carroll, 1985). Older children were hypothesized to demonstrate a better rate of learning than younger children. The findings of the current study examined the age of children while controlling for grade status, specifically, whether or not older children in kindergarten had higher rates of learning (or learning ability). The results did not support the hypothesis in that older kindergarten children did not demonstrate better learning performance than younger children. However, a post hoc power analysis that was conducted indicated that there was not sufficient power to detect an effect, if one was present.

Previous research by Morrison et al. (1997) suggested that younger children may not learn as much or as fast as older children in the same grade. On the other hand recent research has found that students who start kindergarten at an older age learn at the same pace once they enter school. They may indicate some initial deficit in skill development but at an older age the gap narrows (Elder & Lubotsky, in press).

Hypothesis 8

It was hypothesized that children's attitudes about school would predict academic performance and behavior. Results supported the hypothesis and indicated that children's attitudes toward school, as measured by the SABQ, predicted their academic performance, in that children with more positive attitudes toward school performed better academically. This finding was consistent with previous research which demonstrated that children's attitudes toward school positively correlated with academic performance (Ak & Sayil, 2006; Hauser-Cram et al., 2007; Marjoribanks, 1992; Price,
Hauser-Cram et al. 2007 conducted a study with children in kindergarten and first grade asking questions about how children felt about school. Researchers later followed up with children in 5th grade and found that reported positive attitudes in kindergarten predicted higher 5th grade literacy skills. Beginning school with a positive attitude about school will place children at an advantage over children who enter school with negative attitudes.

Children who have positive feeling toward school will likely have a greater motivation to learn and to succeed. On the other hand, children who have negative attitudes toward school may be singled out or ignored by teachers and, therefore, further lose interest in school (Hauser-Cram et al., 2007). A child’s attitudes can have a significant impact on the learning process (Price, 2000). A child’s negative attitudes toward school may be the result of a variety of events. Previous failure can lead to negative attitudes about school and academics, which may lead to less motivation and perpetuate the academic failure in the future (Demirbas et al., 2006).

General Implications

The current study has several implications for educators working with young children and for parents of young children during early school years. A child’s experiences in early school years will shape his/her attitudes about school and subsequently be a significant influence on future academic performance. The way that children feel about school will affect their motivation and willingness to work toward attaining good grades and positive academic outcomes. If children’s negative attitudes about school and the source of those attitudes are ascertained early educators and
Parents can address those causes of negative attitudes and attitudes. Children may be able to change their outlook on school and increase their probability of positive academic outcomes.

Children who have difficulty learning and who learn at a slower rate display poorer attitudes about school, additionally those children who have poorer attitudes about school also demonstrate worse academic performance. On the other hand, there is no significant direct prediction of academic performance based on learning ability. While it cannot be said that learning ability directly predicts academic performance, but by influencing a child’s attitudes about school may also indirectly influence academic performance. While many believe that inherent learning ability (or intelligence) is an innate and immutable biological factor, others believe that it can be influenced and changed depending upon the child’s context. If an early measure of learning ability or learning ability were to be devised, using a type of MTS or something different, parents and teachers may be able to target and remediate learning deficiencies that could be contributing to children’s poor attitudes about school. If learning ability can be increased and learning deficiencies remediated, attitude toward school may become more positive; and, again, academic outcomes would likely increase. Children’s ability to associate school with positive stimuli or with negative stimuli does not seem to be affected by their attitudes about school or by their academic performance. This data suggests that young children’s attitudes toward school may be easily influenced or changed if they have had previously negative attitudes about school.

One final implication of the results of the current study is that it may not matter the age at which the child enters formal schooling. Children do not show differential
learning ability or learning ability solely based on age. There was not relationship between age or grade level and learning ability. These findings are in agreement with a recent study reporting that although there is a trend to keep children out of school and enter into kindergarten 1 year later than normal, it may not make a significant difference in the child’s learning ability or eventual academic outcome (Elder & Lubotsky, in press).

Limitations

The current study offered valid findings which may have a significant impact and considerable implications for future childhood education. However there were numerous limitations of this project. First, the children who participated in the study were very young and many of them, in pre-kindergarten and kindergarten class, were in their first year of school. As stated earlier, Zill and West (2001) found that children who are just starting school have mostly positive attitudes toward school. This resulted in little variability in student reports of their attitudes. Research has also shown that young children typically show a “yes-bias,” often answering “yes” to questions that are phrased in a yes-no choice manner (Moriguchi, Okanda, & Itakura, 2008). The measure that was used to determine child attitudes was constructed in a yes-no format, with most of the questions being positively worded.

Teacher and child reports of child attitudes had acceptable internal consistency reliability; however, parental reports showed extremely low internal consistency reliability. Perhaps this can be explained by the fact that most student attitudinal measures are based on a single component, and may not accurately predict the construct (Subramaniam & Silverman, 2007). Historically parents have proven to be
poor reporters of their children’s behavior. Additionally the academic achievement information gathered by teachers was subjectively determined (above average – A/B student, average – C student, below average – D/F student), as kindergarten and pre-kindergarten students do not normally receive traditional grades. It should also be noted that a teacher’s previous feelings about a student may have biased their ratings of the child’s attitudes and behavior. Future studies should observe children and code their behavior in order to reduce this bias.

The MTS procedure was conducted on a laptop computer. Most previous studies that utilized MTS with young children were conducted using cards or similar items. Children initially had considerable difficulty with the MTS procedure on the computer, and it was modified so that children could better complete the task. There may have been variables associated with technology and completing the MTS task on a computer that influenced the child’s measured learning ability. A computer that used a touch screen allowing children to physically touch and identify the stimuli would likely avoid the limitations present due to the computer. Children have demonstrated some previous difficulty recognizing faces in prior MTS tasks (Mondloch & Thomson, 2008). Children may have had the same type of difficulty in recognizing differences in the stimuli that were used in this study. Additionally, when examining variables related to school, the stimuli that were used to represent school may not have been relevant to school for some children. Future studies should allow children to choose the stimuli that represent school or the phenomena being studied. Furthermore, children had one training session to train the equivalence relations in the current study, and children, therefore, had significant difficulty forming the transitive connections in the equivalence relations.
Previous studies with young children performed numerous training sessions over multiple days to adequately train children so that they could form transitive links between stimuli. If additional training sessions had been conducted, it may have been better to have separated the children who were able from those who were unable to form the equivalence classes. The more pronounced learning differences potentially demonstrated by further training would provide better information for the analysis of impact on academic performance and attitudes.

The sample size for the current study was small and data were gathered from participants at four different schools: two public schools with 14 and 22 participants at each school and two private schools, with 8 and 2 participants. The small number of participants in the study also limited the power, of some of the statistical analyses used, to detect an effect. Results may not be generalizable to the population based on the small samples gathered from individual schools and the extremely small samples from private schools. Children who experienced some developmental delays displayed correlations with child attitudes, learning ability, and academic achievement. Further investigation into learning disabilities and developmental delays may yield more information as to their true effects on learning ability and school attitudes.

Future Directions

Several suggestions for future directions of the current research have been mentioned throughout the course of the discussion. Some of these suggestions include a more in-depth analysis of children’s attitudes toward school; more objective measures of academic performance for children in younger grades of kindergarten and pre-
kindergarten, and touch screens for computer MTS research with children. Additionally there were quite a few parents who did not complete questionnaires. Future studies could conduct further analyses to examine differences that may be present for children whose parents did and did not complete the questionnaires.

As with most psychological research, reproduction of the current study should be undertaken with a larger and more diverse population to increase the external validity and generalizability of findings. Research could be conducted with older children to determine if the phenomena found in young children are the same with older children. Older children would also likely display greater variability in their attitudes about school. Longitudinal research in this area would be especially beneficial in that researchers could follow children, examine how attitudes toward school develop and change, and the effects that has on children's educational outcomes and learning ability in school. When conducting further research on more diverse populations, researchers should take nested models into consideration, in that students with teachers who are in different schools, in different districts, in different states, may perform differently and that students in the same group may share some variance. Researchers should obtain as wide a variety of samples from schools, teachers, districts and states to obtain the most generalizable results possible. Additionally, recruiting more children who have been diagnosed with learning disorders would provide additional useful information as to the effect of learning difficulties on attitudes toward school and academic outcomes.

Lastly, the current study suggests future directions for intervention in the early education of students. Children who have poor attitudes toward school early may have difficulties academically. If poor attitudes could be identified early, teacher and parents
could then intervene and seek the reason for the negative attitudes about school. If parents and teachers could find the reasons behind children’s poor attitudes about school, these issues could then be addressed, and this would likely decrease the probability of poor outcomes.
REFERENCES


