HOW FAST CAN THEY LEARN? DEVELOPMENTAL DIFFERENCES IN INFORMATION ACQUISITION OF EDUCATIONAL AND NARRATIVE CONTENT THROUGH PACING AND DISTANCE

by

CYNTHIA ANN NICHOLS

A DISSERTATION

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ABSTRACT

Many studies have shown that children can learn from television, but few studies have explored how children process the information that is presented to them. The present study investigates this process through the constructs of the capacity model, which is built upon three basic components: the processing of narrative content, the processing of educational content, and the semantic distance between the two. According to the capacity model, a variety of factors influence the processing of narrative and educational content including cognitive maturity of the child, prior exposure to the material, the degree to which the educational content is integral or tangential to the narrative content (i.e., distance), and the complexity of the formal features in the program (e.g., pace).

More specifically, the purpose of this study was to examine how the pace of children's educational programming and the semantic distance between educational and narrative content influence the acquisition of information for preschool children between the ages of three and five. In order to select the proper stimuli for the quasi-experimental portion of the project, a content analysis was conducted to examine the pace and distance of 80 programs on three child-oriented television networks—Nick Jr., PBS Kids, and Playhouse Disney. The results of the content analysis indicated considerable variability in pace and distance in E/I programming television and guided the selection of stimulus material for the main study.

The quasi-experimental portion of this study used 3- to 5-year-old children (*N* =

135) in a 3 (pace) x 2 (distance) factorial, within-subject design to measure the acquisition of educational content and narrative content. Findings indicated that children typically acquired narrative content more easily than they acquire educational content, and as the complexity of a program increased, children's ability to process information decreased. Pace, distance, and children's cognitive maturity played a significant role in the acquisition of information, as well as liking and recognition. However, the sensitivity of these variables varied. Additionally, the results revealed that the degree of semantic distance and children's cognitive maturity played a significant role in their ability to acquire information from educational and narrative content.

DEDICATION

This dissertation is dedicated to everyone who helped me through the trials and tribulations of getting my degree. In particular, my family, friends, and professors who stood by me throughout. I couldn't have done it without you.

LIST OF ABBREVIATIONS AND SYMBOLS

a	Cronbach's index of internal consistency
df	Degrees of freedom: number of values free to vary after certain restrictions have been placed on the data
F	Fisher's *F* ratio: A ration of two values
M	Mean: the sum of a set of measurements divided by the number of measurements in the set
N	Size of overall data set
n	Size of a cell or group
p	Probability associated with the occurrence under the null hypothesis of a value as extreme or as more extreme than the observed value, significance level
r	Pearson product-moment correlation
SD	Standard deviation
t	Computed value of a *t* test
χ^2	Chi-squared
$<$	Less than
$>$	Greater than
$=$	Equal to
%	Percentage

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Only having two pages to thank everyone who has helped me live through a doctoral program doesn't seem like enough. I am a truly blessed individual, and I would never have been able to finish this program without the guidance of my committee members, help from friends, and support from my family—for that I am truly grateful.

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CHAPTER 1

Introduction

Television is a vital part of our world. For decades, families have been gathering around the television for news, entertainment, socialization, and education. In fact, 99% of homes in America have at least one television, with households averaging between two and three sets (Van Evra, 2004). Television and media use is so ubiquitous in America that it is a constant companion—children can not only watch their favorite DVDs as they travel, but they can also watch age-specific television channels, such as Nickelodeon, the Disney Channel, and Cartoon Network, at any time via Sirius backseat TV (Sirius XM Radio Inc., 2009). Watching television is no longer the family activity that it used to be. Many children have televisions (68%), VCR/DVD players (54%), video game consoles (49%), and computers (31%) in their bedrooms (Roberts, Foehr, & Rideout, 2005), which often isolates them from their families. And watch television they do. Studies have found that children between the ages of two and seven typically use these media an average of 3.5 hours per day, and children as young as one year old are exposed to an average of six hours per week (Van Evra, 2004). According to the Kaiser Family Foundation, an unprecedented amount of media access is available to young children—the majority (63%) of 2- to 7-year-olds have a computer in their home, 32% have a TV in their bedroom, 26% play video games daily, and nearly half (47%) spend as much time with screen media as they do playing outside (Roberts, Foehr, Rideout, & Brodie, 1999).

Generally, children watch programs and interact with media that are understandable and interesting to them—whether they may have positive or negative effects has little impact on a child's viewing choice. For more than 50 years, researchers (and producers) have attempted to understand these programs and their relationship with children, what effects television might have on children, how programs gain and hold children's attention, how programs affect children differently at different ages, and what impact it has on them (Pecora, 2007). This research has examined nearly every topic, from media effects and violence to advertising and marketing, and has ranged from simple effects studies to longitudinal studies that examine changes in attitudes, knowledge, and behaviors (Pecora, 2007). These questions have helped scholars begin to understand the complexities of attention to television.

One model used to explore children's relationship with television is the *capacity model* (Fisch, 2000, 2004a), which explores how children comprehend educational content. Comprised of three basic elements—the processing of narrative, the processing of educational content, and the distance between the two—the capacity model posits that comprehension of educational material depends on the processing of both the educational content and the narrative content (Fisch, 2004a). The capacity model also emphasizes that *distance*, or the degree to which the educational content is integrated with the narrative content, plays a key role in comprehension of educational content. When educational content is integrated throughout the narrative and distance is small, Fisch posited that children will have an easier time processing and remembering the curricular lesson. However, if the distance is large and the educational content is not related to the narrative content, then the two compete for resources in working memory, and a child will have greater difficulty retaining the educational material (Fisch, 2009). Since most educational television programs include both narrative and educational content, viewers must process both simultaneously to comprehend it fully—something that, because of the narrative complexity of a message, young children may not be able to do.

An integral part of children's attention to television may be linked to the formal features of the narrative content in a program, for they can automatically trigger an orienting response from children (Huston et al., 1981).The measurement of how these features change from scene to scene is known as *pacing*. As one might guess, the pace of a show can vary from being slow and ordered, such as on *Sesame Street*, or fast and frenetic, such as on *Yo Gabba Gabba* (Nichols & Murray, 2009). Studies have indicated that programs with a faster pace can hold the attention of young children quite easily (Bickham, Wright, & Huston, 2001; Wright et al., 1984), for young children are perceptually oriented and can be easily affected by salient formal features in a program (Campbell, Wright, & Huston, 1987; Huston & Wright, 1983; Miron, Bryant, & Zillmann, 2001). However, as children age, they become less reliant on salient formal features in order to understand the context of a show. The rapid nature of some programs can produce mental arousal in older children, and can increase the short-term alertness, or vigilance, in the viewer (Zillmann, 1982; Zillmann, Williams, Bryant, Boynton, & Wolf, 1980). However, if the pace of an educational program is too densely packed for a young viewer, it may continuously orient the child to the program but not permit them to process the information within it (Singer, 1980; Wright et al., 1984). To aid memory and comprehension, the material should be presented in a slow, linear fashion, with multiple repetitions of material (Crawley et al., 2002; Guernsey, 2007). The ideal pace in educational television has yet to be determined; however, research on children's learning has suggested that the ideal pace is one in which children can best grasp the information presented in a program (Singer & Singer, 1998).

According to Fisch (2000), the developmental changes that occur in young children may influence how they process narrative and educational content. This development does not happen overnight, but rather sequentially over four distinct stages that represent different points in a child's understanding of reality (Piaget, 1926, 1952, 1970; L. J. Smith, 1995). As children grow, their ability to process information develops, which allows him or her to understand more complex information and messages. In the *stage theory of cognitive development,* the four stages—the sensorimotor period (0 to 2 years), preoperational (2 to 7 years), operational concrete (7 to 11 years), and formal operational (11+ years)—have been used to help scholars understand not only how children attend to television at different ages, but why children can learn differently from the same educational material.

The proposed study aims to investigate how children learn from television utilizing the perspective of the capacity model (Fisch, 2000, 2004a). Since the capacity model explores how children comprehend educational content in television programming, this study will use three parameters of capacity modeling, specifically through pacing, cognitive complexity, and distance, to explore the relationship that children have with television. By using these variables, this study will examine how pace (low, medium, high) interacts with distance (small, large) to influence the comprehension of educational television of preschool children (ages three through five) who are likely in the symbolic function substage of the preoperational level of cognitive development.

For the purposes of the proposed research, narrative complexity will be measured through the pacing index (McCollum & Bryant, 2003), which measures the rate at which formal features in a television program, such as the number of times a character speaks or the length of a visual or audio element, change (Huston et al., 1981). This study will also use distance (*d*) in the capacity model, which is operationally defined as the degree to which educational content is integral or tangential to the overall narrative in a program (Fisch, 2002). In the research at hand, all the programs used in the sample will have an Educational/Informative (E/I) label.

A proposed pre-test will help confirm the cognitive level of each subject. By doing so, the investigator will be able to determine if the child's cognitive abilities and knowledge are influencing factors in the study. Additionally, parental surveys and a script for investigators will be used to examine additional external variables. Controlling as many external variables as possible allows the investigators to determine how distance and pace work together or against one another to influence attention and recall of educational content.

CHAPTER 2

Review of Literature

CTW and Educational Television

For many years, producers of television programs held little regard for the cognitive and developmental needs of children, and thus children's television was a wasteland that lacked meaningful and educational content—only cartoons, slapstick humor, and situational comedies were available for children's entertainment (Cooney, 2000). Prior to *Sesame Street*, many of the programs available to children were locally produced, had low production quality, and were condescending to children (Palmer & Fisch, 2001). Although some of these programs—such as *Captain Kangaroo*—conveyed positive messages, there were no programs in existence intended to teach children specific curricular goals.

In 1968, the Children's Television Workshop (CTW) was established to help change this. As part of its efforts to not only entertain children, but educate them as well, CTW created two in-house departments—one for television production, which was responsible for the creative aspects of programming, and another for conducting empirical research on child development and learning. The educational specialists who worked with CTW came from a wide variety of disciplines including child development and linguistics, gender and cultural studies, sociology, art, music, literacy, and other relevant fields (Cole, Richman, & McCann Brown, 2001). This collaboration allowed CTW to create a new television series designed to help low-income, preschool children develop school readiness skills (Palmer & Fisch, 2001). The program was *Sesame Street.* Backed by an $8 million grant, CTW was able to create 130 expertly planned, curriculum-based, hour-long episodes that were backed by empirical research and addressed pre-determined educational goals. *Sesame Street* used a unique combination of integrating high production quality, entertaining content, and formative and summative research into each program. This model, known as the Children's Television Workshop Model, or CTW Model (see Figure 1), allowed the producers, educational content specialists, and researchers to create an integrated program that was not only educationally sound, but appealing to its intended audience as well (Fisch & Truglio, 2001; Mielke, 1990).

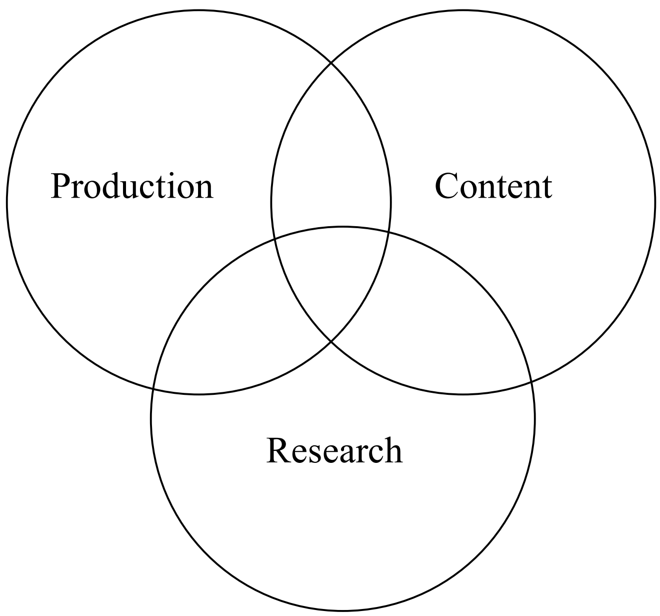


Figure 1: The Children's Television Workshop Model (Fisch & Truglio, 2001)

Despite the success of *Sesame Street*, the producers and scholars at CTW occasionally struggled to find a balance between entertaining and educating young children. For example, they found segments that were dramatic, tense, and loud often caught the attention of a child, but children could not remember the educational content—a finding that was later backed up by pacing and formal feature research (e.g. Huston & Wright, 1983). Segments that were slow lost the child's attention, but had better acquisition of information. From this, the concepts of emphasis, repetition, pace, and sequencing became integral parts of every program (Palmer & Fisch, 2001). Although some critics were initially resistant to the idea of developing an educational program with specific curricular goals, *Sesame Street* soon became a rousing success that revolutionized the children's television industry (Cooney, 2000; Fisch, 2004a). Today, many educational television programs use *Sesame Street* and the CTW model in order to develop successful curriculum-based programs.

Curriculum-Based Programs

Until the 1990s, *Sesame Street, The Electric Company, 3-2-1 Contact,* and *Mister Rogers' Neighborhood* were some of the only educational programs available to children, primarily airing on the Public Broadcasting Service (PBS). However, in 1996, a little blue cartoon dog began to change the world of educational television. *Blue's Clues,* which was televised on Nickelodeon from 1996 to 2006, was designed to teach preschoolers problem-solving and flexible thinking skills (Anderson et al., 2000), and was unique to television in many ways. Unlike other children's programs at the time, producers of *Blue's Clues* were not only focused on the bottom line, but also on creating a curriculum that systematically provided tools to develop the minds of its young viewers. Producers also sought to engage children, so that they would respond to the main characters during quasi-interactive segments. When a character had a question about a situation, he or she would ask the children in the audience for help. Additionally, once a program had been shown, it would repeat for four consecutive days to allow children the chance to master the presented lesson (Crawley, Anderson, Wilder, Williams, & Santomero, 1999). By teaching children critical thinking skills, repeating episodes, and creating quasi-interactive, kid-friendly characters, the show became extremely popular. Soon after *Blue's Clues* became one of the most popular children's shows on television, a plethora of similarly designed curriculum-based programs began targeting infants, toddlers, and young children.

Currently, a variety of curricular programs on television seeks to provide the tools to develop the social, cognitive, and affective needs of children (Berry, 1993), many of which use the CTW model. Programs popular among preschool children include *Sesame Street, Arthur, Martha Speaks, Maya and Miguel, Dora the Explorer, Go, Diego, Go!,* and *The Little Einsteins,* among others. Despite the fact that the curricular goals of these programs may vary from show to show, several overarching themes, formal features, and characteristics can be found in such educational (E/I) programming. For example, almost every E/I program on children's television uses music and sound prominently in order to gain the attention of children and allow them to follow and process the information more easily (Fisch, 2004b). Additionally, the grammar and sentence structure of the dialogue is kept relatively simple so that children can easily understand it (Rice & Haight, 1986). When words are targeted in a program's curricular lesson, they are often emphasized in the program by adding vocal stresses, presenting them in isolation, and frequently repeating them (Fisch, 2004b; Rice, Huston, & Wright, 1986). Additionally, characters in many curriculum-based programs often address the audience by speaking directly to them.

In a majority of television programs, school readiness emerges as the primary curricular goal. The term can be defined as "children's preparedness to succeed in school" (Fisch, 2004a, p. 37), which touches a variety of topics, including academic skills, interpersonal skills, as well as self-confidence and cooperation. According to Singer & Singer (1998), this "preparedness" contributes to school readiness in a variety of ways by providing basic academic curricula—such as reading, vocabulary, mathematic, social, and science skills—in an entertaining fashion. Indeed, educational television has been found to foster imagination, curiosity, and creative play; encourage emotional development; introduce new vocabulary and mathematical skills; encourage flexible thinking and problem solving abilities; as well as develop communication skills, self-confidence, cooperation and engagement (Fisch, 2004a).

Another theme that can be found in educational television is the promotion of pro-social behavior, which attempts to reduce aggression and stereotyping, among other things, while promoting friendly interaction and altruism (Mares & Woodward, 2001). Three children's programs in particular—*Sesame Street*, *Mister Rogers' Neighborhood*, and *Barney & Friends*—have distinguished themselves as having notable amounts of pro-social content, being extremely popular with children, and having a positive lasting effect on children. According to Mares & Woodard, children who watch such programs have been shown to persist "longer on tasks, [be] more likely to obey rules, and [be] more likely to delay gratification without protest" (2001, p. 193). Although every program on television cannot live up to the standards of these three (Anderson, 2003; Fisch, Truglio, & Cole, 1999; Wright, Huston, Scantlin, & Kotler, 2001), many of the programs in children's television, such as *Blue's Clues* (Anderson et al., 2000; Crawley et al., 1999;

Linebarger & Walker, 2005), *Between the Lions* (Linebarger, Kosanic, Greenwood, & Doku, 2004), *Reading Rainbow* (Wood & Duke, 1997), and *Dora the Explorer* (Linebarger & Walker, 2005) have been shown to assist children in developing pro-social behavior, such as sharing, cooperation, self-restraint, problem-solving and thinking skills, in addition to aiding vocabulary building, beginning math skills, and reading skills (Berry, 1993).

Positive and Negative Effects

From its inception, *Sesame Street* has been the benchmark for children's television and educational programming and, for nearly 40 years, researchers have been trying to determine what positive or negative effects the show has had on its audience. Early results regarding the effects of *Sesame Street* were generally encouraging. After two seasons of production, pretest-posttest gains showed that 3- to 5-year-olds who watched *Sesame Street* regularly showed greater gains in academic skills—such as classification, the alphabet, numbers, and rationality—than did children who watched only a little of the educational program. This finding was consistent across socioeconomic status (SES), gender, age, and geographic location (Ball & Bogatz, 1970; Bogatz & Ball, 1971; Diaz-Guerrero & Holtzman, 1974). These findings were challenged, however, when an extensive secondary analysis of the data indicated the findings were only supported when parents were coviewing with children (Cook et al., 1975).

In general, *Sesame Street* has helped children become better prepared for school and has shown long-term results. Empirical studies indicated that *Sesame Street* could be credited with increasing vocabulary skills, enhancing school readiness, encouraging pro-social behavior, enhancing reading skills, and developing problem-solving skills (Bickham et al., 2001; Fisch et al., 1999; Mielke, 2000; Zill, 2001). One longitudinal "recontact" study found that high school students who watched *Sesame Street* as preschoolers were significantly more likely to have higher grades in core classes, read more books, test better in science and math, and have lower levels of aggression than children who did not watch the program (Huston, Anderson, Wright, Linebarger, & Schmitt, 2001).

Despite the positive effects associated with educational television, it is not without criticism. Critics of children's programming contend that television is universally inimical to the development of children (Mander, 1978a, 1978b; Zimmerman & Christakis, 2005); further, they claim it is detrimental to creative thinking (Healy, 1990), hampers children's play (Schmidt, Pempek, Kirkorian, Lund, & Anderson, 2008), and potentially leads to aggression and violent behavior (Johnson, Cohen, Smailes, Kasen, & Brook, 2002). A common criticism of children's programming is that the rapid pace and frenetic nature of many programs does not allow children the time needed to process the information presented (Singer, 1980). Indeed, critics have noted that if any information processing occurs, it would be at a superficial level as opposed to a conceptual one (Huston et al., 2001).

Additionally, critics claim that "frequent viewing could lead children to develop patterns of short attention span and superficial, nonreflective learning style ... One would also expect negative influences on creative and reflective thinking" (Huston et al., 2001, p. 134). This has caused some concern among scholars, leading to a debate over whether children should be watching television at all (Kirkorian, Wartella, & Anderson, 2008). In

1999, the American Academy of Pediatrics (AAP) recommended that children under the age of 24 months should not be exposed to any electronic media, and that older children should be limited to no more than one or two hours per day (American Academy of Pediatrics, 1999; Anderson & Pempek, 2005). However, despite these recommendations, the amount of television that American juveniles watch has increased from 5.5 hours per day in 1999 to 6.5 hours per day in 2005 (Roberts et al., 2005; Roberts et al., 1999), and it can be argued that for at least a portion of the time, they are not necessarily watching television (or using media) that is targeted to their demographic.

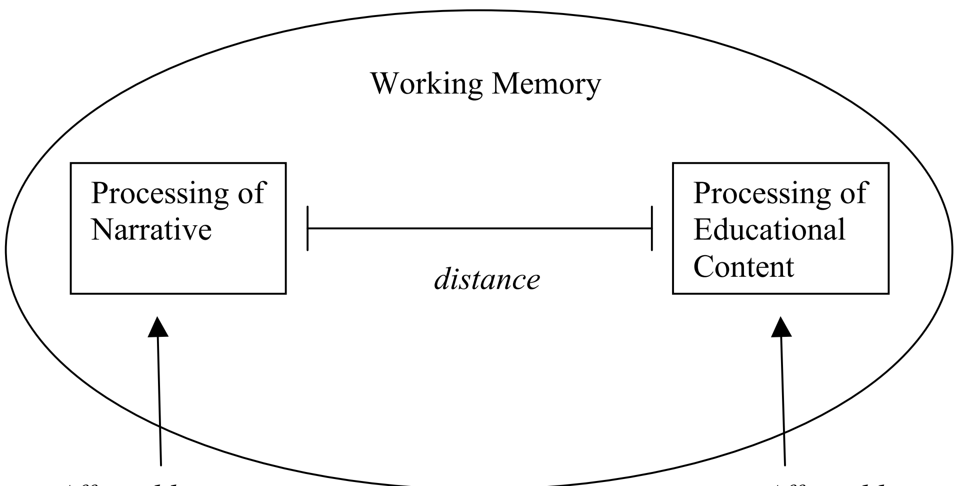
Following this recommendation from the AAP, Razel (2001) conducted a meta-analysis of studies related to academic achievement and television viewing, and determined that a for children under the age of seven, a positive correlation exists between viewing time (i.e., the number of hours viewed per day), age, and academic achievement; however, this same correlation becomes negative after age seven. The results of the analysis indicated that for small amounts of viewing time, academic achievement increased, but after a certain number of hours watching television, achievement decreased; however, the optimal viewing time varies by age. For preschoolers, the viewing time that led to the greatest amount of measurable academic achievement was between 2.5 and 3.5 hours per day. However, elementary school-aged youths (ages 7 to 12) had an optimal viewing time ranging from 2.5 to 1.5 hours per day. Optimal viewing time for youths ages 12 to 20 ranged from 1.5 to 0 hours per day (Razel, 2001). From this, Razel developed a complex model of viewing and achievement, which suggests that children could receive benefits from watching a certain amount of educational television depending upon age and amount of viewing.

Capacity Model

One mechanism used to illustrate how children learn from television is the capacity model (Fisch, 2000, 2004a), which explores how children comprehend educational content in television programming. The model is composed of "three basic elements: processing of narrative, processing of educational content, and the distance (*d)* between the two—that is, the degree to which the educational content is integral or tangential to the narrative…" (Fisch, 2004a, p. 144). Within the model, Fisch suggested that several governing principles—such as prior knowledge of content and interest in the story—are employed by children when processing television, which assist in the simultaneous understanding of both educational content and narrative content.

Introduced by Fisch (2000), the capacity model has roots in cognitive psychology and the limited capacity of *working memory*, which refers to the mental resources required for the viewers' comprehension of television content (Fisch, 2009). According to many scholars (e.g., Armstrong & Greenburg, 1990; Beentjes & van der Voort, 1993; Lang, Geiger, Strickwerda, & Sumner, 1993; Lorch & Castle, 1997; Meadowcroft & Reeves, 1989; Thorson, Reeves, & Schleuder, 1985), working memory plays a key role, for both children and adults, in higher-order cognition and the thinking process, and is often associated with cognitive tasks—such as textual comprehension, logical reasoning, and mathematical problem-solving (Demetriou, Christou, Spanoudis, & Platsidou, 2002). Working memory has only a limited amount of resources available for processing. Therefore, if the demands of a given task, also known as the *cognitive load*, exceed the available resources in working memory, the material cannot be processed effectively (Fisch, 2004a; Gopher & Donchin, 1986; Hart, 1986).

According to the capacity model, a child's comprehension depends on the cognitive demands of simultaneously processing both *narrative* and *educational content*. In this model, narrative refers to the story that is presented to the viewer during the program, whereas the educational content is the curricular lesson that is intended for the viewer to learn. When processing educational content, the limited capacity of working memory can pose a challenge to young viewers, for E/I television typically presents narrative and educational content simultaneously (Fisch, 2009). The comprehension of the educational content depends not only on the demands of processing it, but on processing the narrative content as well; however, little research has explored this.



Affected by:
Viewer Characteristics
Prior knowledge: story/characters, story schemata
Knowledge/schemata: formal features
Interest in subject matters
Verbal reasoning ability
Short-term memory

Program Characteristics
Complexity/coherence of story
Need for inferences
Fit to existing story schemata
Temporal organization
Advance organization

Affected by:
Viewer Characteristics
Prior knowledge of content
Interest in content

Program Characteristics
Clarity of presentation
Explicitness of content
Visually concrete content
Advance organizers

Figure 2: Capacity Model

Distance. A unique feature of the capacity model is distance *(d)*, or the degree to which educational content is integral or tangential to the overall narrative in a program (Fisch, 2002). This concept, which was dubbed “content on the plotline” by the Sesame Workshop, adopts language from previous studies that have examined story structure in text comprehension (Mandler & Johnson, 1977; Rumelhart, 1975; Thorndyke, 1977; Trabasso, Secco, & van den Broek, 1984). Typically, distance can be thought of in terms of how educational content causally connects to the structure of the story (Fisch, 2004a). The degree to which the educational content is incorporated into the plot can be measured through the integration of the educational content into the plotline, the clarity of the educational content (Wilson, Kunkel, & Drogos, 2008), the redundancy of the content, as well as the amount of direct address that occurs (Fisch, 2004b; Rice et al., 1986). Fisch (2000) has defined two categories for distance: small—when educational content is causally connected to a large number of subsequent events—and large—when educational content is embedded in the plot in a manner that does not forward the story. Although the term of distance has been used in a variety of educational psychology research (e.g., Simons, 1999), it is important to note that, in reference to the capacity model, this distance is not related to transfer of learning.

To understand the concept of distance, imagine an episode of the cartoon program *Kim Possible*—a program that features Kim Possible, a high school student and secret agent, saving the world from supervillains each week. The episode would have a large distance if in the middle of chasing an evil villain, Kim Possible stops to give a grammar lesson on the proper use of “*i* before *e* except after *c*,” a topic that is not relevant to the plot and, therefore, tangential to the narrative. However, if Kim Possible gives a mathematical explanation using rate, time, and distance of how long it will take to catch the super villain while chasing him, then the content could be considered integral to the narrative and the distance would be small (Fisch, 2009). This small distance minimizes the mental resources needed to comprehend the educational content, and therefore would result in greater comprehension of the material than the same scene with a large distance.

According to the capacity model, if the distance between educational and narrative content is large, indicating that the curricular lesson is tangential to the story, then the two types of content must compete for working memory, or the mental resources required to process it. If this is the case, working memory will generally be more devoted to processing the narrative, and children will be less likely to be able to process educational content as deeply (Fisch, 2000). This may cause children to have difficulty recalling and comprehending the educational content in the program. However, when the distance is small (i.e., well-integrated into the narrative), then the opposite effect may happen. In this case, educational content will be integrated with the narrative and the two will work in correspondence with each other (Fisch, 2004a). Thus, the complementing content may reduce the amount of mental resources needed to process and understand the material (Fisch, 2002), and comprehension of the educational content is likely to be strengthened.

The distance construct predicts that comprehension of educational content is stronger when the distance of that educational material is small. One study examining this prediction showed that children who viewed the television program, *Cro*—a program that intertwined science, math and technology closely into the plot of its episodes—had a significantly greater understanding of science and technological principles than children who did not view the program (Goodman, Rylander, & Ross, 1993). However, there was not significance with every episode, but rather with the ones in which educational content was closely integrated with narrative content (i.e., had a small distance).

One consideration of the distance construct, is that prior exposure to television may allow children the opportunity to engage in semantic and syntactic analysis of the educational and narrative content in children's television programming. As children mature, they begin to develop schema to process and practice complex cognitive tasks such as these. As these tasks are repeated, they become more automatic, and the schema used to process them develop and require less working memory (e.g., Shriffin & Schneider, 1977). Although distance is merely defined as the tangential relationship of the educational content to narrative content in a program, it should be noted that children can learn from both the auditory and the visual messages in a program (Baggett, 1989), thus creating the need to measure semantic distance.

Although children can construct the semantic meaning of a story from either the audio or the visual information that is presented to them, when the two are presented together, they often compliment each other and create greater recall of the information (Kozma, 1991). Thus, distance could be measured either syntactically or semantically. The nuances of syntactic and semantic distance have been examined by scholars, and a number of classification systems have been developed to understand the nuances within them (e.g., Blattner, Sumikawa, & Greenberg, 1989) However, little research has examined them in relation to children and television. Thus, it becomes very difficult to apply these classification systems directly to the capacity model.

In essence, semantic distance is the measure of the closeness of the relationship between the image or symbol and what it intends to represent (McDougall, Curry, & DeBruijn, 1999). On television, this degree of relatedness can range from being very clear to being vague and symbolic. For example, a children's television program with clear semantic distance would be one that uses imagery that pulls from existing schema, is easy to understand, and relies on children's previous experiences (i.e., on the program *Imagination Movers*, the main characters hold a giant number seven as they sing about the seven days of the week). However, if the imagery is vague, then the relationship between what is presented and what it represents is much weaker (McDougall et al., 1999). Thus, children would not be able to fully comprehend, interpret, and process its meaning. Therefore, producers use certain program characteristics in order to assist in the processing of educational content. In order to properly measure semantic distance, several program characteristics—such as the clarity of the message, the integration of the material into the plotline (Wilson et al., 2008), the redundancy of the lesson, and whether a character directly addresses the audience members in regards to the educational content of the show (Fisch, 2004b; Rice et al., 1986)—must be examined.

Processing of Narrative. Any program on television has some form of narrative, for it is, in essence, the story that is presented to the viewer. According to Huston & Wright (1997), television viewers actively construct their understanding of narratives. In doing so, they use many references that are often used in reading, such as drawing inferences from the narrative and accessing prior knowledge to interpret the information—a process that is also presumed to take place in working memory, creating additional demand during the processing of information (Fisch, 2004a).

Viewer Characteristics. There are multiple factors, relating to both the individual viewer and the television program itself, that influence how working memory processes narrative content. One of the most influential (developmental) factors in the capacity model is prior knowledge of the subject matter, since what an individual already knows can influence what he or she is able to learn. As children age, they naturally acquire more knowledge about the world around them and develop schemata to help them understand and process information, allowing new topics to be understood more easily (Fisch, 2004a). This skill, known as conservation (Piaget, 1970), can be seen in children as young as three (McGarrigle & Donaldson, 1974; Rose & Blank, 1974). As children gain familiarity and perspective on their world, they also reduce the demands of processing information in working memory, regardless of whether the information is narrative or educational content. Indeed, one study by Newcomb and Collins (1979), indicated that children's comprehension of narrative was likely to be greater when the child's ethnic and social background were the same or similar to the characters in the program, indicating the power of the schemata developed through prior knowledge.

In essence, prior knowledge establishes schemata and scripts in the minds of viewers before they watch a program. By establishing these schemata, prior knowledge enables viewers to process and assimilate the information from the program more easily and reduces the demands for processing (Fisch, 2009). Although not identical, the schemata children use to understand television are developed in much the same way as story and textual schemata (Bower, 1978; Spilich, Vesonder, Chiesi, & Voss, 1979). Research on the development of these schemata have indicated that story schemata (i.e., understanding the basic story structure of a program) can aid in comprehension of narrative content (Fisch, 2000; Mandler & Johnson, 1977; Thorndyke, 1977), by reducing processing effort, increasing memory for the narrative, and allowing for flexibility in distributing resources in working memory (Meadowcroft & Reeves, 1989).

For example, to better understand prior knowledge, consider how different individuals might watch a football game. For a person with no previous exposure to football, the rules and actions of the game would make little sense and processing these events could overwhelm him or her. However, someone who has had previous exposure to football would have less difficulty understanding the game, as he or she would not only be able to process the action in the game, but also be able to pull from prior knowledge to understand the intricacies of an on-side kick in the last two minutes of the game. The amount of prior knowledge that is available to an individual contributes to how well an individual can process large chunks of information, with greater amounts of prior knowledge allowing improved information processing. The more familiar an individual is with a topic, the more automatic learning about that topic becomes. With this automation, working memory becomes more efficient and parallel processes in the working memory function in a deeper fashion (Norman & Bobrow, 1976; Shriffin & Schneider, 1977). Specifically, the capacity model posited that as the textual schemata develop and prior knowledge increases, the greater the likelihood that processing demands decrease, allowing for the information to be comprehended more deeply (Fisch, 2000).

As the demands of processing narrative can ease with prior knowledge, Fisch (2004a) also posited that it can “be lessened by knowledge of the conventions of television. Television conventions include ‘formal features’ such as cuts, fades, and montage that convey narrative information in and of themselves” (p. 148). According to

Fisch (2000), the understanding of formal features allows viewers to be able to process information more easily. If a child can comprehend the pace of the cuts and changes in a program, then they will understand the narrative content in the program more easily, because they will not be distracted by the orienting features. If the child cannot understand the frenetic nature of some formal features, a deeper processing of narrative content will not occur (Huston & Wright, 1983; R. A. Smith, Anderson, & Fischer, 1985).

Another viewer characteristic that can lessen the demands of processing both educational and narrative content is the general cognitive ability of the viewer. Over the years, scholars have examined children's attention to television and have found that cognitive abilities and skills, such as the ability to develop and use short-term memory or verbal skills, can influence how a child perceives, understands, and interacts with a television program (Eckhardt, Wood, & Jacobvitz, 1991; Jacobvitz, Wood, & Albin, 1991; Pezdek, Simon, Stoeckert, & Kiely, 1987). When these cognitive skills are more developed, the resources required for working memory to process the information from television decrease and working memory becomes more efficient.

Despite the impact that prior knowledge, understanding of formal features, and cognitive ability may have on the demands of working memory, none would have much influence if the viewer had no interest in the information itself. Thus, viewer interest is also a key factor in reducing the demand of working memory, and is something that producers continually try to meet—as the viewer becomes more interested they automatically dedicate more cognitive resources to processing the information (Scheifele, 1998). This reduces cognitive demands and facilitates comprehension of the narrative, but may also increase comprehension of educational content (Fisch, 2000); studies have discovered significant correlations between viewer interest and learning (e.g., Scheifele, 1998).

Program Characteristics. Although viewer characteristics are important, so are program characteristics. Scholars have found that a variety of characteristics, such as the complexity and explicitness of the narrative have as much influence on process as viewer characteristics (Fisch, 2004b). Accordingly, one of the most influential program characteristics is the complexity of the narrative, or the number of events in a story and the connections among them (Fisch, 2000; Mandler & Johnson, 1977; Rumelhart, 1975), also known as advanced organizers. These advanced organizers are merely cues that alert viewers to subject matter in a program, and by orienting viewers to certain subjects, they allow for the demands of working memory to be reduced. Specifically, this reduction of demands potentially allows material, such as narrative and educational content, to be processed more deeply. Since these advanced organizers orient viewers, it allows them to identify information to be centrally routed versus peripherally routed. Information that is centrally routed tends to be more highly processed by the viewer, whereas peripherally routed information does not require extensive processing. Both routes are influenced by motivation, or the need for cognition, and cognitive ability (Petty & Cacioppo, 1986), and the route is chosen depending on the information being processed and how much elaboration is desired. Because less working memory is needed to process centrally routed information, when a child is exposed to advanced organizers, working memory distributes resources to process and centrally route those advanced organizers (Fisch, 2004a). When information is presented again later, fewer resources are needed to recall and retain centrally routed information. Research on these advanced organizers has indicated that using them can result in greater comprehension of narrative content (Calvert, Huston, & Wright, 1987).

Research examining formal features and program complexity has found that when children are exposed to clear, simply structured events in a story, these orienting schemata help children process the information from the story, for they place fewer demands on working memory (Mandler & Johnson, 1977; Meadowcroft & Reeves, 1989). Programs that have complex story structures may be too rapid and frenetic to support deep processing. Although the complexity of the narrative (or formal features) may catch the attention of the child, the rapid changes in the schema, also known as the pace (McCollum & Bryant, 2003), would be likely to place greater demands on working memory, thus reducing the comprehension of the material (Fisch, 2004a).

An additional program characteristic that can influence the ease of processing the narrative is the degree of inference of the narrative (Collins, 1983), in correspondence with the linearity of a program (Collins, Wellman, Keniston, & Westby, 1978). Research has indicated that the explicitness or clarity of a program can influence the demands of working memory. As the narrative of the program moves from explicit to implicit (i.e., scenes become scrambled or anachronic and information becomes more sporadic or subtle), the viewer must rely more on inferences in the program to process the information. According to Fisch (2000), inferences draw on working memory capacity, and require greater resources to process. When this occurs, comprehension of content is typically weaker. However, prior knowledge can aid in the comprehension of inferences. As children age, their knowledge base allows them to draw upon schemata that can aid them in processing inferences, drawing less on working memory (Fisch, 2004a). The more developed the schemata, the more easily a child can draw from inferences when viewing a program (Omanson, Warren, & Trabasso, 1978).

Processing of Educational Content. As many parents can testify, there are a multitude of programs on television—some educational, some not. Despite the likelihood that many children are exposed to programs that are not necessarily beneficial, many programs do possess the Educational/Informative (E/I) label and may have the potential to help children learn educational lessons. Processing the information that is presented on educational programs, according to the capacity model, is influenced by many of the same factors as narrative content, including both viewer and program characteristics, such as prior knowledge, viewer interest, and complexity of the content (Fisch, 2004a).

Viewer Characteristics. Much like narrative content, educational content is influenced by the viewer characteristics of prior knowledge and viewer interests. According to Newcomb & Collins (1979), prior knowledge of a subject matter allows for better comprehension of the narrative, and cognitive demands for processing the information is reduced. Thus, if a child has been previously exposed to material in educational content, they are more likely to comprehend the information within it—a philosophy that many E/I programs utilize. For example, programs such as *Go Diego Go!* and *Dora the Explorer* often use repetition in the program to emphasize certain points in the lesson, something that is thought to reinforce the lesson to children. This repetition allows children to process the educational content with greater ease and less working memory each time. Another program that emphasized repetition is Nickelodeon's *Blue's*

Clues, which presented the same program for five consecutive days, thus repeating the lesson to children multiple times and providing them with a greater likelihood of retaining the information that was presented (Bickham et al., 2001; Bryant et al., 1999). As previously discussed, viewer interest is an important part of processing, for the more a person is interested in the educational content presented, the more they are likely to dedicate resources and memory capacity to processing the information (Scheifele, 1998).

Program Characteristics. Much like narrative content, the processing of educational content is also influenced by program characteristics—such as the complexity of the educational content, and the explicitness of the message. For example, much like narrative content, demand on working memory for processing educational content decreases as educational content becomes more explicit and has a low complexity (i.e., a slow pace with few formal features). The clearer the message is, the fewer demands it makes on working memory (Fisch, 2009). Additionally, empirical evidence suggests that working memory demand for processing educational content will decrease if the educational information is visually concrete, especially for younger children (Fisch, 2004a).

Finally, paralleling narrative content, advanced organizers can assist young viewers in identifying centrally routed information and comprehending presented information (Calvert et al., 1987). These features orient the viewer and allow them to extract the essential information and create schemata for processing, thus reducing the demands on working memory (Fisch, 2004a).

Governing Principles. In the capacity model, Fisch specifies several governing principles that influence the allocation of resources for processing narrative and educational content. These principles include narrative dominance, availability of resources, allocation of resources, prior knowledge, and inference (Fisch, 2009).

Narrative Dominance. According to Fisch (2000), the capacity model posits that in processing, priority is generally given to comprehension of narrative content, a principle called narrative dominance. This supposition is based on the finding that children's comprehension of television is influenced by the motives for viewing (i.e., whether a child is watching a program to learn or to be entertained) (Salomon & Leigh, 1984). If a child's primary reason for watching is for entertainment, then, according to Fisch (2004a), the child would automatically default to devoting more working memory to narrative content. When the educational content and narrative content are in competition with each other—which occurs when the distance is large or the demands of processing are high—working memory will likely be devoted to processing narrative content before educational content. Since many children primarily use television for entertainment purposes (Greenburg, 1974), most would automatically devote resources to processing the narrative content as the entertaining content is likely to be centered there.

As previously discussed, educational and narrative content can be routed both centrally and peripherally. Typically, educational content can be thought to have both implicit and explicit content, which can lie on the surface (explicit) of the program (i.e., a character on *Sesame Street* saying "B is for ball"), or may lie deep (implicit) within the program. Additionally, since it is quite possible for educational content to be embedded within narrative content, a young viewer could easily watch a program that presents both narrative and educational content simultaneously. In such a circumstance, the young viewer would likely default to processing the narrative content first, as that is the primary message (Fisch, 2004a). Although no empirical studies have tested narrative dominance, some scholars have indicated that narrative content in television programs can be more easily recalled than educational content (Peel, Rockwell, Esty, & Gonzer, 1987).

Availability of Resources. The second governing principle in capacity model is that the availability of resources that an individual has when processing educational content is merely a function of the resources remaining from the processing of the narrative content (Fisch, 2004a). Since the model places emphasis on narrative dominance, it is logical to assume that deficiencies in resources available will most likely occur in processing educational content (Fisch, 2004a). Like other research in information processing (Norman & Bobrow, 1976; Shriffin & Schneider, 1977), the capacity model posits that when these processes occur concurrently (i.e., the distance between narrative content and educational content is minimal), fewer resources are available in working memory than if the processes were to occur in isolation.

When processing information in working memory, educational content often depends on several factors—such as distance and the complexity of the narrative—to determine how many resources are available to it (Fisch, 2000). For example, when the narrative is simple and processing demands are low, more resources are available to process educational content. However, when educational content is presented in a clear and linear fashion (i.e., processing demands are low), fewer resources are needed to process it and the resources remaining in working memory after processing narrative content may suffice. As previously mentioned, when the distance between the narrative and the educational content is minimal, the two processes can work concurrently and can contribute available resources to processing the other (Fisch, 2004a). Thus, under the general principles established by the capacity model, the combination that would yield the weakest amount of comprehension would be when the distance between educational and narrative content is large and the demand for processing narrative content is high. Under the same principle, the greatest amount of comprehension of educational content would occur when distance is small, and processing demands are low (Fisch, 2009).

Allocation of Resources. Although narrative content remains dominant, the capacity model also posits that young viewers can also allocate resources differentially between narrative and educational content (Fisch, 2000). According to scholars, a variety of factors can influence how children attend to the narrative of the program, including reasons for watching (Kwaitek & Watkins, 1981; Salomon & Leigh, 1984), comprehension, and parental comments and coviewing among others (Collins, Sobol, & Westby, 1981). Additionally, the capacity model posits that children may be able to learn more from educational television when instructed to view a program for learning (Fisch, 2000; Kwaitek & Watkins, 1981). Therefore, depending on the circumstances, a child may be motivated to allocate more resources to processing more of the salient information that is presented in educational content (Fisch, 2004a). However, it is important to note that although there may be greater allocation of resources to educational content, the processing of the narrative content is not abandoned completely. When the concept of narrative dominance combines with the idea that educational content is embedded more deeply in a program than narrative content, the capacity model implies that when an individual allocates more resources to educational content, they may reduce the processing of narrative content, but can not eliminate it altogether (Fisch, 2009). However, little research has examined this in relation to the capacity model.

Developmental aspects of the model. As studies have indicated, children's comprehension of narrative and educational content improves with age, as does their ability to attend to television (Huston & Wright, 1997). According to Anderson & Pempek (2005), by 30 months children are able to effectively pay attention to and comprehend information from television. The effectiveness of television may increase at this age because of the development of cognitive abilities. Multiple theories have been used to explore the development of children's cognitive abilities, including social cognitive theory, Piagetian theory, and Chaiken's heuristic-systematic processing model. According to Fisch (2000), the developmental changes that occur in young children may affect how processing of narrative and educational content changes with age. Indeed, as much as the model is affected by the processing of narrative and educational content, it is also impacted by development factors—which can affect the demands of processing both narrative and educational content, as well as the allocation of resources in working memory (Fisch, 2004a).

As children mature, they develop a greater ability to understand the narrative and educational content in a program, and can hold increasing amounts of information in working memory (Dempster, 1981; Gathercole & Baddeley, 1993), thus decreasing the demands of processing information in working memory (Fisch, 2004a). Various studies indicate that this change is not an increase in the speed in processing information, but rather an indication that as children mature they can process information more effectively in working memory (Demetriou et al., 2002; Fry & Hale, 1996; Kail, 1992; Kail & Park, 1994). The ability to process information more efficiently is advantageous to children, particularly when watching television, as the pace of television is often varied and can change rapidly. This type of increase may allow for deeper processing of narrative and educational content, as well as a greater efficiency and effectiveness in managing these parallel processes (Fisch, 2009).

Additionally, as children mature they develop the ability to manage multiple tasks in working memory. According to Lawson & Kirby (1981), this ability is something that can be taught to children, implying that the ability to manage multiple tasks—such as processing narrative and educational content simultaneously—may increase with age and experience. If this ability does indeed increase with age and experience, then (under the auspices of the capacity model) as a child watches more television programming, he or she will be able to balance resources among the processing of narrative and educational content more easily—a skill that would only improve with practice (Fisch, 2000).

Summary. The capacity model is built upon three basic components: the processing of narrative content, the processing of educational content, and the distance between the two. The parallel processes of narrative and educational content are affected by several factors, including prior knowledge, story complexity, clarity of information, need for inferences, use of advance organizers (i.e., formal features), and cognitive ability of the viewer (Fisch, 2000).

How resources are allocated to working memory for the processing of narrative and educational content is influenced by three factors. First, narrative content is a default priority in working memory. Resources will almost always be allocated to processing it first. Second, when narrative dominance occurs and there are high demands for processing narrative (i.e., numerous advance organizers, transitions, and formal features), there are fewer resources available for processing educational content and the two processes must compete for resources. However, if there are low demands for processing narrative content, (i.e., few transitions, a slow pace, and few advanced organizers), then there are more resources available to allocate for the processing of educational content. Finally, resources can also be allocated to educational content voluntarily—depending on parental commentary, reasons for viewing, and comprehension of the material—but the processing of narrative content can never be completely overridden.

According to the capacity model, one critical part in the comprehension of educational television is how much working memory is devoted to processing the narrative and educational content (Fisch, 2004a). Specifically, the capacity model presents conditions indicating when comprehension of educational content will be the strongest. According to Fisch (2000), comprehension of educational content can be stronger when: (1) the total amount of working memory resources devoted to understanding the material is increased; (2) demands for processing narrative content is small, so more resources are available for processing educational content; (3) when the distance between narrative and educational content is small (i.e., the educational content is integral to the narrative content, making the processes complement, rather than compete with, each other); (4) when the viewer has a greater motivation to learn and voluntarily allocates more resources to working memory resources for the processing of educational content (Fisch, 2004a); and (5) when demands for processing educational content is small. However, if the demands for processing the educational and narrative content exceed the capacity of working memory, then comprehension is impaired and the acquisition (encoding, storage, and retrieval) of the information decreases (Lang, 2000). Since most educational television programs include both narrative and educational content, viewers must process both simultaneously to comprehend it fully.

Stage Theory of Cognitive Development

Scholars have been attempting to understand the relationship between media and the cognitive development of children for several decades, and have used variety of theories to provide insight into how and what children learn from television. The reason for this interest is simple—if we can understand how children perceive media in different stages of development, then we can gauge how that media affect them. Although different theories ascertain that children learn from others, they vary on how this learning takes place.

One such theory is Piaget's (1926) stage theory of cognitive development—which became one of the most significant theories in child development (Bryant & Miron, 2004)—posits that children's cognitive abilities develop in a series of stages as the child matures. Each stage represents a child's understanding of reality during that phase, and the constructs behind it have become part of how we think and learn about children. As a child grows older and gains more experience, their ability to process information develops, which, in turn, allows them to process and understand more complex information and messages.

According to Piaget (1926, 1952, 1970), the cognitive development of a child does not happen overnight, but rather sequentially over four distinct levels: the sensorimotor period (0 to 2 years), preoperational (2 to 7 years), concrete operational (7 to 11 years), and formal operational (11+ years). These four stages take a child from infancy through preschool, childhood, and eventually adolescence. It is important to note that the ages assigned to these stages are guidelines, which can vary depending on the individual development of the child (Kennedy, 1995). In his work, Piaget posited that children are born with pre-established schemata, or reflexes, which they use to learn about their environment. He hypothesized that as children age, the schemata that are ingrained within them become more complex. Eventually, the complexity of the schemata develops and becomes structures, and hierarchal behaviors occur. This happens gradually, over a period of stages that develop as the intelligence of the child develops. Each stage represents the understanding of reality for the child. As time progresses, several factors, such as peer interaction, understanding of their environment, and accumulation of knowledge, help develop a child's understanding of reality.

The earliest stage of cognitive development is the period of *sensorimotor* intelligence, which is categorized primarily as infancy (birth through two years old). In the sensorimotor stage, infants develop motor skills and use their senses to gain knowledge about the world. Knowledge of the outside world and perceptions of other viewpoints is extremely limited, as their world is based on their physical experiences (Kennedy, 1995; Wackman & Wartella, 1977). Typically, the sensorimotor period consists of a series of six substages: simple reflexes, primary circular reactions, secondary circular reactions, coordination of secondary circular reactions, tertiary circular reactions, and internalization of schemata (Piaget, 1972b).

First, in the reflexive stage, the child learns simple reflexes, such as grasping or sucking during the first two months of life. Between two to four months, children begin having primary circular reactions to their environment, doing reflexive behaviors that encompass repetitive movements or actions, such as smiling or opening and closing their hands. At four to eight months, secondary circular reactions to their environment begin to occur, such as reaching for a rattle to shake it. It is at this substage that a child begins to act intentionally, and becomes aware of objects other than themselves. At eight to 12 months, a child begins to coordinate secondary reactions, understand permanence of objects, and combine their understanding of different schemata to reach a goal (Piaget, 1976). For example, if a child is able to display an understanding of object permanence, they may be able to find a toy that is hidden under a blanket. The child would understand the toy was still there and would possibly move the blanket to retrieve it. Although most scholars agree that the construction of object permanence occurs in the first year, some studies have indicated that it may begin by three to four months (Baillargeon & Devos, 1991; Baillargeon, Spelke, & Wasserman, 1985; Munakata & McClelland, 1997).

In the fifth substage (12 to 18 months), tertiary circular reactions develop, and the child begins to try different ways to accomplish different goals. Finally, children between the ages of 18 to 24 months begin to internalize and symbolize their thought processes and develop language skills (Piaget, 1972b). Despite this lack of both memory and motor skills in the sensorimotor period, the media are not typically wary of targeting messages directly to children. However, the parents of children at this stage are bombarded with games, videos, and a variety of tools that are allegedly designed to benefit their children. From toys that develop motor skills to videos that will make their child smarter, parents are inundated with products that may or may not help their child.

The second stage of cognitive development, known as the *preoperational* stage, typically centers on preschool and early elementary school-aged children (between the ages of two to seven years old), who tend to be egocentric and form ideas based on experience (Piaget, 1970). Language skills and thought processes are very limited for this age group, and are based on salient features, nonverbal cues, and mental images rather than the meaning of words (L. J. Smith, 1995). Although the egocentricity of the child diminishes with age, children in this stage typically have a difficult time understanding the viewpoints of others. However, scholars have criticized the tests Piaget used to test for egocentricity and conservation, alleging they were too complex for children to understand. They claim that if the tests had been simplified, results would have indicated preoperational children can understand other viewpoints in a simple manner.

The preoperational stage is divided into two substages known as the true preoperational, or symbolic function, substage and the intuitive thought substage. The symbolic function substage typically is shared by children ages two to four years old. It is at this stage that verbal skills grow and imaginative play begins. Although there is a great amount of egocentrism at this point in a child's life, it is at this stage that a child can remember and repeat a simple series of actions or sounds over a delayed time period, a function known as deferred imitation (Piaget, 1962a). Children in this stage also believe that inanimate objects can hold lifelike characteristics.

The second substage of the preoperational stage of cognitive development is the intuitive phase (age four through age seven), in which children become less egocentric and develop the ability to understand other viewpoints. Children in the intuitive substage are naturally curious and begin to develop more social speech patterns, yet they still have the tendency to focus attention on one object or action while ignoring their surroundings. The question "Why?" is commonly asked by children in this stage. Children in this substage are rules-based, as their perceptions of right and wrong are not completely developed (Santrock, 2007). Perceptions of reality and fantasy are still extremely fluid, as children at this age tend to believe in magic as an explanation for the workings of the world. For example, children's belief of Santa Claus is strongest during this phase. Studies of children at this developmental stage indicate that below the age of five, they cannot distinguish programming from commercial content, and they base brand preferences solely on visual cues and modeling (L. J. Smith, 1995). This form of centration, focusing on one characteristic of a stimulus, is a common characteristic with children in this stage, because visual cues often create an orienting response that can guide the child to focus on one specific point (Ward & Wackman, 1973).

The third stage of cognitive development, also known as *concrete operational*, is when adolescents (ages 7 to 11) begin to discern between central and peripheral information (Wackman & Wartella, 1977). Occasionally, depending on the intelligence of the child, children as young as five can enter this stage of development. It is at this level that the child can begin to process information logically and think in systematic and categorical terms (Piaget, 1929). Egocentricity also greatly diminishes, as sociocentricity and operational thinking develop. At this stage, elementary school children and early adolescents become capable of concrete problem solving, classification, and understanding various concepts in mathematics and science. Children are also able to classify objects into logical sequences. This may be the earliest stage at which children can understand the advertising tactics that are used to gain their attention.

The final stage of cognitive development is known as *formal operational*, which occurs when children develop the ability to understand complex and abstract thoughts. At this level, the adolescents (beginning at ages 11 or 12 and onward) can use conceptualization to understand their environment (Piaget, 1970). Adolescents can understand proportions, thinking becomes less tied to concrete reality, and the ability to cultivate abstract thinking develops. Propositional logic develops at this stage, and adolescents gain the ability to draw conclusions from different premises. Operational thinkers can recognize problems, find various solutions, and test the hypotheses. However, some individuals are not able to develop these formal thinking skills until adulthood, or their early 20s—or sometimes not at all.

Although Piaget's stage theory of cognitive development has been one of the most influential theories in understanding the development of children, it is not without critics (Brainerd, 1978). A multitude of papers critique the concepts of stage theory; in fact, some critics have even called it naïve. Questions have been raised by a number of scholars about Piaget's research methods, the stage-like nature of the theory, the age limits imposed in the model, as well as the adequacy and universality of the model (Flavell, 1977; Miller, 1993). Supporters of Piaget believe that his critics misunderstand the goals of the theory and have made mechanical errors in the procedures used to refute Piagetian Theory.

The idea that Piaget underestimates children's cognitive capabilities and set unnecessary age limits is a criticism that repeatedly appears in scholarly literature (Berger, 1988; Brainerd, 1973). Vygotsky (1978) claimed that Piaget overlooked the finding that children are capable of concrete reasoning at a young age. Subsequent evidence supports this concern and indicates that children are capable of concrete operations, such as problem solving, at a much younger age than originally thought. For example, research has indicated that young children in the preoperational stage can practice numeric conservation—something that Piaget believed did not begin until the operational concrete stage (Mehler & Bever, 1967). Recent research conflicts with the precepts of the sensorimotor stage, as infants have been found to understand more than they can demonstrate. Goodwyn, Acredolo, and Brown (2000) supported this idea when they found that infants and toddlers who used signing to aid in communication had a larger vocabulary and less frustration with the communication process than children who did not sign. Additionally, research has shown that some individuals never reach the formal operational stage—something that is not addressed in Piaget's work (Lourenço & Machado, 1996). Another issue that some scholars have with the theory is that it lacks universality and does not reflect the role of social factors, cultural norms, creativity, or the individuality of cognitive development of a child (Papalia, Olds, & Feldman, 1998). Factors such as cultural norms, heredity, culture, and education create different developmental values that affect cognitive development in unique ways (Berger, 1988). According to Berger, the theory should incorporate more flexible standards into it, as it is a nonuniform process, which does not occur in distinct stages, but in fragments that build as children develop new skills and behavior. A final criticism is one that Piaget himself addressed: the assessment of knowledge through language. In Piaget's original work, great emphasis was placed on evaluating cognitive development through linguistic development. However, in his later works he admitted his earlier work to be too linguistically centered, that cognitive development and logical processes were rooted in deeper processes than simple linguistics alone (Piaget, 1962b, 1972a). Because of this, Piaget's stage theory of cognitive development—specifically the preoperational stage—will serve as the framework for the following study.

Attention and Comprehension

In the last few decades, there has been tremendous interest in the relationship between children's comprehension of and attention to educational content on television. Studies examining this relationship have posited that a variety of factors—such as vigilance, monitoring skills, and strategies in viewing—can influence how children attend to and comprehend a program (Miron et al., 2001). According to Anderson and Lorch (1983), these skills develop between the ages of two and five years old, when cognitive abilities and background knowledge develop significantly, as does a child's ability to engage with television—usually during Piaget's preoperational level.

Although different studies have yielded a variety of results, several have argued that comprehension is a predictor of engagement for young children (Crawley et al., 2002; Lorch, Anderson, & Levin, 1979), and a prerequisite for learning (Bickham et al., 2001). For example, one study examined segment order in a *Sesame Street* program, and found that when presenting information in a program, children were more likely to become engaged when the information was presented in a comprehensible manner (Lorch & Castle, 1997). Scholars have also found that repetition of material also influences the comprehension of content on television (Crawley et al., 2002; Crawley et al., 1999). Crawley and colleagues (1999) examined the influence of repetition by presenting children between the ages of three and five years old with multiple opportunities to view a single episode of *Blue's Clues*. The results of the study revealed that comprehension of educational content improved after episode repetition, and that interaction with the program, both verbal and nonverbal, increased significantly after each repetition (Crawley et al., 1999).

Additionally, scholars have indicated that comprehension is related to visual attention, and when children view messages that are visually concrete, comprehension increases (Fisch, Brown, & Cohen, 2001). Because of the assumption that comprehension is a prerequisite for learning, producers of television programming create material that is specifically designed to capture the attention of children while they present educational material to them (Bickham et al., 2001). However, the relationship between attention and comprehension has been challenged by scholars, including one study by Lord et al. (1979). According to the study, the influence of outside factors—such as playing with toys—can produce a difference in the amount of attention that is paid to the central content of a program. These findings have led producers of educational programming to attempt to develop effective content that holds the attention of the viewer. However, the question remains: What exactly prompts children to attend to the screen?

Just as Piaget and other scholars examined the development of cognitive abilities of children, they have also examined how children attend to television—an ability that strengthens with age. According to the Piagetian framework, the concept of attention is not likely to occur before school age (age five years old and up). Rather, for most young children attention is elicited through an orienting response that is triggered by stimuli from television (Miron et al., 2001). One reason many scholars have examined attention is that it is a concept that is difficult to explain, for it can be defined and measured in a variety of ways, and since the 1890s, scholars and psychologists have been attempting to do so. Over the years, the concept of attention has been defined as everything from "taking possession of a mind in clear and vivid form…" to "all those aspects of human cognition that the subject can control" to "the focalization of consciousness" (Styles, 2006, pp. 1-3). As scholars understand more about attention, the concept has become more refined. Generally, attention involves the concept of some sort of fixed-capacity pool of resources wherein resources are removed from the pool of resources to carry out a task (Fisch, 2000).

It is important to note that attention is not a static condition; rather, it is an ongoing activity, as individuals continually process information that is presented to them based on their goals, motivations, and reactions. Attention occurs when individuals allocate a certain amount of their mental resources to a message or task, and providing there are enough mental resources available, attention can be divided among different tasks (Lang, Bradley, Park, Shing, & Chung, 2006). If there are not enough resources available to working memory, the processing of information will suffer. Each process pulls from the allocated resources out of the total pool of resources available to the receiver (Lang & Basil, 1998). As a message becomes more complex, the amount of resources allocated to process the message increases, thus leaving fewer resources available to other tasks (Lang et al., 2006).

According to the literature concerning attention, when an individual views a complex message, the message draws from the available resources in working memory. When resources are allocated to a specific task, this causes individuals to devote fewer resources to secondary tasks—as posited by capacity model (Lang & Basil, 1998). Because of this strain on resources—especially the limited resources of young children—it has been assumed that complex messages may interfere with the processing of educational content presented on television (Bickham et al., 2001). Most often, children are portrayed as active viewers when processing complex messages, as they use the knowledge they have in order to use the television medium to make attentional decisions. As children mature, he or she gains the ability to better understand media messages and choose which messages he or she wants to focus on (Bickham et al., 2001), and thus may be less influenced by a complex message.

Television programs compete for children's attention through a number of cues, both visual and auditory, that elicit attention—such as contrast, scene change, intensity, incongruity, movement, and novelty (Bickham, Wright, & Huston, 2001), as well as content that contains "important learned messages" (Bickham et al., 2001, p. 103). These cues, which are often referred to as formal features, constantly make children choose what to attend to and automatically orient a viewer to a program (Berlyne, 1960). Auditory cues presented in a message provide viewers with the contextual information that helps them elaborate on the visual cues presented in the content of the show (Anderson & Field, 1983; Lorch et al., 1979). Auditory cues can be an essential part of any television program, since children as young as three years old have the ability to monitor audio tracks while their attention has shifted elsewhere (Pingree, 1986). When an auditory cue indicates something important is happening, then the child will refocus their attention on screen (Miron et al., 2001). Despite the fact that the child's eyes might not be attending to the screen, there is still some level of attention to the information. It is no surprise, then, that studies have indicated that children who are attuned to both the visual and auditory content in a program score higher on measures of comprehension than children who are focused on only one of the two (Bickham et al., 2001).

When it comes to production, strategically placed visual and auditory cues are vital parts of the program, as the right mix can help maintain children's attention.

Increasing the amount of time that children spend looking at the television screen will naturally lead to greater comprehension of the material. However, if a program uses too many cues in order to maintain the audience, abnormally increased arousal, also known as hypervigilance, can occur, and learning from television can be jeopardized (Miron et al., 2001). Therefore, producers of educational programming must strive to create material that is not only age appropriate, but also maintains the attention of the child without endangering learning through over stimulation. Information overload can be detrimental to any program if education and creative thinking is the main goal.

Formal Features

When too many cues occur for a child to process, information overload may occur. However, since comprehension of educational content can depend on the formal features in a program, one of the practical implications of the capacity model posits that educational television can be enhanced by effective use of these features (Fisch, 2004a). In other words, producers may be able to enhance the impact of the program and increase comprehension by using appropriate formal features and creating programs that have a small distance between narrative and educational content (Fisch, 2004a). For example, when formal features are few and arousal is low, a child is apt to have poor short-term memory and not retain the information presented, but good long-term memory and able to maintain information from and about the program itself over time (Kleinsmith & Kaplan, 1963, 1964; Levonian, 1967, 1968, 1972), whereas high arousal helps short-term memory more (Crane, Dieker, & Brown, 1970). This may indicate that in order for a child to remember educational content in the long-term, programs should be minimally arousing.

Children's comprehension of media is often associated with their amount of invested mental effort, also known as AIME. When children show a greater investment in a program, they are often able to process information more deeply, and thus improve comprehension of the material (Fisch, 2004a). One way producers attempt to increase this investment is by using orienting formal features to increase attention to and interest in an episode. What children watch on television, how they watch it, and what they pay attention to is extremely important for both media producers and scholars to understand. Both groups realize a relatively simple truth: if a child is not paying attention to the message, they cannot learn the material in it (Burns & Anderson, 1993; Kirkorian et al., 2008). Although the basic mechanisms for watching television may be the same, scholars have found that how and what children watch changes with age (Huston & Wright, 1983; Kirkorian, 2007). An integral part of this may be linked to the formal features of a program—how it cuts from one scene to another, how often the sound changes, or how much action there is (Anderson, Lorch, Field, & Sanders, 1981; Bryant, Zillmann, & Brown, 1983; Kirkorian, 2007).

Formal features can be found in every television program, for they are the visual and auditory cues or events within the program that are independent from the story content, and serve as syntactic markers that help individuals encode information about the program (Calvert, Huston, Watkins, & Wright, 1982). These events are stimuli—such as loud sounds, quick movements, camera and scene changes, bright lights, and auditory changes—that are embedded in the program and orient the viewer to the program by using salient features to captivate the child's attention (Bickham et al., 2001). Salient features, which help orient and determine attention, include the physical activity of the characters, pace of the program, variations between scenes, special effects, background music, sound effects, and voice-acting (Huston & Wright, 1983).

Early studies examining formal features posited that features in a television program could arouse viewers by combining the different aspects of the program—such as rapid action, visual effects, and sound effects—to determine viewers' preferences for the program (Calvert et al., 1982), and often the most preferred programs and stimuli were only moderately arousing (Berlyne, 1971; Wundt, 1874). Berlyne (1960), one of the forefathers in formal features research, posited that arousal potential and preference towards a stimulus (on television) would be determined when collative, psycho-physiological, and ecological features combine—the greater the arousal the features generate, the greater the preference towards it. When determining aesthetic preference, however, the most important of the three are the collative features of the program—such as the novelty, complexity, motion, or incongruity within it—and the psycho-physiological aspects—such as the intensity of the brightness, color, and size of elements within the program—rather than the ecological properties—such as the meaningfulness of the program (Martindale, Moore, & Borkum, 1990).

Research has indicated that the amount of perceptual salience of a formal feature is determined primarily by the stimulus, and can be effective at a variety of age levels (Calvert et al., 1982). However, the salience the viewer experiences often depends on their age and cognitive abilities. Research has also indicated that children's cognitive abilities progress over time (Huston & Wright, 1983), and that younger children are less capable of understanding material that is cognitively complex (Fisch et al., 2001; Richards & Anderson, 2004). For example, although older children may understand the concept of instant replay, children under the age of six can not comprehend the replay as repetitive, but rather, they believe that it occurred twice (Rice et al., 1986). Therefore, as children get older, and more capable of processing the information around them, the formal features of the programs they watch may become more intense, and more attention can be paid to the content of the story. Once children become more familiar with formal features and devote less effort to processing them as they age, the educational content of a program may also become more complex (Fisch, 2004a).

Findings from a variety of studies have found that children under the age of two may view television automatically through perceptually salient features—such as movement or sound—but by the time children are in preschool, other nonsalient formal features begin to influence a child's attention to a program (Anderson, Alwitt, Lorch, & Levin, 1979; Campbell et al., 1987; Huston & Wright, 1983; Kirkorian et al., 2008; Wright et al., 1984). For example, children often look away from the screen when a television program has an adult male speaking, shows animals in the wild, and or features speeches that are not about the present situation (Bickham et al., 2001). Thus, many programs use perceptually salient features, in the hopes that the automatic viewing process leads to attention and, eventually, comprehension. Take *Dora the Explorer* for example. The songs, colors, characters, and actions in the program are all carefully orchestrated by the producers to draw the attention of children and teach them specific curricular lessons. These formal features gain the child's attention, aiding in the recall of information—such as the fact that "*hola*" is Spanish for "*hello*"—which can later be used by the child.

Although younger viewers (ages four through six) rely heavily on such salience to process television programs, older viewers (ages seven and up) tend to focus more on the non-salient features, for they have already learned how to process the features that signal importance (Calvert et al., 1982). Automaticity posits that as children become more comfortable with these cognitive tasks, fewer resources and working memory are needed to process formal features as they become an automatic response, enabling them to process more complex information (Shriffin & Schneider, 1977). Indeed, as they develop, children begin to use different methods of seeking and processing information, and begin to learn the associations between content and formal features (Fisch, 2004a). Since children are exposed to both formal features and curricular lessons in educational television at an early age, it has also been posited that through this exposure—in both formal and informal settings—children can process education content in an increasingly automatic way as they age (Fisch, 2004a). This automaticity towards both narrative and educational content reduces the demands on the viewer, and allows for the viewer to be able to process and manage both more easily (Fisch, 2004a).

Formal features influence attention and comprehension by acting as a signal to children that important or interesting information is being presented to them (Calvert et al., 1982). Additionally, formal features orient the viewer to specific content and provide the appropriate tools that children need to process central versus peripheral information—a task which is difficult for many young children (Calvert et al., 1982). This concept has been embraced by many television producers in the hopes of taking advantage of the natural orienting responses elicited by using attention-getting formal features, such as rapid shifts and changes in form, setting, and other aspects, or cues, within programming (Calvert et al., 1982). However, if children are not attending to the screen, as the producers intend, then the children cannot process the material that is presented. By creating material that incorporates educational content into the visual or auditory cues, children can learn material that is linked to perceptually salient and enticing formal features more easily (Bickham et al., 2001). Moreover, as long as the material presented to children does not push them beyond their processing capacity, then the child can potentially benefit from processing the content. According to Miron et al. (2001), this is most likely to happen when the stimuli has a moderate level of density or intensity.

Pacing. Research has indicated that an integral part of attention may be linked to the formal features of a program—how it cuts from one scene to another, how often the sound changes, or how much action is presented (Anderson et al., 1981; Bryant et al., 1983; Kirkorian, 2007). The manner in which formal features are used—the rate at which scenes change, the number of times a character speaks, and length of a visual or audio element in a television program—is known as pacing (Huston et al., 1981).

Although the formal features of a program have been examined by scholars for years, it was not until 2003 that McCollum and Bryant developed an index that could measure pacing accurately and be universally applied to television, movies, and other forms of media. In the index, the following criteria were used to determine the pace of a program: (a) “frequency of unrelated shifts” or unexpected changes, (b) “related shifts,” or visual changes related to the previous scene, (c) “frequency of camera cuts,” (d) “percent of active motion,” or the amount of time characters moved faster than a walking pace (e) “frequency of auditory changes,” (f) “percent of active music,” and (f) “percent of active talking” (McCollum & Bryant, 2003, pp. 123-124). The pace of 85 popular children’s television programs were examined with this index, and the results of the study found E/I programs to be significantly slower paced than programs that are solely dedicated to entertainment (McCollum & Bryant, 2003). Pace can vary from program to program—some with extremely rapid changes in formal features and some with slow and easily understood transitions. For example, programs that are primarily focused on entertainment often use quick and frenetic formal features designed to orient the child to the program—much like *Pokémon* or *Bakugan.* However, programs that are primarily educational often have a slow pace with smooth, uncomplicated transitions—much like *Mister Rogers' Neighborhood* or *Sesame Street.*

In 2009, Nichols and Murray analyzed the top 100 kids' show for the year to examine the relationship between the educational quality and the pace in a program. Children's television programs were assigned a score derived from the pacing index established by McCollum and Bryant (2003), and from the educational quality index, established by Wilson et al. (2008). The study also explored the relationships that pacing and educational quality have with show type, show format, and target audience age. Results broadly indicated that as the educational quality of a program increased, the pace of a program decreased. However, show format was a key player in this relationship. For example, in animated programs, the pace increases as educational quality decreases; whereas in live-action programs, as pace increased, so did educational level (Nichols & Murray, 2009). In addition, the results indicated that target age and show format had a significant relationship with pace and educational quality. For example, live-action programs targeted to teens and preteens that are highly educational will likely have a faster pace. Additionally, animated programs that are targeting preschool children are likely to have a slower pace if they are highly educational (Nichols & Murray, 2009).

For some, the topic of pace in television programming holds little importance, but in children's television programming, it is a very controversial topic. For although a fast pace is credited with allowing more messages to be presented during a single episode, the pace required to do so does not necessarily enhance attention and may interfere with comprehension and memory (Singer, 1980; Wright et al., 1984). Indeed, critics have noted that if any processing occurs, it would be at a superficial level as opposed to a conceptual one (Huston et al., 2001). Additionally, critics claim, "frequent viewing could lead children to develop patterns of short attention span and superficial, non-reflective learning style.... One would also expect negative influences on creative and reflective thinking" (Huston et al., 2001, p. 134).

Research has indicated that pacing is directly related to attention and automatically triggers an orienting response. In fact, studies have shown that the faster the pace, the more likely a child will be to give it attention (Bickham et al., 2001; Wright et al., 1984). In other words, the more rapidly the formal features in a program change, the more children will automatically orient themselves to it. Younger children are especially affected by the effects of pacing, as they are more perceptually oriented than their older counterparts, and therefore more affected by the salient formal features in a program rather than the content of the program itself (Campbell et al., 1987; Huston & Wright, 1983; Huston et al., 1981; Miron et al., 2001; Wright & Huston, 1981). This concept may be less true for older children, for they tend to be less reliant on the salient formal features of a program and typically understand the context of a show.

Because research has indicated that children learn better if educational messages are presented slowly, repeated often, and given in a linear fashion, it is no surprise that producers of educational programs want to provide children with the optimal chance for learning (Crawley et al., 2002; Guernsey, 2007). Programs with rapid paces and unpredictable shifts in content are extremely difficult for a young child to comprehend (Wright et al., 1984). Therefore, it becomes extremely difficult for producers of E/I programming to find a balance between getting the child's attention and presenting the curricular lesson. Singer (1980) suggested that the fast pace, or high density of formal features, of some programs may overburden a young child's attentional capacity and not allow them to be able to think about the information presented—which can undermine the storage and processing of that information. If an educational program is too densely packed with formal features, then a young child may not be able to process the information within it and will instead merely continuously orient themselves to the program. Therefore, educational programs may need to have a slower pace to help children understand curricular messages (Singer, 1980). However, the need for a slower pace may not universally be the case, as the rapid nature of many programs have been found to produce arousal in children, especially older children, and can increase the short-term alertness, or vigilance, in the viewer (Zillmann, 1982; Zillmann et al., 1980). It is important to conduct more research to determine the ideal pace for the children of different ages.

Vigilance. Several factors may influence the amount of alertness that children attend to when watching and processing education content. This vigilance, or maintained state of alertness, can change depending on the show format, the child's age, the child's gender, as well as the child's circadian rhythms (Miron et al., 2001). In regards to times of the day, vigilance is found to be greatest in the morning and weakest in the afternoon

(Rana, Rishi, & Sinha, 1996). “Short term memory (immediate recall) was better for information acquired in the morning (9:00 a.m.) at the time of a relatively low arousal, whereas long-term memory (recall one week later) was better for information acquired in the afternoon (3:00 p.m.) at the time of relatively high arousal….” (Miron et al., 2001, p. 174). Additionally, girls tend to be more accurate than boys are in the morning and afternoon, but not in the evening (Rana et al., 1996). This supports the idea that education content is likely to receive more attention from children in the morning, a period in which children have a greater ability to retain the information.

Vigilance also tends to increase with younger children when they are watching a magazine format program—a program in which information is presented to the audience in separate pieces that could be considered self-contained, such as *Fetch! With Ruff Ruffman*—that has a fast pace, than with a magazine formatted show with a low pace (Wright et al., 1984). However, when older children watch a show with a magazine format, pace has little to no effect on how much they attend to the program, for they have the cognitive ability to react to the continuity of the plot (Miron et al., 2001).

Obviously, the ideal pace for a program to maximize the potential to both educate and entertain has yet to be determined, as there are a variety of variables influencing the acquisition of the information, which explains many of the contradictory findings in the literature. For example, in regards to formal features, vigilance is related to the orienting response to changes and the unusualness of the environment they are watching (Miron et al., 2001). Research on children’s learning has suggested that the ideal pace is one in which children can best grasp the information presented in a program (Singer & Singer, 1998). This can vary for different ages, as younger children do not have the cognitive abilities needed to process the same amount and type of information as older children.

Research Questions

Scholars have determined that programs with complex formal features and a rapid pace gain the most attention from young children. Although these programs can be quite popular, they do not necessarily assist young children in retaining any educational content, for children may not have the cognitive ability to process information presented to them at a rapid pace (Wright et al., 1984). Research examining formal features and program complexity has found that when children are exposed to clear, simply structured events in a story, these orienting schemata help children process the information presented. According to the capacity model (Fisch, 2000, 2004a), children automatically process narrative content, or the plot of the show, before they begin to process educational content. However, since no one has tested the capacity model, there is no definitive understanding of this relationship.

RQ1: What is the relationship between the pacing index and program distance of E/I programs?

RQ2: What correlations exist between the pacing index of the shows and show type, show format, and/or network type?

The Peabody Picture Vocabulary Test-IV has been used to measures the verbal intelligence of children and pre-literate adults (Pearson Education Inc., 2009). Although it has been revised several times (Dunn, 1965; Dunn & Dunn, 1981), the PPVT is one of the most popular and reliable tools for evaluating the scholastic aptitude of school-aged children. The researcher will be using this to measure children's cognitive abilities.

However, other outside factors, such as family media habits, income, or other socio-economic factors may influence a child's score. In order to fully understand the participants, the following question has been posed.

RQ3: How are demographics and media use related to the PPVT score?

As suggested by Fisch (2000), the complexity of narrative content determines the amount of resources that will be allocated to processing the curricular information in an educational program. This would mean that the simpler the formal features (i.e., slow pace), the more resources will be available for processing educational content. According to Fisch (2009), when the amount of working memory resources devoted to processing increases and demands for processing narrative content is small, then more cognitive resources are available for processing educational content.

RQ4: Do children recall narrative content more easily than educational content from E/I programs?

H1: Narrative content in E/I television programs can be more easily recalled than educational content.

Research has suggested the pace of a program influences how children attend to the television program (or segment); additionally, research has suggested that as the complexity of the formal features increase, the attention to them will also increase. When this occurs (i.e., at a fast pace), more resources are allocated in working memory to process the narrative content, and resources for the processing of educational content become unavailable.

RQ5: Does pace mediate the recall of narrative content versus educational content?

RQ6: At what pace do children between the ages of three and five retain the greatest amount of educational content?

RQ7: At what pace do children between the ages of three and five retain the greatest amount of narrative content?

H2: As the pace of the program increases, the acquisition of narrative content will increase.

H3: As the pace of the program increases, the acquisition of educational content will decrease.

One of the key elements to capacity models is distance. Fisch (2009) has posited that when educational content is integrated throughout, and distance is small, children will have an easier time processing and remembering the curricular lesson. However, children will likely still automatically process narrative content first. If the distance is large, then the two processes will compete for resources in working memory, and a child would have greater difficulty retaining the educational material.

RQ8: Does distance mediate the recall of narrative content versus educational content?

RQ9: At what distance do children between the ages of 3 and 5 retain the greatest amount of educational content?

RQ10: At what distance do children between the ages of 3 and 5 retain the greatest amount of narrative content?

H4: When the distance between educational and narrative content is large, acquisition of narrative content will be the highest.

H5: When the distance between educational and narrative content is small, acquisition of educational content will be the highest.

Depending on the complexity of the formal features and the integration of the educational content within the program, or distance, a child's comprehension and information acquisition of educational content should change (Wright et al., 1984). When processing educational content in working memory, in-depth processing often depends on distance and the complexity of the narrative to determine how many resources are available to it (Fisch, 2000). However, it is not known when the complexity of the formal features becomes too much for the young child to process, thereby causing them to ignore the educational content of the program.

RQ11: What are the interaction effects between distance and pacing on the acquisition of educational content and narrative content?

H6: A small distance and slow pace will yield the greatest information acquisition of educational content.

Research has shown that the complexity of formal features can influence the depth of processing in young children by dictating the amount of required cognitive resources. The ideal pace of these formal features is one in which children can best grasp the information (Singer & Singer, 1998); however, this can vary for different ages, as children's ability to process information presented on television improves with age (Huston & Wright, 1997). According to Fisch (2000), these developmental changes can affect how narrative and educational content is processed.

RQ12: How is age related to the acquisition of information in educational and narrative content?

Additionally, research has shown that as children mature, salient formal features have less of an impact as children begin to understand context in a show (Bickham et al., 2001). According to Piaget (1952), these developmental changes do not happen overnight, and attention is unlikely to occur before school age. One of the most common tools to assess the cognitive development and intelligence of children is the Peabody Picture Vocabulary Test. Therefore, the following research questions were developed to understand the relationship between the cognitive maturity of a child and their ability to attain information.

RQ13: What is the relationship between a child's PPVT raw score and narrative information acquisition score?

RQ14: What is the relationship between a child's PPVT raw score and educational information acquisition score?

H7: As children become more cognitively mature, processing of narrative content will improve, and resources will be allocated to processing educational content.

Although a fast pace may hold the attention of a younger child, older children will have more complex schemata for processing and will thus be able to simultaneously process both educational and narrative content. In this case, rapid pace will only create short-term alertness (Zillmann, 1982).

Studies have indicated that the repetitive nature of television can positively influence information acquisition (Crawley et al., 1999) in children. Additionally, according to capacity model, comprehension of educational content will be stronger when the child in interested in and prior knowledge about a show or character in the show (Fisch, 2004a). Fisch (2009) posited that by establishing these scripts and schemata about a program, children can acquire information from the program more easily and reduce the demands for processing it. Thus, the more attention a child gives, the more likely a child will be able to acquire the information presented. Additionally, a child's prior knowledge of a program may influence how the child attends to the information presented in a program. Therefore, the following research questions were created to determine if liking, recognition or heavy viewing patterns influence information acquisition.

> RQ15: How is the amount of television a child watches related to information acquisition?
>
> RQ16: How is children's "liking" of a program segment related to acquisition of narrative and educational content?
>
> RQ17: How is prior exposure to a program related to the acquisition of educational and narrative content?

The dependent variable in this study is the acquisition of the information in the programs. The capacity model posits that narrative content is processed before educational content, depending on the distance between the two and the complexity of the narrative. In order to address the hypotheses and research questions, a controlled set of experimental studies took place.

CHAPTER 3

Methodology

The purpose of this study was to examine how pace of children's educational programming and the distance between educational and narrative content influence the acquisition of educational and narrative content. Through the parameters of the capacity model, these variables were examined to determine how they affect children's acquisition of information from television. This study first examined the independent variables of pace and distance of educational content on children's television programs, and then used a 3 (pace) × 2 (distance) factorial, within-subject design measuring the dependent variable of acquisition of educational content and narrative content. The following section explains the measures used in the study, as well as the data collection process.

Stimuli and Independent Variables

The program sample for this study was children's television programs selected by examining current E/I programs on the PBS Kids (*n* = 39), Nick Jr. (*n* = 24), and Playhouse Disney (*n* = 16) Web sites—three networks that promote themselves as providing television programs that are educational for preschool children, typically between the ages of three and five. The episodes used in this study were either recorded during the course of a randomly selected week or purchased from iTunes. If the program was purchased from iTunes, then the second episode from the most recent season was used. A total of 80 episodes were analyzed for pace and distance.

Coding procedure. Every episode was watched in its entirety, and coders were permitted to watch any segment as many times as necessary to gain clarification about the shows before any judgments on distance or pacing were made. Each coder was given a stopwatch and a coding sheet to assist in the coding of the episodes. Discussion between coders was permitted.

For the pacing index, the author chose randomly selected 5-minute segments—0 to 5 minutes, 5 to 10 minutes, 10 to 15 minutes, and 15 to 20 minutes—from each of the episodes. Although analyzing the pace of the entire show would be best, the author emulated McCollum and Bryant's study as closely as possible, and examined the 5-minute segments for a representation of the show's pacing (2003). Opening credits were included in the coding schema, but commercials were not. These 5-minute segments were viewed as many times as necessary until the coders were positive that all the variables were accounted for and coded correctly, and to clarify any questions. Coding occurred in real time to examine duration as well as frequency measurements.

For distance, the coders examined the selected 5-minute segments to determine how tightly the program's educational content and narrative content were interwoven. The coders used the categories of "lesson clarity" and "lesson integration" from the educational quality index to determine how well the episode balanced the curricular lessons with the narrative content of the program (Wilson et al., 2008). In addition, the redundancy of the lesson and direct address to the audience was examined to determine distance.

Training and reliability. Two coders were trained through a series of sessions with a coding book and coding sheet (Appendix A) to ensure there was a comprehensive understanding of the parameters of the study. Each variable within the information introduced was examined independently, to ensure reliability of the analysis. After 20% of the selected messages were examined to test for reliability, and an intercoder reliability of at least 85% was reached, one coder analyzed the remainder of the data. Total inter-coder agreement emerged as 89.8%. For distance, coders examined the established variables of the EQI (Wilson et al., 2008), as well as direct address to the audience and lesson redundancy. A subsequent intercoder reliability check yielded the following kappas for the data: lesson clarity, .806; lesson integration, 1.000; lesson redundancy, .925; and direct address, .886. The mean kappa for this intercoder test was .904. For pacing, each program was coded for the seven variables in the pacing index: unrelated camera shifts, related camera shifts, camera cuts, auditory changes, active motion, active talking, and active music (McCollum & Bryant, 2003). A subsequent intercoder reliability check yielded the following kappas for the data: unrelated camera shifts, .859, related camera shifts, .897; camera cuts, .907; auditory changes, .860; active motion, .863; active talking, .862; and active music, .908. The mean kappa for this inter-coder test was .879. Other variables also yielded satisfactory kappas including channel, 1.000; show type, .925; and show format, .875.

Pace. As previously discussed, the complexity of narrative content is an influencing factor as to the amount of resources that will be dedicated to processing information. This complexity can be measured through the pacing index by coding seven dimensions of complexity, including unrelated shifts, related shifts, camera cuts, active motion, auditory changes, active music, and active talking (McCollum & Bryant, 2003).

Frequency of unrelated shifts. Given a weight of 20% in the pacing index, this occurs when scenes on either side of a cut are completely unrelated to each other. This type of shift is typically abrupt and unexpected—almost as if the channel has been changed (Lang et al., 1993). For example, an unrelated shift could include when the scene shifts from children building a sandcastle on *Fetch! with Ruff Ruffman* to a cartoon segment of the show's namesake. This was coded by marking each incidence in a 5-minute segment.

Frequency of related shifts. Given a weight of 15% in the pacing index, this occurs when a visual scene shifts and reveals a new scene that is related to the previous one. An example of this could be when Cleo on *Between the Lions* introduces a book to the cubs, and the scene dissolves from the lions discussing the book into animation from the book. This was coded by marking each incidence in a 5-minute segment.

Frequency of camera cuts. Given a weight of 15% in the pacing index, this occurs when the camera cuts between various shots in a single scene. Camera pans, zooms, or tilting do not count in this category. An example would include a long shot of *Dora the Explorer* speaking with her friends, then a close up of her speaking. This was coded by marking each incidence in a 5-minute segment.

Percent of active motion. Given a weight of 20% in the pacing index, this occurs when characters are engaged in an activity that is at a faster pace than a walk, including running, jumping, and dancing, among others (Anderson, Levin, & Lorch, 1977; Huston et al., 1981). Examples could include *Arthur* riding his bike, the dog from *Martha Speaks* shaking her wet fur, a fire hydrant spewing water, or a machine transforming into an action hero. When active motion occurred, coders used stop watches to denote the amount of time the active motion was occurring. At the end of the 5-minute segment, the length of time was totaled and the percentage found.

Frequency of auditory changes. Given a weight of 10% in the pacing index, this occurs when there is a change from "one qualitative type of sound to another" (McCollum & Bryant, 2003, p. 124). Examples might include the change from a woman to a man's voice, a child to an adult's voice, or the insertion of a sound effect, among others. A conversation among people with the same auditory qualities would not count as an auditory change. This was coded by marking each incidence in a 5-minute segment.

Percent of active music. Given a weight of 10% in the pacing index, this occurs when instrumental music is anything above low-key, and includes singing by the main characters and sound effects. Music that is steady in the background of the program is not counted. When active music occurs, coders will use stop watches to denote the amount of time the active music was occurring. At the end of the 5-minute segment, the length of time was totaled and the percentage was found.

Percent of active talking. Given a weight of 10% in the pacing index, this can be categorized as any conversation above low-key background talking. Examples of active talking could also include barking, singing, and animal sounds. When active talking occurs, coders will use stop watches to denote the amount of time the active talking is occurring. At the end of the 5-minute segment, the length of time was totaled and the percentage was found.

In order to fuse the frequencies and percentages into a reliable formula, the frequency data were normalized and converted into a percentage. To do this, every show was coded, with the highest frequency in that category serving as the denominator for the normalization. The McCollum & Bryant Index (2003) then weights the variables by importance and establishes the following formula: [(normalized percentage of unrelated shifts) × .20] + [(normalized percentage of related shifts) × .15] + [(normalized percentage of camera cuts) × .15] + [(percentage of active motion) × .20] + [(normalized percentage of auditory changes) × .10] + [(percentage of active music) × .10] + [(percentage of active talking) × .10] = pacing index (Anderson et al., 1977; Huston et al., 1981; Lang et al., 1993). Once the index was established for each segment, the segments were ranked by pace and categorized as "slow," "medium," and "fast," depending on the mean and range of the scores.

Distance. A unique feature of the capacity model is distance *(d)*, or the degree to which educational content is integral or tangential to the overall narrative in a program (Fisch, 2002). This concept, which was dubbed as "content on the plotline" by the Sesame Workshop, adopts language from previous studies that have examined story structure in text comprehension (Mandler & Johnson, 1977; Rumelhart, 1975; Thorndyke, 1977; Trabasso et al., 1984). According to Malone & Lepper (1987), content on the plotline typically occurs in television programs that are well-written and place educational and curricular content central to the plot of the show.

In order to measure this semantic distance, this study will pull from a variety of sources including the educational quality index (Wilson et al., 2008), as well as two additional measures. The first two criteria for measuring distance come from the educational quality index (EQI) designed by Wilson, Kunkel, & Drogos (2008). The EQI was originally created to evaluate the educational quality of popular children's programming. The index measured program quality by assessing the strategies that were used to convey the primary lesson in each program. Lessons were defined as "a sustained theme or topic within a program that conveys a message or curriculum of educational value to children" (Wilson et al., 2008, p. 7). In this index, six criteria were used in the assessment of educational level: lesson clarity (how directly the lesson is presented to the viewer), lesson integration (how well the lesson is incorporated into the plot of the show), lesson involvement (how engaging the primary lesson is for the viewer), lesson applicability (how realistic the primary lesson is), lesson importance (how worthy or crucial a lesson is), and lesson reinforcement (how much positive reinforcement is used with the lesson) (Wilson et al., 2008). However, only two of the elements—lesson clarity and lesson integration—apply to this study. Therefore, for the purposes of this study, coders examined the primary lesson in the program for two of the criteria created by the EQI, as well as two additional independent measures, to determine how well an episode or segment embeds educational content into the narrative content. Two coders examined each criterion independently on a 3-point scale from low (1) to medium (2) to high (3). The following sections explain these criteria.

Lesson clarity. According to Wilson et al. (2008), lesson clarity is defined as "how directly and explicitly the primary lesson is presented" (p. 8). A lesson that is high in clarity is easy to decipher, straightforward, and transparent. A child would easily understand such a lesson. A lesson that is low in clarity is not articulated clearly and may be muddled by distractions, unclear dialogue, or competing subplots within an episode. A child would miss this lesson. A lesson that has a medium level of clarity may at times appear straightforward, but may not be prevalent in the dialogue or visual elements. A child may or may not remember seeing such a lesson (Wilson et al., 2008).

Lesson integration. Wilson et al. (2008) defined lesson integration as "the extent to which the primary lesson is repeated or incorporated throughout the program" (p. 8). Lesson integration refers to the extent to which the primary lesson is incorporated into the narrative of the clip. A lesson that is high in integration will be a contiguous part of the plotline and works with the narrative to get the educational lesson across. The educational lesson would not appear to be separate from the narrative, but rather would be a contiguous part. A lesson that has a medium level of integration may not appear to be a continuous part of the clip, but rather its own independent section using the main characters. A lesson that is low in integration is isolated or separated from other program content, does not include the main characters, and may "appear to be tangential to the main plot or storyline" (Wilson et al., 2008, p. 9).

Lesson redundancy. Lesson redundancy refers to the extent to which the primary lesson is repeated throughout the program. A lesson that is high in redundancy will be emphasized or demonstrated multiple times throughout the clip. A lesson that has a medium level of redundancy may only appear or be mentioned a couple of times by the characters in a clip. A lesson that is low in redundancy is one that is only mentioned once or not at all in the clip (Fisch, 2004b; Rice et al., 1986).

Direct address with potential for interaction. Direct address refers to whether a character directly addresses the audience members in regards to the educational content of the show. A lesson that has a high amount of direct address is one in which a main character addressed the audience and waits for a response. This may occur multiple times. When this happens, the content become less tangential to the narrative content, and thus, distance should decrease (Fisch, 2004b). A lesson that has a medium level of direct address is one in which the characters or narrators speak directly to the audience, but may only do so once, and does not wait for a response from the audience. A lesson that is low in direct address does not have any main character addressing the audience. In low direct address, the narrator may be guiding the story, but does not directly ask the audience any questions (Fisch, 2004b; Rice et al., 1986).

Each variable was coded on a 3-point scale (1 = low, 2 = medium, 3 = high), the sum of the scores could range from a low of four to a high of 12. The score were then categorized as either “small” or “large” depending on total distance score. Fisch (2000) has defined these two types of distance: small, when educational content is causally connected to a large number of subsequent events, and large, when educational content is embedded in the plot and does not forward the story. Therefore, the scores from the four categories will be totaled, and categorized based off of the range: programs with scores ranging from 4 through 8 will be categorized as “large,” and programs with scores of 9 or higher will be categorized as “small.”

Type of show. Another variable used in the analysis of these data is the type of show. In children’s television, two main types of shows exist—magazine and story (Wright et al., 1984). A magazine show is one in which information is presented to the audience in separate segments that could be considered self-contained. This type of show presents information and plotlines in a noncumulative, often frenetic manner, which tends to jump from segment to segment (Bryant et al., 1983; Wright et al., 1984). However, story types of programs present information in a cumulative format. A larger, more meaningful plotline develops in the story and often climaxes towards the end of the show.

Each type effects the continuity of the program, and in turn, the children's attention to the program (Bryant et al., 1983; Wright et al., 1984).

Show format. In addition, show format—the portrayal of live characters versus animated characters—may be an influencing factor in pacing in children's television (Kirkorian et al., 2008; Rice et al., 1986; Salomon & Cohen, 1977). Because certain formal features, such as the show format, humor, special effects, and pace are extremely appealing to young children, it is important to determine the relationship between pace and format (Huston & Wright, 1983; Kirkorian et al., 2008). Several programs use a magazine format and intersperse different types of characters throughout; however, for this variable each show was coded for the format that was prevalent.

Station & Type. The final variable that was examined was the type of station the program was aired on—public television versus commercial television. Although public television has been known historically for a prosocial educational focus, network channels have created a number of educational programs in recent years. Thus, the type and the station—PBS Kids, Nick Jr., and Playhouse Disney—was recorded.

Selection of stimuli. After the programs were analyzed for pace and distance, the 5-minute segments were divided into the six categories according to the permeations and combinations of pace and distance: fast pace, small distance; fast pace, large distance; medium pace, small distance; medium pace, large distance; slow pace, small distance; and slow pace, large distance These programs were edited into 60- to 90-second clips that contained an educational lesson. The six programs' segments—*Imagination Movers, The Electric Company, Can You Teach My Alligator Manners?, Word Girl, Dora the Explorer,* and *Teletubbies*—were then coded for pace and distance. The stimulus segments used in this study varied in length from 63 seconds (*The Electric Company*) to 90 seconds (*Can You Teach My Alligator Manners?, Word Girl,* and *Dora the Explorer*).

According to McCollum & Bryant (2003), several of the criteria in the pacing index—active music, active motion, and active talking—must be normalized by the segment's length of time in order to yield reliable integral data. Although it would have been ideal for coding purposes to have segments of equal length, it was not possible in the selected video segments. Therefore, to control for the variation in length, 90 seconds from each stimulus segment's program were examined to determine the pacing score. By using the 90 seconds that frame the stimulus segment (as opposed to the actual length of the selected clip), it allowed the data to be (Bandura, 1965) normalized.

Table 1

Programs' Network, Pacing and Distance (Boldface Indicates Show Selected for Stimuli)

Program	Pacing Score	Pacing Level	Distance Score	Distance Level
***The Electric Company* (PBS Kids)**	69.43	fast	6	large
Fetch! with Ruff Ruffman (PBS Kids)	58.01	fast	10	small
***Imagination Movers* (Nick Jr.)**	52.16	fast	9	small
Yo Gabba Gabba (Nick Jr.)	48.64	fast	9	small
Arthur (PBS Kids)	46.66	fast	7	large
Barney & Friends (PBS Kids)	45.79	fast	10	small
The Fresh Beat Band (Nick Jr.)	40.17	fast	5	large
Jack's Big Music Show (Nick Jr.)	39.85	medium	10	small
My Friends Tigger & Pooh (Playhouse Disney)	37.91	medium	9	small
Dragonfly TV (PBS Kids)	37.09	medium	10	small
Mama Mirabelle (PBS Kids)	37.03	medium	7	large
***Can You Teach My Alligator Manner?* (Playhouse Disney)**	36.73	medium	12	small
Angelina Ballerina (PBS Kids)	35.96	medium	6	large
LazyTown (Nick Jr.)	34.71	medium	6	large
Dinosaur Train (PBS Kids)	34.65	medium	11	small
Lomax the Hound of Music (PBS Kids)	34.11	medium	9	small
Choo Choo Soul (Playhouse Disney)	34.11	medium	6	large
Postcards from Buster (PBS Kids)	34.09	medium	6	large
Zoom (PBS Kids)	34.08	medium	10	small
Word World (PBS Kids)	33.99	medium	10	small
Handy Manny (Playhouse Disney)	33.59	medium	8	large
BunnyTown	32.81	medium	6	large
Clifford the Big Red Dog (PBS Kids)	32.71	medium	7	large
Wonder Pets (Nick Jr.)	32.36	medium	10	small
***Word Girl* (PBS Kids)**	32.26	medium	6	large
*Special Agent OSO (*Playhouse Disney)	32.14	medium	12	small
Between the Lions (PBS Kids)	32.11	medium	7	large
Animalia (PBS Kids)	31.63	medium	6	large
Ooh & Aah (Playhouse Disney)	31.43	medium	7	large
Sid the Science Kid (PBS Kids)	30.60	medium	11	small
Caillou (PBS Kids)	30.53	medium	5	large
Happy Monster Band (Playhouse Disney)	30.31	medium	6	large
Dragon Tales (PBS Kids)	30.17	medium	7	large
Jay Jay the Jet Plane (PBS Kids)	29.82	medium	8	large

(continued)

Table 1 (Continued)

Program	Pacing Score	Pacing Level	Distance Score	Distance Level
Ni Hao Kai-Lan (Nick Jr.)	29.78	medium	12	small
It's a Big Big World (PBS Kids)	28.97	medium	10	small
Little Bill (Nick Jr.)	28.73	medium	8	large
Go, Diego, Go! (Nick Jr.)	28.46	medium	11	small
Curious George (PBS Kids)	28.32	medium	7	large
Franny's Feet (PBS Kids)	28.32	medium	12	small
Martha Speaks (PBS Kids)	27.99	medium	9	small
Maggie and the Ferocious Beast (Nick Jr.)	27.93	medium	7	large
Higglytown Heroes (Playhouse Disney)	27.66	medium	5	large
Cyberchase (PBS Kids)	27.26	medium	10	small
Chugginton (Playhouse Disney)	27.18	medium	5	large
Jungle Junction (Playhouse Disney)	26.76	medium	8	large
Tasty Time with Ze Fronk (Playhouse Disney)	26.47	medium	10	small
Zoboomafoo (PBS Kids)	26.28	medium	7	large
George Shrinks (PBS Kids)	26.08	medium	6	large
Mickey Mouse Clubhouse (Playhouse Disney)	25.89	medium	9	small
Lou and Lou: Safety Patrol (Playhouse Disney)	25.74	medium	12	small
Maya and Miguel (PBS Kids)	25.08	medium	9	small
Pinky Dinky Doo (Nick Jr.)	24.46	medium	9	small
Franklin (Nick Jr.)	24.32	medium	6	large
Boohbah (PBS Kids)	24.16	medium	5	large
Sagwa (PBS Kids)	23.65	slow	6	large
***Dora the Explorer* (Nick Jr.)**	23.12	slow	12	small
Little Einsteins (Playhouse Disney)	22.91	slow	8	large
Little Bear (Nick Jr.)	22.22	slow	8	large
Sesame Street (PBS Kids)	22.21	slow	11	small
Betsy's Kindergarten (PBS Kids)	21.58	slow	10	small
Wow! Wow! Wubbzy (Nick Jr.)	20.84	slow	8	large
Super Why! (PBS Kids)	20.70	slow	11	small
Toot & Puddle (Nick Jr.)	20.59	slow	7	large
Panwapa (PBS Kids)	20.15	slow	12	small
The Backyardigans (Nick Jr.)	19.94	slow	9	small
Toopy and Binoo (PBS Kids)	19.74	slow	9	small
Berenstain Bears (PBS Kids)	19.59	slow	6	large

(continued)

Table 1 (continued)

Program	Pacing Score	Pacing Level	Distance Score	Distance Level
Moose & Zee (Nick Jr.)	19.18	slow	11	small
Blue's Clue's (Nick Jr.)	18.76	slow	12	small
Make Way for Noddy (PBS Kids)	18.34	slow	7	large
Miss Spider (Nick Jr.)	16.73	slow	6	large
Team Umizoomi (Nick Jr.)	16.20	slow	12	small
Max & Ruby (Nick Jr.)	15.69	slow	4	large
Charlie & Lola (Playhouse Disney)	15.63	slow	4	large
Olivia (Nick Jr.)	15.61	slow	6	large
***Teletubbies* (PBS Kids)**	15.14	slow	5	large
Oswald (Nick Jr.)	13.25	slow	5	large
The Upside Down Show (Nick Jr.)	11.45	slow	7	large
Mister Roger's Neighborhood (PBS Kids)	9.74	slow	10	small

As Table 2 indicates, overall pacing scores for the stimuli ranged from 70.56 for *Electric Company* to 21.87 for the *Teletubbies*. The mean pacing index score for these shows was 28.71, with a standard deviation of 9.99. The overall distance scores for the stumuli ranges from 12 for *Can You Teach My Alligator Manners?* and *Dora the Explorer* to 4 for *Teletubbies*. The mean distance score for these shows was 10.17, with a standard deviation of 3.13.

Table 2

Pace, Distance, Length, and Frequency of Stimulus Segments

Experimental Treatment	First Segment Shown	Pacing Score	Distance Score	Length shown	Frequency Shown (n)
Fast Pace, Small Distance	*Imagination Movers*	57.45	10	88	22
Fast Pace, Large Distance	*The Electric Company*	70.56	6	63	21
Medium Pace, Small Distance	*Can You Teach My Alligator Manners?*	33.93	12	90	24
Medium Pace, Large Distance	*Word Girl*	32.81	7	90	23
Slow Pace, Small Distance	*Dora the Explorer*	27.2	12	90	23
Slow Pace, Large Distance	*Teletubbies*	21.87	4	84	22

Note. Pacing Index score based off a 90 second clip of the program. Not every segment shown to participants was 90 seconds in length. Pacing and distance scores of the clips may vary from the 5-minute clips coded for the selection of stimuli.

A pretest was run to determine if the selected stimulus segments seemed to be too complex or simple of a lesson for children between the ages of three and five years old to comprehend, to ensure the segments have parallel structure in the between the treatments, and to ensure the pace and distance scores of the segments are optimal for testing. After pretesting with 15 children, the various stimulus segments were then edited for appropriateness and difficulty. If the segment was deemed inappropriate for the category or age group, it was thrown out, and a more appropriate segment was found. The six stimulus segments were then burned to a DVD, that was then presented to children in the preoperative stage of cognitive development (between the ages of three and five years old) to determine how the independent variables of pace and distance influence the dependent variable of acquisition of educational and narrative content.

Dependent Variable

Acquisition of information. One of the methods of measuring encoding and acquisition of information is through recognition of the message. Therefore, this was measured by cued recall (Lang, 2000). Participants were pretested to determine their prior awareness of the characters as well as their cognitive maturity. After viewing the program segments, participants were then asked a question about the narrative content of the program, as well as a question about the educational content. This measured how accurately the participant could recall the information from the messages that they had previously viewed; the greater the accuracy, the greater the presumed acquisition of a subject. Participants were asked simple, open-ended questions about the narrative plotline and educational lesson from each of the program segments; however, answers were coded in a dichotomous correct/incorrect format. Each question asked "explicitly presented facts or inferences about character[s]" that are central to the story or lesson at hand (Calvert et al., 1982, p. 604). The percent correct was measured for each message and used in the analysis of the data.

Main Quasi-Experiment

The purpose of the main quasi-experiment was to find out how narrative complexity (i.e., pace) and distance influence the acquisition of educational and narrative content. The researcher also hoped to determine how these variables work in combination with one another to influence attention.

Design. A within-subjects design was used so that all participants were exposed to each of the conditions. A 3 (pace) × 2 (distance) mixed design was used, and a Graeco-Latin square technique (Cochran & Cox, 1957) was utilized to randomize the program conditions, allowing each condition to be viewed at least 21 times. Participants in each condition were exposed to the six 60-to-90-second television segments with varying pace and distance. Between each treatment, there was a 15-second break with a black screen for the child to view. Alternating the order in which children viewed the stimulus ensured protection from primacy and recency effects.

Table 3

Randomization of Program Segments

1	2	3	4	5	6
S1	S2	M1	M2	F1	F2
S2	F1	M2	F2	S1	M1
F1	S1	F2	S2	M1	M2
M2	M1	S2	F1	F2	S1
M1	F2	F1	S1	M2	S2
F2	M2	S1	M1	S2	F1

Note. S = Slowly paced segment; M = Moderately paced segment; F = Fast paced segment; 1 = Large Distance; 2 = Small Distance

Participants. All of these dimensions were investigated using children, ages three through five years old, who are within the Piagetian preoperational level of cognitive development. Participants were recruited from local daycares and private schools in two southern states. After permission was obtained from the directors of the programs, parents of participants were given an informal explanatory letter to introduce them to the research study, along with a permission slip (i.e., an informed parental consent form) (Appendix B). Given the age of the participants, parents were also asked to complete a short survey assessing the demographic and media use patterns in their household. Before the child could participate, the permission slip was returned, signed, and dated (Appendix C). Additionally, each child was required to give verbal assent before the experiment began (Appendix D).

A total of six cells were necessary for this experiment. Results from an ANOVA statistical-power analysis ($p < .05$) indicated that a minimum of 120 preschool children (with roughly 20 children per cell) were required in order to yield significant results. Thus, a total *N* of 140 children between the ages of 3- and 5-years old were recruited from various preschools in two southern states. Of the 140 participants, five children refused to participate, resulting in 135 completed assessments. Of those 135 completed assessments, 57.0% (n=77) were female and 43.0% (n=58) were male; moreover, 37.78% (n=51) were three years old, 38.52% (n=52) were four years old, and 23.70% (n=32) were 5 years old. The ethnic breakdown was as follows: 113 (83.7%) of the children that participated were Caucasian, 12 children were African-American (8.9%), 4 (3.0%) children were Native American, 3 (2.2%) children were Hispanic/Latino, and 3 (2.2%) children were Asian. Approximately 83.70% (n=113) of the participants lived in a two-parent household.

Given the age of the participants in this study, parents were asked to complete a survey about their family's demographic information and media use patterns. Of the parents filling out the survey, 83.70% were female. Of the adults who completed the accompanying survey, the average age was 34 years old, with the majority (85.19%, n = 115) indicating that they were married. The ethnic breakdown of the parents was 89.63% Caucasian (n = 121), 5.19% (n = 7) African-American, 2.22% American Indian/Native American (n = 3), 2.22% Hispanic/Latino (n = 3), and .74% Asian or Asian American (n = 1). The majority of parents (96.5%, n = 130) had some form of formal higher education, with a large number (33.33%, n = 45) having a master's degree or beyond. The mean family income of the children tested was $105,865 with a standard deviation of $79,348.

Procedure. Once the principal or day-care director provided consent, the researcher set a specific timeframe with the teachers to conduct the experiment. A cover letter, informed consent letter, and parental demographic survey were distributed to each student's family. The parental survey contained questions about the age and gender of the child, general household data (income, number of siblings, one or two parent household), and typical media usage (estimates of number of hours per day and per week the child consumes media, parental control, number of media devices inside the home, etc.) (Appendix E). This survey and all consent forms were completed and collected prior to the experiment.

After all the forms were collected, the study began. Participants were escorted one by one from the classroom and taken to a special room in which they agreed to "play games" with the researcher. The research assistants were two females, one age 28 years, the other 62 years old. Each assistant received IRB approval, completed a training session, and observed the primary researcher conduct the experiment with the child for no less than three sessions.

During a brief warm-up period, the researcher introduced herself and conversed with the child in order to make him or her feel comfortable. Researchers read the Child's Assent Script (Appendix D) to make sure the child thoroughly understood what he or she would be involved in. Each child was seated at a table facing a Sony 9" widescreen portable DVD player with a swivel and flip screen. After the child agreed to participate, the PPVT-IV was completed to measure the cognitive capabilities of the child. If the child did not agree to participate, they were taken back to the classroom and their data were not used.

Pretest. After assent, the children's cognitive abilities were assessed by using the Peabody Picture Vocabulary Test-IV, which measured the verbal intelligence of an individual (Pearson Education Inc., 2009). Although it has been revised several times (Dunn, 1965; Dunn & Dunn, 1981), the PPVT is one of the most popular and reliable tools for evaluating the scholastic aptitude of school-aged children. In past research, the PPVT has been shown to be an appropriate measure for determining cognitive maturity of individuals. Because cognitive maturity has been found to be an influencing factor on how children pay attention to and learn from television, this confounding variable was controlled for and used as a covariate in all of the analysis.

Throughout the PPVT-IV, the researcher presented a series of pictures to the child. The researcher said a word and then asked the participant to identify the picture that best matched the words. The researcher recorded the number of correct answers, and the two scores were computed for the child: a raw score, and a standard score that was normalized for age. The pretests lasted roughly 15 minutes.

Stimulus. After the pretest had been completed, the researcher played the 9-minute tape of the different program segments (Appendix I). As previously mentioned, the segment order was randomly assigned to prevent recency and primacy effects. At the end of the video segment, the researcher engaged in conversation with the child and asked her or him how they enjoyed the video, and if he or she recognized the characters in the segment. This answer was recorded in a dichotomous, "correct" or "incorrect" format, depending on the accuracy of answer provided by the child.

Posttest. Next, the researcher administered a posttest to determine participants' recall of both the narrative content and the educational content in the program (Appendix

F). Participants were asked questions about the plot and the curricular lesson within the educational content. For each question, children were provided with a visual stimulus of an image of the main character (i.e., Dora), or a screen shot of a moment from the stimulus segment (i.e., A screen shot of a character singing from *The Electric Company*) (Appendix H). Throughout the posttest, each answer was recorded and the child was praised for responding or encouraged if there is any hesitation.

Debriefing. When the researchers completed the interviews with each child, they inquired if the child had any additional questions about the content that he or she watched (Appendix F). The researchers then debriefed each child, thank him or her for helping with the study, and walked the child back to his or her classroom. The entire experimental process, from start to finish, took approximately 30 minutes.

CHAPTER 4

Results

Content Analysis

An analysis of the 80 E/I shows on Playhouse Disney, Nick Jr., and PBS kids yielded a wide range of overall pacing scores ranging from 69.43 for *The Electric Company* to 10.74 for the *Mr. Rogers' Neighborhood*. The mean pacing index score for these shows was 29.01, with a standard deviation of 10.76. Upon classification, 31.3% (*n* = 25) of the programs were categorized as having a fast pace, 58.7% (*n* = 47) of the programs had a medium pace, and 10.0% (*n* = 8) had a slow pace. Table 4 shows the pacing index categories of the programs under examination.

Table 4

Programs' Pacing Indices and Scores in the Individual Pacing Criteria

Program	Pacing Index	Camera Edits (*N*)	Related Shifts (*N*)	Unrelated Shifts (*N*)	Auditory Changes (*N*)	Active Motion (%)	Active Music (%)	Active Talking (%)
Angelina Ballerina	35.96	62	5	1	33	50.67	85.00	36.67
Animalia	31.63	85	3	0	52	25.00	60.67	38.67
Arthur	46.66	96	11	3	41	41.33	58.33	67.00
Barney & Friends	45.79	50	5	5	55	58.67	46.00	55.67
Berenstain Bears	19.59	61	3	0	23	1.33	80.00	8.33
Betsy's Kindergarten	21.58	56	4	0	31	0.67	78.33	20.00
Between the Lions	32.11	52	11	0	68	1.00	99.33	21.33
Blue's Clue's	18.76	8	5	0	24	13.67	76.00	18.33
Boohbah	24.16	24	1	0	43	40.33	9.67	65.00
BunnyTown	32.81	23	10	1	29	42.67	56.67	55.00
Caillou	30.53	72	9	2	36	16.33	55.67	16.67
Can you teach my Alligator Manner?	39.73	58	10	1	36	30.67	93.67	25.00
Charlie & Lola	15.63	27	6	0	5	0.00	86.67	6.00
Choo Choo Soul	34.11	48	20	0	64	6.00	4.67	88.67
Chugginton	27.18	31	8	0	23	34.33	77.00	24.00
Clifford the Big Red Dog	32.71	60	3	1	58	32.33	64.00	29.00
Curious George	28.32	55	7	0	63	11.33	80.00	6.67
Cyberchase	27.26	73	4	0	27	1.00	71.33	72.33
Dinosaur Train	34.65	61	8	4	26	12.67	68.67	15.00
Dora the Explorer	23.12	42	4	0	20	27.67	55.33	32.67
Dragon Tales	30.17	83	1	0	51	5.00	72.00	66.33
Dragonfly TV	37.09	72	14	0	20	46.33	92.67	17.33
The Electric Company	66.43	80	17	8	62	85.33	0.00	100.00
Fetch! With Ruff Ruffman	58.01	157	29	4	74	3.00	100.00	1.33
Franklin	24.32	56	8	0	33	1.67	98.67	1.67
Franny's Feet	28.32	25	7	0	22	41.00	100.00	11.33
George Shrinks	26.08	43	4	0	20	7.33	98.33	59.00
Go, Diego, Go!	28.46	60	10	1	22	20.67	45.00	41.33
Handy Manny	33.59	60	7	4	55	0.00	95.33	0.00
Happy Monster Band	30.31	72	14	1	21	9.00	42.00	55.33
Higglytown Heroes	27.66	36	7	0	19	26.67	97.67	29.33
Imagination Movers	52.16	131	20	3	23	44.67	65.67	52.33
It's a Big Big World	28.97	52	7	0	47	13.00	76.00	38.33

(continued)

Table 4 (continued)

Program	Pacing Index	Camera Edits (*N*)	Related Shifts (*N*)	Unrelated Shifts (*N*)	Auditory Changes (*N*)	Active Motion (%)	Active Music (%)	Active Talking (%)
Jack's Big Music Show	39.85	64	7	5	49	16.67	51.00	59.67
Jay Jay the Jet Plane	29.82	52	7	1	28	29.00	91.00	7.33
Jungle Junction	26.76	45	0	0	33	41.00	65.33	32.67
LazyTown	34.71	73	8	0	52	23.00	78.00	41.67
Little Bear	22.22	73	3	1	59	2.67	15.67	18.00
Little Bill	28.73	57	6	0	46	6.00	94.67	33.00
Little Einsteins	22.91	28	3	1	38	0.00	50.33	67.00
Lomax the Hound of Music	34.11	48	20	0	64	6.00	4.67	88.67
Lou and Lou: Safety Patrol	25.74	42	6	0	48	13.00	66.67	28.67
Maggie and the Ferocious Beast	27.93	52	3	0	24	15.00	94.00	57.67
Make Way for Noddy	18.34	52	2	0	22	17.33	37.67	21.33
Mama Mirabelle	37.03	60	16	0	32	35.67	81.33	34.33
Martha Speaks	27.99	61	6	0	53	1.33	82.67	33.67
Max & Ruby	15.69	56	3	0	11	4.00	65.00	0.00
Maya and Miguel	25.08	83	3	0	52	6.00	43.00	30.67
Mickey Mouse Clubhouse	25.89	48	1	0	49	23.33	75.00	20.00
Miss Spider	16.73	50	3	0	17	1.00	47.33	31.67
Mister Roger's Neighborhood	9.74	12	3	0	25	1.67	15.67	17.67
Moose & Zee	19.18	44	5	0	11	18.00	20.67	52.33
My Friends Tigger & Pooh	37.91	68	5	4	32	40.67	66.00	25.00
Ni Hao Kai-Lan	29.78	62	8	1	38	20.67	45.00	41.33
Olivia	15.61	38	4	0	7	0.00	89.67	0.00
Ooh & Aah	31.43	59	8	1	37	22.33	55.67	48.00
Oswald	13.25	19	3	0	12	1.33	66.67	13.33
Panwapa	20.15	31	5	0	53	5.67	50.33	33.33
Pinky Dinky Doo	24.46	47	12	2	13	5.66	66.67	5.67
Postcards from Buster	34.09	96	11	3	41	17.00	26.00	22.33
Sagwa	23.65	81	8	0	4	9.00	66.33	28.00
Sesame Street	22.21	31	5	0	53	5.67	50.33	33.33
Sid the Science Kid	30.6	67	2	1	26	41.00	96.33	0.00
Special Agent OSO	32.14	54	3	0	56	40.67	94.33	3.00

(continued)

Table 4 (continued)

Program	Pacing Index	Camera Edits (*N*)	Related Shifts (*N*)	Unrelated Shifts (*N*)	Auditory Changes (*N*)	Active Motion (%)	Active Music (%)	Active Talking (%)
Super Why!	20.7	12	7	1	26	3.00	100.00	0.00
Tasty Time with Ze Fronk	26.47	64	8	1	34	1.67	80.00	14.67
Team Umizoomi	16.2	33	1	0	16	4.33	91.00	4.00
Teletubbies	15.14	52	0	0	23	5.33	36.00	24.00
The Backyardigans	19.94	30	5	0	12	23.67	55.67	25.67
The Fresh Beat Band	40.17	72	7	0	18	88.67	31.67	63.33
The Upside Down Show	11.45	4	1	0	6	0.00	88.67	8.67
Toopy and Binoo	19.74	43	3	0	9	27.33	59.67	14.33
Toot & Puddle	20.59	66	3	0	18	29.33	34.33	10.00
Wonder Pets	32.36	34	13	0	65	18.00	0.00	100.00
Word Girl	32.26	67	13	0	40	13.33	84.00	26.67
Word World	33.99	46	4	0	52	42.67	65.00	54.67
Wow! Wow! Wubbzy	20.84	74	3	0	28	7.67	40.33	28.67
Yo Gabba Gabba	48.64	66	7	11	43	16.67	46.00	49.67
Zoboomafoo	26.28	55	3	0	59	6.33	77.00	25.33
Zoom	34.08	75	12	1	27	1.33	95.76	56.67

The overall distance scores for the programs ranged from nine programs with a score of 12 to two programs with a score of 4 ($\mu = 8.21$, *SD* = 2.30). Upon classification, 46.3% (*n* = 38) of the programs had a large distance and 51.2% (*n* = 42) had a small distance. Descriptive statistics indicated that for the variable of show type, 54.9% (*n* = 45) were in a cumulative linear fashion, and 42.7% (*n* = 35) proved to be a magazine type of program, in which the topics shifted by segment. For the show format variable, 71.3% (*n* = 57) of the programs were animated, and 28.7% (*n* = 23) were live action. More than half of the programs (51.2%, *n* = 41) were aired on commercial or commercial-affiliate networks, and 48.8% (*n* = 39) were aired on public television. Table 5 shows the distance score categories that were coded for the programs under examination.

Table 5

Programs' Distance Scores and Individual Distance Criteria

Program	Clarity	Integration	Redundancy	Direct Address	Distance Score
	1=low 2=medium 3=high	1=low 2=medium 3=high	1=low 2=medium 3=high	1=low 2=medium 3=high	
Angelina Ballerina	1	2	2	1	6
Animalia	1	2	2	1	6
Arthur	1	2	3	1	7
Barney & Friends	3	3	3	1	10
Berenstain Bears	1	1	3	1	6
Betsy's Kindergarten	3	3	3	1	10
Between the Lions	2	2	2	1	7
Blue's Clue's	3	3	3	3	12
Boohbah	1	2	1	1	5
BunnyTown	1	2	2	1	6
Caillou	1	2	1	1	5
Can You Teach My Alligator Manners?	3	3	3	3	12
Charlie & Lola	1	1	1	1	4
Choo Choo Soul	2	3	3	1	9
Chugginton	1	2	1	1	5
Clifford the Big Red Dog	2	2	2	1	7
Curious George	2	2	2	1	7
Cyberchase	3	3	3	1	10
Dinosaur Train	3	2	3	3	11
Dora the Explorer	3	3	3	3	12
Dragon Tales	2	2	2	1	7
Dragonfly TV	3	3	3	1	10
The Electric Company	1	3	1	1	6
Fetch! with Ruff Ruffman	3	3	3	1	10
Franklin	1	2	2	1	6
Franny's Feet	3	3	3	3	12
George Shrinks	1	3	1	1	6
Go, Diego, Go!	3	2	3	3	11
Handy Manny	1	3	3	1	8
Happy Monster Band	1	2	2	1	6
Higglytown Heroes	1	2	1	1	5
Imagination Movers	3	2	3	1	9

(continued)

Table 5 (continued)

Program	Clarity	Integration	Redundancy	Direct Address	Distance Score
	1=low 2=medium 3=high	1=low 2=medium 3=high	1=low 2=medium 3=high	1=low 2=medium 3=high	
It's a Big Big World	3	3	3	1	10
Jack's Big Music Show	2	3	2	3	10
Jay Jay the Jet Plane	2	3	2	1	8
Jungle Junction	2	2	2	2	8
LazyTown	2	2	1	1	6
Little Bear	2	3	2	1	8
Little Bill	2	2	2	2	8
Little Einsteins	2	2	2	2	8
Lomax the Hound of Music	2	1	1	2	6
Lou and Lou: Safety Patrol	3	3	3	3	12
Maggie and the Ferocious Beast	1	3	2	1	7
Make Way for Noddy	1	3	2	1	7
Mama Mirabelle	3	2	1	1	7
Martha Speaks	3	3	2	1	9
Max & Ruby	1	1	1	1	4
Maya and Miguel	3	3	2	1	9
Mickey Mouse Clubhouse	2	2	2	3	9
Miss Spider	1	2	2	1	6
Mister Roger's Neighborhood	3	2	2	3	10
Moose & Zee	3	2	3	3	11
My Friends Tigger & Pooh	2	2	2	3	9
Ni Hao Kai-Lan	3	3	3	3	12
Olivia	1	3	1	1	6
Ooh & Aah	1	3	1	2	7
Oswald	1	2	1	1	5
Panwapa	3	3	3	3	12
Pinky Dinky Doo	1	3	2	3	9
Postcards from Buster	2	1	2	1	6
Sagwa	1	3	1	1	6
Sesame Street	3	3	3	2	11
Sid the Science Kid	3	3	3	2	11

(continued)

Table 5 (continued)

Program	Clarity	Integration	Redundancy	Direct Address	Distance Score
	1=low 2=medium 3=high	1=low 2=medium 3=high	1=low 2=medium 3=high	1=low 2=medium 3=high	
Special Agent OSO	3	3	3	3	12
Super Why!	3	3	2	3	11
Tasty Time with Ze Fronk	3	3	2	2	10
Team Umizoomi	3	3	3	3	12
Teletubbies	1	1	2	1	5
The Backyardigans	3	2	2	2	9
The Fresh Beat Band	1	1	1	2	5
The Upside Down Show	1	2	2	2	7
Toopy and Binoo	3	3	2	1	9
Toot & Puddle	2	3	1	1	7
Wonder Pets	2	3	2	3	10
Word Girl	1	2	2	1	6
Word World	3	3	3	1	10
Wow! Wow! Wubbzy	2	3	2	1	8
Yo Gabba Gabba	2	3	3	1	9
Zoboomafoo	2	2	2	1	7
Zoom	3	3	3	1	10

Simple linear regressions and correlation coefficients were calculated for the pacing index based on the distance scores. These variables were then examined by one-way analysis of variance (ANOVA) for main effects and interaction effects of target age, show type, and show format. The ANOVA's examined either show type (story, magazine), show format (live, animated), or network type (commercial, public) with distance as a within-subjects factor.

RQ1: What is the relationship between the pacing index and program distance of E/I programs? To explore the relationship between the distance and pacing indices, simple linear regressions were calculated. First, a simple linear regression was calculated to predict the distance of the program based on the pace of the program. The results indicated that pace is not a significant predictor of distance $F\,(1, 78) = .248$, $p > .620$, with an R^2 of .003. A chi-square test of independence was then calculated comparing the distance level (small, large) and the pacing levels (slow, medium, fast). No significant relationship was found ($\chi^2\,(2) = .032$, $p > .984$), indicating that there is no direct relationship between the pace of E/I programs and the distance of those programs.

RQ2: What correlations exist between the pacing index of the shows and show type, show format, and/or network type? Pacing scores were analyzed by means of several two-way mixed design ANOVA's. The ANOVA examined either show type (story, magazine), show format (live, animated) or network type (public, commercial) with the distance level (small, large) as within-subjects factors, and the pace as the dependent variable. As Table 6 indicates, no main or interaction effects were present for network type × distance level, show format × distance level, or show type × distance level. This lack of significance may indicate that for E/I programs, show format, network type, and show type do not play a major role with distance to influence pace.

Table 6

Interaction and Main Effects on the Pacing Index

	F	*df*	*p*	η^2
Show Type	368.602	1, 76	0.074	0.041
Show Type * Distance	304.701	1, 76	0.103	0.035
Show Format	353.946	1, 76	0.084	0.039
Show Format * Distance	15.485	1, 76	0.715	0.002
Network Type	341.87	1, 76	0.084	0.039
Network Type * Distance	361.803	1, 76	0.076	0.041
Distance	8.701	1, 76	0.078	0.001

Main Quasi-Experiment

A total of 140 participants between the ages of three and five were recruited from local preschools in two southern states. The data of five participants were removed from the study because of children's refusal to participate, resulting in a usable sample size of 135. The children in the quasi-experiment ranged in age from 36 months to 70 months ($\mu = 50.87$, $SD = 8.78$), with a breakdown of 41 children between 36 and 47 months, 52 children were between the ages of 48 and 59 months, and 32 kids between the ages of 60 and 72 months, and the majority (57.0%, $n = 77$) being female.

Media habits. The majority of children in this study (59.5%) did not have a television in their bedroom, but the average household had at least three televisions ($\mu = 3.22$, $SD = 1.59$). As estimated by their parents, nearly one-third of the children participating (32.59%, $n = 44$) in this study watched approximately one hour of television per day, 28.89% ($n = 39$) watched approximately two hours of television per day, 24.44% ($n = 33$) watched approximately three hours of television per day, and 14.07% ($n = 19$) watched more than four hours of television per day. The average amount of television watched per day ranged from no television to 300 minutes ($\mu = 104.25$, $SD = 62.202$). By inspection, the linear curve of the data was not the traditional normal data curvilinearity, as the data was skewed left. A Pearson's correlation coefficient was calculated for the relationship between children's age and the amount of time spent watching television. A weak negative correlation was found ($r(133) = -.173$, $p < .045$), indicating a significant linear relationship between the age of the child and the amount of television a child watches. Older participants tended to watch less television.

When asked about the amount of time their children spend in front of a TV set, more than half the parents (57.04%, $n = 77$) indicated they believed their child watched an "average" amount of television, a quarter (25.19%, $n = 34$) indicated that they believed the amount their child watched was "below average," 8.14% ($n = 11$) indicated they thought the amount their child watched was "well below average," and only 9.63% believed that the amount of television their children watched as "above average" ($n = 9$), or "well above average" ($n = 4$). Parents also indicated they believed educational television to have a positive influence on their children. When asked, 86.3% "Agreed" or "Strongly Agreed" that it had a positive influence, and 91.6% "Agreed" or "Strongly Agreed" that it helped their child learn. A Pearson's correlation coefficient indicated a weak positive correlation was found ($r(133) = .220$, $p < .006$), indicating a significant linear relationship between the amount of television a child watches and their parent's opinion about whether it helps children learn. A Pearson's correlation coefficient also indicated a weak positive correlation ($r(133) = .220$, $p < .006$) between the amount of television a child watched and their parent's opinion about whether it positively influences children. In addition, a Pearson's correlation coefficient also indicated a strong positive correlation ($r(129) = .635$, $p < .001$) between parents' opinions that E/I television helps their child learn and that E/I television positively influences their child. However, a Pearson's correlation coefficient did not indicate a statistically significant relationship between the amount of television parents watched and their opinion that E/I programming helped their children learn ($r(129) = .137$, $p > .121$) or that E/I programming had a positive influence on their children ($r(129) = .138$, $p > .118$). This indicates that a parent's positive opinion about E/I programming can potentially influence how much television a child watches; however, how much television a parent watches does not influence their opinion about E/I programming.

According to the results, parents (32.59%, $n = 44$) in this study watched up to eight hours of television per day. However, the average amount of television watched per day for parents was just over an hour and a half ($\mu = 102.96$, $SD = 72.21$). In terms of family media habits, parents' media habits were correlated to their children's. A Pearson's correlation coefficient was calculated for the relationship between parents' television watching and their children's. A moderate positive correlation was found ($r(133) = .431$, $p < .001$), indicating a significant linear relationship between the amount of television a parent and a child watches.

PPVT-4 pretest. A Peabody Picture Vocabulary Test-4 pretest was run in order to gain knowledge about the participants' intellectual abilities. In regards to their cognitive development, pretesting indicated a wide range of raw scores, from a low of 30 to a high of 132 ($\mu = 77.64$, $SD = 22.46$). When the data were transformed into standard scores, which take a child's age in months into account, the standard score ranged from a low of 82 to a high of 141. With a mean of 107.87, ($SD = 11.81$), the data indicated the children participating were slightly higher in measured intelligence than the national average ($\mu = 100.00$).

RQ3: How are demographics and media use related to the PPVT score?

A Pearson's correlation coefficient was calculated for the relationship between the participants' age in months and the PPTV-4 raw score. In this instance, a strong positive correlation was found ($r(133) = .739$, $p < .001$, $R^2 = .546$). This indicated a significant linear relationship between the age of the participant and their raw PPVT-4 score, where

54.6% of variance in PPVT can be explained by age variable. The older the child is, the better their raw score on the PPVT-4 test.

One of the questions posed during the research was about the relationship of the PPVT score to the time a child watched television. In order to understand how the amount of television viewing is related to the PPVT score, a simple linear regression was run. On this variable, the Standard PPVT scores were used because these scores have been adjusted for the child's age and age dependent biases have been removed. The participants were divided into two groups with Group 1 (n = 64) being the children who watched one hour or less of television each day and Group 2 (n = 72) being the children who watched two or more hours of television each day. In this instance, no correlation was found ($r(133) = .145$, $p > .094$, $R^2 = .021$). However, an independent samples t-test comparing the mean scores of the two groups found significance at the .10 level ($t(133) = -1.686$, $p > .100$). The mean of the group who watched more that two or more hours of television per day ($\mu = 109.42$, $SD = 1.391$) was significantly higher than the mean of the group that only watched one hour of television per day ($\mu = 106.00$, $SD = 1.464$). Thus at .10 significance, the Standard PPVT scores of children who watched one hour or less of television each day are statistically significantly lower than the Standard PPVT scores of children who watched two hours or more of television each day.

An independent samples t-test found no significant differences ($t(134) = .425$, $p > .343$) between the PPVT scores of children whose parents were married (n = 115) versus not married (n = 20). Thus at .05 significance, there is not enough evidence to say that the Standard PPVT scores of children whose parents are married ($\mu = 110.35$, $SD = 11.107$) are different from the Standard PPVT scores of the children whose parents are not married (μ = 107.41, *SD* = 12.003). This indicates that marital status is not statistically significantly related to Standard PPVT scores, at least not in this sample.

Additionally, the participants were divided into two groups with Group 1 (n = 106) being the children whose parents did not have a college degree (Associates or higher) and Group 2 being the children whose parents did have a college degree (n = 28). A Spearman's correlation coefficient indicated a weak significant relationship (*rho* (132) = .156, $p < .036$) between the PPVT standard score and the parent's educational accomplishments. Children with parents who had degrees tended to score higher on the PPVT test. However, an independent samples t-test found no significant differences ($t(132) = -1.515$, $p > .516$) between the PPVT scores of children whose parents had a college degree (μ = 108.69, *SD* = 11.696) versus those children whose parents did not have a college degree (μ = 104.89, *SD* = 12.164). This indicates that a parent's college education does not appear to be related to their child's PPVT score. Finally, an analysis of the relationship between a child's PPVT score and family income was conducted. A Pearson correlation coefficient indicated that no significant relationship between PPVT standard score and a family's income level existed ($r(126) = -.029$, $p > .371$). So for all practical purposes, we may say that income does not appear to be related to Standard PPVT scores, based on the current findings.

Stimulus Responses. In order to understand the posed research questions, the accuracy of participants responses for each stimulus segment was examined. Participants watched six program segments varying slightly in length. At the end of each clip, experimenters asked questions regarding both the narrative and educational content, as well as recognition of the program. Although information acquisition was measured through the accuracy of responses to educational and narrative content, it is important to note that the participants may have acquired information about the topic *before* they watched the video. For example, some of the questions that were asked are novel to the program; however, other questions are not novel to the program and children may have learned about them at their preschool, from their teachers, from previous media exposure, or in day-to-day life.

RQ4: Do children recall narrative content more easily than educational content from E/I programs?

H1: Narrative content in E/I television programs can be more easily recalled than educational content.

During the interview process, the children answered 66.7% (n = 540) of the narrative questions and 38.3% (n = 310) of the educational questions correctly. In order to examine the children's general ability to process narrative versus educational content, the total narrative and total educational scores were compiled per child, yielding an aggregate narrative score of 0 to 6 and an aggregate educational score of 0 to 6. A chi-square test of independence that compared the aggregate number of correct educational content questions to the aggregate number of correct narrative questions found significant differences between the two (χ^2 (36) = 92.840, $p < .001$). The results indicated that children were able to recall narrative content with greater accuracy than educational content, thus supporting H1. The recall of narrative versus educational content is examined for each program in the sections below.

Imagination Movers. Participants watched a fast-paced (Pace = 57.45) segment from the show *Imagination Movers* that presented an educational lesson with a small distance (Distance = 10) about the seven days of the week. When asked the narrative question of "Can you tell me what the Imagination Movers did on Saturday?," 22 (16.3%) children provided the correct answer. When asked the educational content question of "How many days of a week are there?," 40 (29.6%) children provided the correct answer. A chi-square test of independence that compared the frequency of correct answers to the educational content questions to the frequency of correct answers to the narrative questions found significant differences between the two (χ^2 (1) = 5.231, $p < .022$). The results indicated that for the fast pace/small distance category, H1 is not supported. With this stimuli, participants were more likely to answer the educational question correctly. It should be noted that the results for the *Imagination Movers* questions are the opposite of the results for the remaining questions, an explanation for this will be forthcoming.

The Electric Company. Participants also watched a fast-paced (Pace = 70.56) segment from the show *The Electric Company* that presented an educational lesson with a small distance (Distance = 6) with various educational themes. When asked the narrative question of "Can you tell me what happened to the floor when the people started singing & dancing?," 80 (59.3%) children provided the correct answers. When asked the educational content question of "Can you tell me what the foot bone is connected to?," only 6 (4.4%) children provided the correct answer. A chi-square test of independence that compared the frequency of correct answers to the educational content questions to the frequency of correct answers to the narrative questions did not indicate significant differences between the two (χ^2 (1) = .143, $p > .706$). The results indicated that for the fast pace/large distance category, H1 is not supported.

Can You Teach My Alligator Manners? The medium-paced (Pace = 33.93)/small distanced (Distance = 12) segment from the show *Can You Teach My Alligator Manners?* presented an educational lesson about sharing and manners on the playground. When asked the narrative question of "Can you tell me what Al the Alligator was trying to take from the little girl?," 127 (94.1%) children provided the correct answers. When asked the educational content question of "What did the little boy suggest that Al the Alligator do to be polite?," 76 (56.3%) children provided the correct answer. A chi-square test of independence that compared the frequency of correct answers to the educational content questions to the frequency of correct answers to the narrative questions found significant differences between the two ($\chi^2(1) = 10.954$, $p < .001$). The results indicate that for the medium pace/small distance category, H1 is supported. With this stimuli, participants were more likely to answer the narrative question correctly.

Word Girl. The medium-paced (Pace = 32.81)/large distanced (Distance = 7) segment from the show *Word Girl* presented an educational lesson about the electoral process. When asked the narrative question of "Can you tell me what happened to Becky's ideas? Who stole them?," 78 (57.8%) children provided the correct answers. When asked the educational content question of "Do you remember the word they told you to listen for that means a person who is running for office?," 8 (5.9%) children provided the correct answer. A chi-square test of independence that compared the frequency of correct answers to the educational content questions to the frequency of correct answers to the narrative questions found significant differences between the two ($\chi^2(1) = 6.214$, $p < .013$). The results indicate that for this stimuli, participants were more likely to answer the narrative question correctly, thus supporting H1.

Dora the Explorer. The slow-paced (Pace = 27.20)/small distanced (Distance = 12) segment from the show *Dora the Explorer* presented an educational lesson about patterns and colors. When asked the narrative question of "Can you tell me what happened to the super babies' blanket?," 124 (91.9%) children provided the correct answers. When asked the educational content question of "What colors were in the pattern on the super babies blanket?," 104 (77.0%) children provided the correct answer. A chi-square test of independence that compared the frequency of correct answers to the educational content questions to the frequency of correct answers to the narrative questions found significant differences between the two (χ^2 (1) = 6.753, $p < .009$). The results indicate that for the slow pace/small distance category, H1 is supported. With this stimuli, participants were more likely to answer the narrative question correctly.

Teletubbies. The slow-paced (Pace = 21.8)/large distanced (Distance = 4) segment from the show *Teletubbies* presented an educational lesson about reflections in water. When asked the narrative question of "Can you tell me what happened when it stopped raining?," 109 (80.7%) children provided the correct answers. When asked the educational content question of "What did Po see reflecting in the water?," 76 (56.3%) children provided the correct answer. A chi-square test of independence that compared the frequency of correct answers to the educational content questions to the frequency of correct answers to the narrative questions found significant differences between the two (χ^2 (1) = 6.152, $p < .013$). The results indicate that for the slow pace/large distance category, H1 is supported. With this stimuli, participants were more likely to answer the narrative question correctly.

The above data indicate that for nearly all of the stimulus segments, narrative content is recalled to a greater extent than educational content. However, it is important to note that one stimuli segment, *Imagination Movers*, did not behave as expected. Although the pace of the program was slower on the pacing scale than *The Electric Company*, the frenetic nature of the actions and music itself may have caused cognitive overload with the children. Additionally, the lack of significance with *The Electric Company* may be a function of the clip itself. Since there was such a discrepancy in whether the number of correct answers between the educational and narrative content questions, a chi-square test may not be able to test if people can recall the information.

RQ5: Does pace mediate the recall of narrative content versus educational content?

RQ6: At what pace do children between the ages of three and five retain the greatest amount of educational content?

RQ7: At what pace do children between the ages of three and five retain the greatest amount of narrative content?

The capacity model posits that as the complexity of the program increases and requires a greater amount of resources, the ability to recall educational content will decrease. To get a better picture of how pace affects information acquisition, one-way repeated measures ANOVA's were calculated comparing the frequency of correct narrative and educational answers at the three different paces: slow, medium, and fast. For each pacing level, the scores for two stimulus segments were combined, and the aggregate scores (0 through 2) were examined. In the General Linear Model (GLM) procedures ($N = 135$), the experimental condition and children's cognitive abilities were controlled for. The following sections explore the relationship between pace, narrative content, and educational content.

H2: As the pace of the program increases, the acquisition of narrative content will increase.

Pace and narrative content. The results indicated that pace alone did have a statistically significant effect on the acquisition of narrative content (F [1, 128] = 20.671, $p < .001$, $\eta^2 = .254$). Stimulus segments with a slow pace had the greatest amount of narrative information acquisition ($\mu = 1.73$, $SD = .043$), followed by segments with a medium pace ($\mu = 1.52$, $SD = .048$), and finally a fast pace ($\mu = .75$, $SD = .052$). Additionally, when children's cognitive abilities were taken into account, and PPVT interacted with pace, a statistically significant effect also existed for pace and the acquisition of narrative content (F [1, 128] = 4.515, $p < .036$, $\eta^2 = .034$). For pace, the order of the experimental condition did not have any statistically significant impact (F [5, 128] = .368, $p > .870$, $\eta^2 = .014$) on how children responded to narrative content. Thus, the order the video were viewed in was had no influence on how they answered the narrative content question. The PPVT raw score was used as a covariate in this model, and the results indicated that children's cognitive maturity did have a statistically significant impact (F [1, 128] = 42.679, $p < .001$, $\eta^2 = .250$) on the frequency of correct answers for narrative content. Thus, H2 is not supported. For as the segment's pacing level increases, the means indicate that the acquisition of narrative content decreases.

H3: As the pace of the program increases, the acquisition of educational content will decrease.

Pace and educational content. The results indicated that pace alone did not have a significant effect on the acquisition of educational content; however, it did approach significance (F [1, 128] = 2.870, $p > .093$, η^2 = 022.). Upon analysis, stimulus segments with a slow pace were found to have the greatest amount of educational information acquisition (μ = 1.34, SD = .056), followed by segments with a medium pace (μ = 1.14, SD = .061), and finally a fast pace (μ = .34, SD = .038). However, when children's cognitive abilities were taken into account, and PPVT interacted with pace, a significant effect was found (F [1, 128] = 7.315, $p < .008$, $\eta^2 = .054$). For pace, the order of the experimental condition did not have any statistically significant impact (F [5, 128] = .985, $p > .430$, $\eta^2 = .037$) on how children responded to educational content, and thus the order of presentation was negligible. The PPVT raw score was used as a covariate in this model, and the results indicated that children's cognitive maturity did have a statistically significant impact (F [1, 128] = 84.324, $p < .001$, $\eta^2 = .397$) on the frequency of correct answers for educational content. Thus, as seen in Table 7, as the pacing level increases, the acquisition of educational content decreases, giving support to H3.

Table 7

Means of Narrative and Educational Content by Pace

	Narrative Content			Educational Content				
Pace	μ	*SD*	*n* correct*	μ	*SD*	*n* correct*	χ^2	*p*
Fast	0.75	0.052	102	0.34	0.038	46	12.411	0.015
Medium	1.52	0.048	205	1.14	0.061	84	96.173	0.001
Slow	1.73	0.043	233	1.34	0.056	180	17.348	0.001

* *Note.* To calculate the n correct for the total score per child, the authors used the total number of questions asked (N=270) for each pacing category.

To further examine how pace interacts with both narrative and educational content in each pacing level, chi-square tests of independence were run to compared the frequency of correct educational content questions to the frequency of correct narrative questions. The following sections examine these relationships.

Fast pace. For the fast pace category, participants answered 17.0% (n = 46) of the educational content questions and 37.8% (n = 102) of the narrative questions correctly. Since two programs were categorized as having a fast pace, and 135 children answered the questions, the total N of the fast-paced questions was 270. A chi-square test of independence that compared the frequency of correct answers to the educational content questions to the frequency of correct answers to the narrative questions found significant differences between the two (χ^2 (4) = 12.411, $p < .015$). This indicated that for these fast-paced programs, narrative content was acquired at a greater rate than educational content.

Medium pace. For the medium paced category, participants answered 31.1% (n = 84) of the educational content questions and 75.9% (n = 205) of the narrative questions correctly. Since two programs were categorized as having a medium pace, and 135 children answered the questions, the total N of the medium-paced questions was 270. A chi-square test of independence that compared the frequency of correct answers to the educational content questions to the frequency of correct answers to the narrative questions found significant differences between the two (χ^2 (4) = 96.173, $p < .001$). This indicated that for these medium paced programs, narrative content was acquired at a greater rate than educational content.

Slow pace. For the slow paced programs, participants answered 66.7% (n = 180) of the educational content questions correctly, and 86.3% (n = 233) of the 270 narrative content questions correctly. A chi-square test of independence that compared the frequency of correct answers to the educational content questions to the frequency of correct answers to the narrative questions found significant differences between the two ($\chi^2 (4) = 17.348$, $p < .002$). This indicated that for these slow paced programs, narrative content was acquired at a greater rate than educational content.

Thus, the pace which had the greatest amount of information acquisition for both the narrative ($\mu = 1.73$) and education content ($\mu = 1.33$) was the slow-paced programs. Additionally, the data indicated that children acquired more educational and narrative content when the pace was slow, than when the pace was medium or fast, as there were statistically significant differences between the groups. Therefore, it can be said that pace acted as a mediator in the recall of both narrative and educational content.

RQ8: Does distance mediate the recall of narrative content versus educational content?

RQ9: At what distance do children between the ages of 3 and 5 retain the greatest amount of educational content?

RQ10: At what distance do children between the ages of 3 and 5 retain the greatest amount of narrative content?

The capacity model posits that as the semantic distance of the educational content from the narrative content grows larger, the more resources will be required to process it. Thus, the ability to acquire information from educational content will decrease. To get a better picture of how distance affects information acquisition, one-way repeated measures ANOVA's were calculated comparing the frequency of correct narrative and educational answers at the two distances: small and large. For each distance level, the scores for two stimulus segments were combined, and the aggregate scores (0 through 3) were examined. In the General Linear Model (GLM) procedures ($N = 135$), the experimental condition and children's cognitive abilities were controlled for. The following sections explore the relationship between distance, narrative content, and educational content.

H4: When the distance between educational and narrative content is large, acquisition of narrative content will be the highest.

Distance and narrative content. The results indicated that semantic distance did not have a statistically significant effect on the acquisition of narrative content (F [1, 128] = 2.351, $p > .128$, $\eta^2 = .018$). Additionally, when children's cognitive abilities were taken into account, and PPVT potentially interacted with pace, a statistically significant effect did not exist for pace and the acquisition of narrative content (F [1, 128] = 2.044, $p > .155$, $\eta^2 = .016$). Although there were no statistically significant differences in the acquisition of narrative content between the two levels of distance, stimulus segments with a larger semantic distance had a smaller amount of narrative information acquisition ($\mu = 1.98$, $SD = .077$), than segments with a small distance ($\mu = 2.02$, $SD = .045$). This may imply that when programs have a larger semantic distance, children will be more likely to process the narrative content within it, since the educational content is tangential to the plotline. For semantic distance, the order of the videos did not have a statistically significant impact (F [5, 128] = .368, $p > .870$, $\eta^2 = .014$) on how children recalled narrative content. The PPVT raw score was used as a covariate in this model, and the results indicated that children's cognitive maturity did have a statistically significant impact (F [1, 128] = 42.679, $p < .001$, $\eta^2 = .250$) on the frequency of correct answers for narrative content. Thus, H4 is not supported. For as the distance level increased, the means indicated that the acquisition of narrative content decreased.

H5: When the distance between educational and narrative content is small, acquisition of educational content will be the highest.

Distance and educational content. The results indicated that stimulus segments with a small distance had a greater amount of educational information acquisition (μ = 1.63, *SD* = .069) than segments with a large distance (μ = .67, *SD* = .047). ANOVA's indicated that distance alone did not have a significant effect on the acquisition of educational content (F [1, 128] = .417, p > .305, η^2 = .008). However, when children's cognitive abilities were taken into account, and PPVT interacted with pace, a significant effect was found (F [1, 128] = 6.312, p < .013, η^2 = .047). For distance, the order of the experimental condition did not have any statistically significant impact (F [5, 128] = .976, p > .435, η^2 = .037) on how children responded to educational content, and thus the order of presentation was negligible. The PPVT raw score was used as a covariate in this model, and the results indicated that children's cognitive maturity had a statistically significant impact (F [1, 128] = 88.378, p < .001, η^2 = .408) on the frequency of correct answers for educational content. Thus, as seen in Table 8, as the distance level became larger, the acquisition of educational content decreased, lending support to H5.

Table 8

Means of Narrative and Educational Content by Distance

	Narrative Content			Educational Content				
Pace	μ	SD	*n* correct*	μ	SD	*n* correct*	χ^2	*p*
Small	2.02	0.045	273	1.63	0.069	291	21.617	0.010
Large	1.98	0.077	267	0.67	0.047	90	34.142	0.001

* *Note.* To calculate the n correct for the total score per child, the authors used the total number of questions asked (N=405) for each distance category.

To further examine how semantic distance interacted with both narrative and educational content at each distance level, chi-square tests of independence were run to compare the frequency of correct educational content questions to the frequency of correct narrative questions. The following sections examine these relationships.

Small distance. For the programs with a small distance, participants answered 67.4% ($n = 273$) of the educational content questions correctly, and 71.9% ($n = 291$) of the 405 narrative content questions correctly. A chi-square test of independence that compared the frequency of correct educational content questions to the frequency of correct narrative questions found significant differences between the two ($\chi^2(9) = 21.617$, $p < .010$). This indicates that even when distance was small, narrative content was acquired to a greater degree.

Large distance. For the programs with a large distance, participants answered 22.2% ($n = 90$) of the educational content questions correctly, and 65.9% ($n = 267$) of the 405 narrative content questions correctly. A chi-square test of independence that compared the frequency of correct answers to the educational content questions to the frequency of correct answers to the narrative questions found significant differences between the two ($\chi^2(9) = 34.142$, $p < .001$). This indicates that when distance was large, narrative content was acquired to a greater degree.

RQ11: What are the interaction effects between distance and pacing on the acquisition of educational content and narrative content?

To get a better picture of how distance and pace interact to affect information acquisition, one-way repeated measures ANOVA’s were calculated with information acquisition as the dependent variable. The two independent variables of pacing level (slow, medium, fast) and distance (small, large) were entered into the analysis. In the General Linear Model (GLM) procedures (N = 135), the experimental condition and children's cognitive abilities were controlled for.

H6: A small distance and slow pace will yield the greatest information acquisition of educational content.

Interaction and narrative content. A one-way within-subjects ANOVA was conducted relating the educational content scores to pace and distance. For pace and distance's interaction with narrative content, the observed F value was statistically significant, F [1, 128] = 14.687, $p < .001$, $\eta^2 = .103$. Bonferroni pairwise comparison tests ($p < .001$) suggested that the stimulus segment with the greatest amount information acquisition is one with a slow pace and small distance ($\mu = .92$, $SD = .023$), followed by the stimulus segment with the slow pace and large distance ($\mu = .81$, $SD = .033$). Thus, H6 is supported. Complete results can be seen in Table 9. However, when children's cognitive abilities were taken into account, and PPVT interacted with pace and distance, a statistically significant effect did not exist for the acquisition of narrative content F [1, 128] = 2.328, $p > .100$, $\eta^2 = .018$. The results indicate that when pace, distance, and PPVT raw scores do not have a significant interaction with narrative content acquisition.

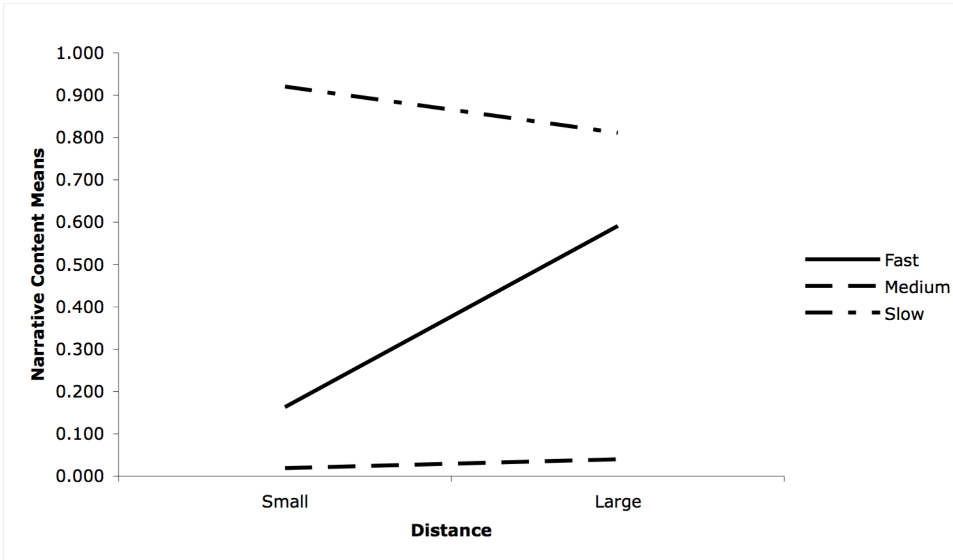


Figure 3. Significant Interaction of Pace and Distance on Narrative Content Acquisition. The covariate of Age in Months equals 50.87.

Table 9

Means of Pace and Distance Interaction on Information Acquisition

		Narrative Content		Educational Content	
Pace	Distance	μ	*SD*	μ	*SD*
Fast	Small	0.16	0.030	0.30	0.037
	Large	0.59	0.042	0.05	0.018
Medium	Small	0.02	0.019	0.56	0.040
	Large	0.04	0.040	0.06	0.019
Slow	Small	0.92	0.023	0.77	0.033
	Large	0.81	0.033	0.57	0.038

Interaction and educational content. General Linear Modeling was also used to determine the interaction effects of pace (slow, medium, fast) and distance (small, large) on educational content. A one-way within-subjects ANOVA indicated that the observed *F*-value for pace and distance with educational content was statistically significant, *F* [1, 128] = 4.023, $p < .019$, $\eta^2 = .030$. Additionally, when children's cognitive abilities were taken into account, and PPVT interacted with pace and distance, a statistically significant effect did exist for the acquisition of educational content F [1, 128] = 4.768, $p < .009$, $\eta^2 = .036$. Bonferroni pairwise comparison tests ($p < .001$) suggested that the stimulus segment the greatest amount information acquisition is one with a slow pace and small distance ($\mu = .77$, $SD = .033$), followed by the stimulus segment with the medium pace and small distance ($\mu = .57$, $SD = .038$). Thus, H6 is once again supported. As Figure 4 indicates, retention was best when the segment had a slow pace, and the educational content was not tangential to the story. The results indicate that as the distance and pacing levels increased, the acquisition of educational content decreased.

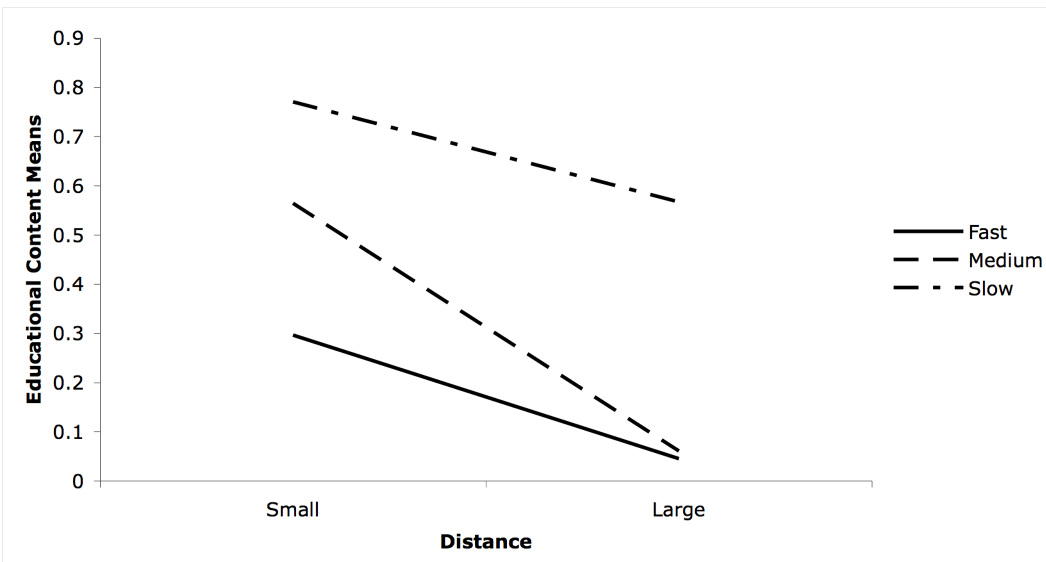


Figure 4. Significant Interaction of Pace and Distance on Educational Content Acquisition. The covariate of Age in Months equals 50.87.

RQ12: How is age related to the acquisition of information in educational and narrative content?

One important consideration in understanding capacity model is to determine how the age and cognitive maturity can influence the acquisition of educational and narrative content, for as children age, they may be able to comprehend content to a greater degree. To explore this relationship, a simple linear regression was run for the child's age and the acquisition of total narrative content. The results revealed that age explains a practically significant amount, approximately 29.1% of the variance in the outcome variable $F(1,133) = 54.585$, $p < .001$). Age and acquisition of narrative content were moderately, positively correlated ($r = .539$). A simple linear regression was also run for the age of the child and acquisition of total educational content. The results revealed that age can explain a practically significant amount of approximately 25.4% of the variance in the outcome variable $F(1,133) = 45.364$, $p < .001$). Age and acquisition of educational content were moderately, positively correlated ($r = .504$). Not surprisingly, the results revealed that as children aged, their acquisition of educational and narrative content increased.

To further explore the impact of age on information acquisition, GLMs computed the main and interaction effects of information acquisition to pace and distance with age as a covariate. For educational content, a one-way within-subjects ANOVA indicated that when age was controlled for, the observed F value for pace (F [2, 128] = .175, $p > .840$, $\eta^2 = .001$), pace × age in months (F [2, 128] = .320, $p > .093$, $\eta^2 = .018$), and distance (F [2, 128] = .243, $p > .623$, $\eta^2 = .002$), with educational content were not statistically significant. However, when children's age interacted with distance, a statistically significant effect did exist for the acquisition of educational content, F [1, 128] = 7.003, $p < .009$, $\eta^2 = .052$. Additionally, pace × distance × age in months also showed significant interaction (F [2, 128] = 3.190, $p < .043$, $\eta^2 = .024$) for acquisition of educational content. For narrative content, a one-way within-subject ANOVA indicated that when age was controlled for, the observed F value for pace (F [2, 128] = 18.179, $p < .001$, $\eta^2 = .124$), pace × age in months (F [2, 128] = 5.228, $p < .006$, $\eta^2 = .039$), distance (F [1, 128] = 4.285, $p < .041$, $\eta^2 = .032$), distance × age in months (F [1, 128] = 3.977, $p < .048$, $\eta^2 = .030$), and pace × distance × age in months (F [2, 128] = 3.220, $p < .042$, $\eta^2 = .025$), with narrative content were statistically significant. The results may indicate that narrative content may be more sensitive to age than educational content.

RQ13: What is the relationship between a child's PPVT score and narrative information acquisition score?

RQ14: What is the relationship between a child's PPVT raw score and educational information acquisition score?

H7: As children become more cognitively mature, processing of narrative content will improve, and resources will be allocated to processing educational content.

The findings indicate that as a child aged, his or her ability to acquire educational and narrative content also increased. However, age does not always equal cognitive maturity, thus it is essential to examine the relationship of the PPVT raw score to the acquisition of narrative and educational content. To explore this relationship, a simple linear regression was run for the PPVT raw score and the acquisition of total narrative content. The results revealed that the PPVT race score explained a practically significant amount—approximately 26.0% of the variance in the outcome variable $F(1,133) = 46.708$, $p < .001$. The PPVT raw score and acquisition of narrative content were moderately, positively correlated ($r = .510$). A simple linear regression was also run for the PPVT raw score and acquisition of total educational content. The results revealed that the PPVT raw score could explain approximately 40.8% of the variance in the outcome variable $F(1,133) = 91.777$, $p < .001$. The PPVT raw score and acquisition of educational content were moderately, positively correlated ($r = .639$). Not surprisingly, the results revealed that that cognitive maturity plays a major role in the acquisition of educational and narrative content, thus supporting H7. Additionally, the results suggest that children's cognitive maturity plays a larger role in the processing of educational content than narrative content.

RQ15: How is the amount of television a child watches related to information acquisition?

Another important consideration in understanding how children acquire educational and narrative content is the amount of exposure a child has to television. To explore this relationship, a simple linear regression was run for the total minutes watched per week (per the parents self-reporting) and the acquisition of total narrative content. The results revealed that the amount of time watched by the child did not have a practically significant amount, for it only accounted for approximately 0.3% of the variance in the outcome variable ($F(1,133) = .439$, $p > .509$). The amount of television watched and acquisition of narrative content not correlated ($r = .057$). A simple linear regression was also run for the total minutes watched per week (per the parents self-reporting) and acquisition of total educational content. The results revealed that the amount of television watched explains a practically significant amount, approximately .1% of the variance in the outcome variable ($F(1,133) = .000$, $p > .997$). The PPVT raw score and acquisition of educational content were moderately, positively correlated ($r = .000$). Therefore, the results revealed that the amount of television a child watched could not predict the amount of correct responses to both the educational and narrative content.

RQ16: How is children's "liking" of a program segment related to acquisition of narrative and educational content?

Liking. General Linear Modeling examined the influence and interaction of pace (slow, medium, fast) and distance (small, large) on the how well a child liked watching a program—also known as "liking." A one-way within-subject ANOVA indicated that the observed F value for pace's influence on children's liking of the program was significant (F [2, 128] = 3.747, $p < .025$, $\eta^2 = .028$). However, when the children's cognitive maturity interacted with pace, the F value held no significance (F [2, 128] = 1.783, $p > .170$, $\eta^2 = .014$). The ANOVA also indicated that distance did not have a significant influence on children's liking of the program (F [1, 128] = 2.925, $p > .090$, $\eta^2 = .022$). Nor was there significant interaction effects on program liking when distance and the PPVT raw score were (F [1, 128] = .381, $p > .538$, $\eta^2 = .003$). Although significance is approached, the ANOVA indicated that pace and distance do not significantly interact to influence program liking (F [2, 128] = 2.512, $p > .083$, $\eta^2 = .019$), nor do they when children's cognitive maturity interacts with them (F [2, 128] = .768, $p > .660$, $\eta^2 = .029$). The GLM indicated that the order of the stimulus segment did not affect children's liking of the program F [5, 128] = .205, $p > .960$, $\eta^2 = .008$, so it is negligible. Additionally, the PPVT raw score covariate also influenced children's liking of the program F [1, 128] = 5.021, $p < .027$, $\eta^2 = .038$. The results reveal that both pace can significantly influence children's liking of a program. Bonferronni pairwise comparison tests ($p < .002$) suggested that children's liking of programs is significantly greater for programs with a fast pace than for programs with a slow pace, as seen in Table 10. As Figure 5 indicates, the results show a significant difference in how well children like fast- and slow-paced programs. Additionally, although the interaction of pace and distance only approached significance, as the distance increases, the children's liking of the program decreased at all three levels of pace.

Table 10

Means of Pace and Distance Interaction on Program Liking

Pace	Distance	Liking μ	Liking *SD*
Fast	Small	2.353	0.053
	Large	2.208	0.061
Medium	Small	2.416	0.056
	Large	2.221	0.065
Slow	Small	2.580	0.050
	Large	2.343	0.058

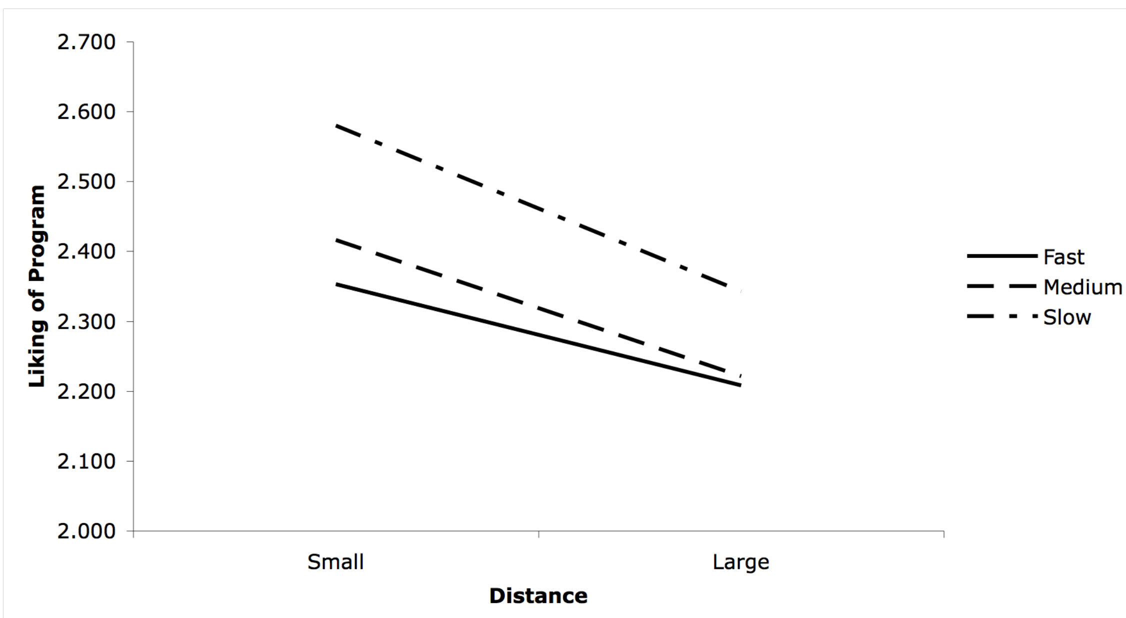


Figure 5. Interaction of Pace and Distance on Program Liking. The covariate of PPVT raw score equals 77.64.

Now that recognition's relationship with pace and distance has been established, the following sections examine how recognition influences information acquisition of narrative and educational content for the individual stimulus segment.

Imagination Movers. At the end of each video segment, participants were asked if they "liked the video clip," "didn't like the video clip," or if they thought it was "just okay." For *Imagination Movers*, 43.0% (n = 58) of the participants indicated that they "liked" the segment, 7.4% (n = 10) indicated that they "didn't like" it, and 49.6% (n = 67) indicated it was "just okay." When asked the narrative question of "Can you tell me what the Imagination Movers did on Saturday?," 24.1% (n = 14) of the children who "liked" the program answered correctly, 11.9% (n = 8) of the children who thought the clip was "just okay" answered correctly, and none of the children who "didn't" like the clip provided the correct answers. A chi-square test indicated significance at the .10 level, but only approached significance at the .05 level (χ^2 (2) = 5.494, p > .064), indicating a child's "liking" of a program may or may not influence if they answer the questions to the program correctly.

When asked the educational content question of "How many days of a week are there?," 31.0% (n = 18) of the children who "liked" the program answered correctly, 29.9% (n = 20) of the children who thought the clip was "just okay" answered correctly, and 20.0% (n = 2) of the children who "didn't" like the clip provide the correct answers. A chi-square test did not indicate a significant relationship (χ^2 (2) = .501, p > .778) between children's liking of the program and his or her ability to answer the educational content question.

The Electric Company. At the end of each video segment, participants were asked if they "liked the video clip," "didn't like the video clip," or if they thought it was "just okay." For *The Electric Company*, 37.0% (n = 50) of the participants indicated that they "liked" the segment, 16.3% (n = 22) indicated that they "didn't like" it, and 46.7% (n =

63) indicated it was “just okay.” When asked the narrative question of “Can you tell me what happened to the floor when the people started singing & dancing?,” 66.0% (n = 33) of the children who “liked” the program answered correctly, 57.1% (n = 36) of the children who thought the clip was “just okay” answered correctly, and 50.0% (n = 11) of the children who “didn’t” like the clip provide the correct answers. A chi-square test did not indicate a significant relationship (χ^2 (2) = 1.839, p > .399), indicating a child’s “liking” of a program did not have a statistically significant influence on whether the child answered the questions to the program correctly.

When asked the educational content question of “Can you tell me what the foot bone is connected to?,” 6.0% (n = 3) of the children who “liked” the program answered correctly, 3.2% (n = 2) of the children who thought the clip was “just okay” answered correctly, and 4.5% (n = 1) of the children who “didn’t” like the clip provided the correct answers. A chi-square test did not indicate a significant relationship (χ^2 (2) = .525, p > .769) between children’s liking of the program and his or her ability to answer the educational content question.

Can You Teach My Alligator Manners? According to the data, 50.4% (n = 68) of the participants indicated that they “liked” the *Can You Teach My Alligator Manners?* segment, 8.9% (n = 12) indicated that they “didn’t like” it, and 40.7% (n = 55) indicated it was “just okay.” When asked the narrative question of “Can you tell me what Al the Alligator was trying to take from the little girl?,” 94.1% (n = 64) of the children who “liked” the program answered correctly, 96.4% (n = 53) of the children who thought the clip was “just okay” answered correctly, and 83.3% (n = 10) of the children who “didn’t” like the clip provide the correct answers. A chi-square test did not indicate a significant relationship (χ^2 (2) = 3.001, p > .223), indicating a child's "liking" of a program did not have a statistically significant influence on whether the child answered the narrative questions to the program correctly.

When asked the educational content question of "What did the little boy suggest that Al the Alligator do to be polite?," 60.3% (n = 41) of the children who "liked" the program answered correctly, 54.5% (n = 30) of the children who thought the clip was "just okay" answered correctly, and 41.7% (n = 5) of the children who "didn't" like the clip provided the correct answers. A chi-square test did not indicate a significant relationship (χ^2 (2) = 1.554, p > .460) between children's liking of the program and his or her ability to answer the educational content question.

Word Girl. According to the data, 42.2% (n = 57) of the participants indicated that they "liked" the *Word Girl* segment, 20.0% (n = 27) indicated that they "didn't like" it, and 37.8% (n = 51) indicated it was "just okay." When asked the narrative question of "Can you tell me what happened to Becky's ideas? Who stole them?," 64.9% (n = 37) of the children who "liked" the program answered correctly, 56.9% (n = 29) of the children who thought the clip was "just okay" answered correctly, and 44.4% (n = 12) of the children who "didn't" like the clip provided the correct answers. A chi-square test did not indicate a significant relationship (χ^2 (2) = 3.174, p > .204), indicating a child's "liking" of a program did not have a statistically significant influence on whether the child answered the narrative questions to the program correctly.

When asked the educational content question of "Do you remember the word they told you to listen for that means a person who is running for office?," 7.0% (n = 4) of the children who "liked" the program answered correctly, 7.8% (n = 4) of the children who thought the clip was “just okay” answered correctly, and none of the children who “didn’t” like the clip provided the correct answers. A chi-square test did not indicate a significant relationship (χ^2 (2) = 2.159, p > .340) between children’s liking of the program and his or her ability to answer the educational content question.

Dora the Explorer. According to the data, 62.2% (n = 84) of the participants indicated that they “liked” the *Dora the Explorer* segment, 4.4% (n = 6) indicated that they “didn’t like” it, and 33.3% (n = 45) indicated it was “just okay.” When asked the narrative question of “Can you tell me what happened to the super babies’ blanket?,” 92.8% (n = 78) of the children who “liked” the program answered correctly, 91.1% (n = 41) of the children who thought the clip was “just okay” answered correctly, and 83.3% (n = 5) of the children who “didn’t” like the clip provided the correct answers. A chi-square test did not indicate a significant relationship (χ^2 (2) = .728, p > .695), indicating a child’s “liking” of a program did not have a statistically significant influence on whether the child answered the narrative questions to the program correctly.

When asked the educational content question of “What colors were in the pattern on the super babies blanket?,” 79.7% (n = 67) of the children who “liked” the program answered correctly, 68.8% (n = 31) of the children who thought the clip was “just okay” answered correctly, and 100.0% (n = 6) of the children who “didn’t” like the clip provided the correct answers. A chi-square test did not indicate a significant relationship (χ^2 (2) = 3.830, p > .147) between children’s liking of the program and his or her ability to answer the educational content question.

Teletubbies. According to the data, 45.2% (n = 61) of the participants indicated that they “liked” the *Teletubbies* segment, 11.1% (n = 15) indicated that they “didn’t like” it, and 43.7% (n = 59) indicated it was "just okay." When asked the narrative question of "Can you tell me what happened when it stopped raining?," 92.8% (n = 53) of the children who "liked" the program answered correctly, 78.0% (n = 46) of the children who thought the clip was "just okay" answered correctly, and 66.7% (n = 10) of the children who "didn't" like the clip provided the correct answers. A chi-square test did not indicate a significant relationship (χ^2 (2) = 3.684, $p > .159$), indicating a child's "liking" of a program did not have a statistically significant influence on whether the child answered the narrative questions to the program correctly.

When asked the educational content question of "What did Po see reflecting in the water?," 65.6% (n = 40) of the children who "liked" the program answered correctly, 47.5% (n = 28) of the children who thought the clip was "just okay" answered correctly, and 53.3% (n = 8) of the children who "didn't" like the clip provided the correct answers. A chi-square test did not indicate a significant relationship (χ^2 (2) = 4.061, $p > .131$) between children's liking of the program and his or her ability to answer the educational content question.

RQ17: How is prior exposure to a program related to the acquisition of educational and narrative content?

Recognition. For recognition, General Linear Modeling examined the influence and interaction of pace (slow, medium, fast) and distance (small, large) on the recognition of the character or program. The GLM indicated that the order of the stimulus segment did affect children's recognition of the program F [1, 128] = 3.181, $p < .010$, η^2 = .011, so it is not negligible. Additionally, the PPVT raw score covariate also influenced children's recognition of the program F [1, 128] = 16.289, $p < .001$, η^2 = .013. A one-way within-subject ANOVA indicated that the observed *F* value for pace's influence on recognition was significant (F [2, 128] = 6.621, $p < .002$, η^2 = .049). However, when the children's cognitive maturity interacted with pace, the *F* value held no significance (F [2, 128] = .651, $p > .522$, η^2 = .005). The ANOVA also indicated that distance had a significant influence on program recognition (F [1, 128] = 8.593, $p < .004$, partial η^2 = .063); however, when distance and the PPVT raw score were examined for interaction effects, no significance was found (F [1, 128] = .132, $p > .717$, η^2 = .001). Also, the ANOVA indicated that pace and distance interacted to significantly influence program recognition (F [2, 128] = 13.963, $p < .001$, η^2 = .098). However, there was no significant influence on recognition when children's cognitive maturity interacted with pace and distance (F [2, 128] = 1.237, $p > .267$, η^2 = .046). The results revealed that both pace and distance had a significant influence on program recognition. Bonferronni pairwise comparison tests ($p < .001$) suggested that the stimulus segments with the greatest amount of program recognition had a slow pace and small distance (μ = .935, SD = .022), as seen in Table 11. As Figure 6 indicates, the results show that for fast- and slow-paced programs, as the distance increased, the program recognition decreased. However, for medium-paced programs, the program recognition remained relatively constant.

Table 11

Means of Pace and Distance Interaction on Program Recognition

		Program Recognition	
Pace	Distance	μ	*SD*
Fast	Small	0.445	0.041
	Large	0.075	0.021
Medium	Small	0.379	0.041
	Large	0.398	0.042
Slow	Small	0.935	0.022
	Large	0.154	0.030

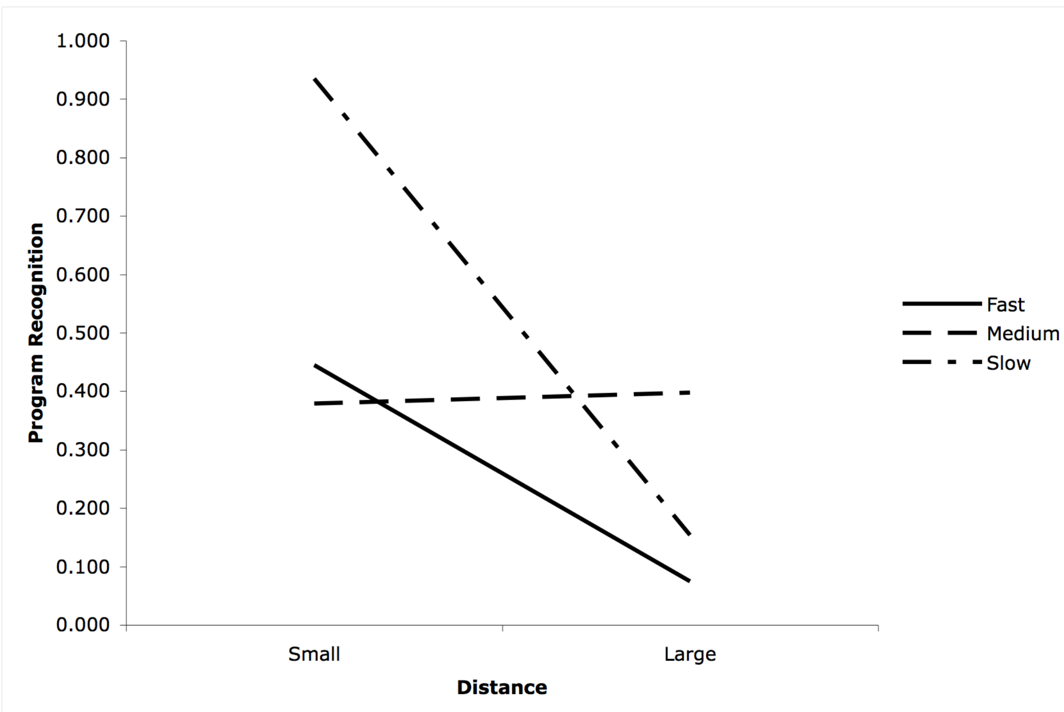


Figure 6. Significant Interaction of Pace and Distance on Program Recognition. The covariate of PPVT raw score equals 77.64.

Now that recognition's relationship with pace and distance has been established, the following sections examine how recognition influences information acquisition of narrative and educational content for the individual stimulus segment.

Imagination Movers. Only 44.4% (n=60) of participants recognized the program. When asked the narrative content question, 12.0% (n = 9) of the children who recognized the program answered correctly, and 21.7% (n = 13) of the children who did not recognize the clip provided the correct answers. A chi-square test did not indicate a significant relationship (χ^2 (1) = 2.283, p > .131) between children's recognition of the program and his or her ability to answer the narrative content question correctly. When asked the educational content question, 28.3% (n = 17) of the children who recognized the program answered correctly, and 30.6% (n = 23) of the children who did not recognize the clip provided the correct answers. A chi-square test did not indicate a significant relationship (χ^2 (1) = .987, p > .768) between children's recognition of the program and his or her ability to answer the educational content question correctly. Of course, because such information is available in a variety of places this is no surprise.

The Electric Company. At the end of the clip, only 7.4% (n = 10) of participants were able to identify this stimuli segment as *The Electric Company.* When asked the narrative content question, 80.0% (n = 8) of the children who recognized the program answered correctly, and 57.6% (n = 72) of the children who did not recognize the clip provided the correct answers. A chi-square test did not indicate a significant relationship (χ^2 (1) = 1.924, p > .165) between children's recognition of the program and his or her ability to answer the narrative content question correctly. When asked the educational content question, 30.0% (n = 3) of the children who recognized the program answered correctly, and 2.4% (n = 3) of the children who did not recognize the clip provided the correct answers. A chi-square test indicated a significant relationship (χ^2 (1) = 16.608, p < .001) between children's recognition of the program and his or her ability to answer the educational content question correctly.

Can You Teach My Alligator Manners? According to the data, 37.8% (n = 51) of children recognized *Can You Teach my Alligator Manners?* When asked the narrative content question, 100.0% (n = 51) of the children who recognized the program answered correctly, and 90.5% (n = 76) of the children who did not recognize the clip provided the correct answers. A chi-square test indicated a significant relationship (χ^2 (1) = 5.163, $p <$ .023) between children's recognition of the program and his or her ability to answer the narrative content question correctly. When asked the educational content question, 62.7% (n = 32) of the children who recognized the program answered correctly, and 52.4% (n = 44) of the children who did not recognize the clip provided the correct answers. A chi-square test did not indicate a significant relationship (χ^2 (1) = 1.358, $p >$ .239) between children's recognition of the program and his or her ability to answer the educational content question correctly.

Word Girl. According to the data, 60.0% (n = 81) of children recognized *Word Girl*. When asked the narrative content question, 70.4% (n = 38) of the children who recognized the program answered correctly, and 49.4% (n = 40) of the children who did not recognize the clip provide the correct answers. A chi-square test indicated a significant relationship (χ^2 (1) = 5.850, $p <$ .016) between children's recognition of the program and his or her ability to answer the narrative content question correctly. When asked the educational content question, 11.1% (n = 6) of the children who recognized the program answered correctly, and 2.5% (n = 2) of the children who did not recognize the clip provided the correct answers. A chi-square test indicated a significant relationship (χ^2 (1) = 4.341, $p <$ .037) between children's recognition of the program and his or her ability to answer the educational content question correctly.

Dora the Explorer. According to the data, 93.3% (n = 126) of children recognized *Dora the Explorer*. When asked the narrative content question, 91.3% (n = 115) of the children who recognized the program answered correctly, and 100.0% (n = 9) of the children who did not recognize the clip provided the correct answers. A chi-square test indicated a significant relationship (χ^2 (1) = .855, p > .355) between children's recognition of the program and his or her ability to answer the narrative content question correctly. When asked the educational content question, 77.8% (n = 98) of the children who recognized the program answered correctly, and 66.7% (n = 6) of the children who did not recognize the clip provided the correct answers. A chi-square test did not indicate a significant relationship (χ^2 (1) = .586, p > .444) between children's recognition of the program and his or her ability to answer the educational content question correctly.

Teletubbies. According to the data, 15.6% (n = 126) of children recognized *Teletubbies*. When asked the narrative content question, 90.5% (n = 19) of the children who recognized the program answered correctly, and 78.9% (n = 90) of the children who did not recognize the clip provided the correct answers. A chi-square test did not indicate a significant relationship (χ^2 (1) = 1.516, p > .218) between children's recognition of the program and his or her ability to answer the narrative content question correctly. When asked the educational content question, 61.9% (n = 13) of the children who recognized the program answered correctly, and 55.3% (n = 63) of the children who did not recognize the clip provide the correct answers. A chi-square test did not indicate a significant relationship (χ^2 (1) = .318, p > .573) between children's recognition of the program and his or her ability to answer the educational content question correctly.

CHAPTER 5

Discussion

The purpose of this project was to investigate how children learn from television utilizing the perspective of the capacity model. By isolating two major factors (pacing and semantic distance), a within-subjects experimental design allowed an in-depth look at what factors influenced the acquisition of educational and narrative content from E/I programming for preschool children (ages three through five), who are likely in the symbolic function substage of the preoperational level of cognitive development. In this study, narrative complexity was measured through the pace (slow medium, fast), or the rate at which formal features in a television program change (Huston et al., 1981). In order to select the proper stimuli for the quasi-experimental portion of the project, a content analysis examining the pace and distance of the 80 programs on the three child-oriented television networks Nick Jr., PBS Kids, and Playhouse Disney was conducted. This chapter briefly summarizes the findings from both the content analysis and quasi-experiment, and concludes with a discussion of limitations to this project as well as recommended future research.

Content Analysis.

Overall, results of the content analysis indicated considerable variabilities in pace in E/I programming television. This is no surprise, since previous research has indicated that pacing in children's television varies significantly by program (McCollum & Bryant, 2003; Nichols & Murray, 2009). What is surprising, however, is how rapid the pace of some of the E/I programs can be. Take the programs with the fastest pace—*The Electric Company, Fetch! with Ruff Ruffman, Imagination Movers* and *Yo Gabba Gabba*—for example. Each of these programs has a fast pace that reflects the complex nature of the program. This complexity may be too overwhelming for children to truly process the information. If we examine the results of the quasi-experiment, and examine how many children were able to recall the educational content from the fast-paced segment, we see an extremely low percentage in comparison to the slow and medium paced programs. In fact, for the fast-paced stimulus segments, only 16.3% of the children were able to recall the curricular lesson for *Imagination Movers,* and only 4.4% of participants were able to recall the curricular lesson from *Electric Company.* This may indicate that some programs for younger children are too fast for them to acquire the curricular lesson from the educational content. However, the results also indicated that the majority (68.7%) of E/I programs were either a medium or slow pace—which seemed to be better paces for acquisition of information than do fast-paced programming, as indicated by the quasi-experiment.

Additionally, the content analysis revealed that educational distance also varied widely in E/I programming. The results suggest that the majority of E/I programs have narrative content that is tightly woven with educational content. However, since multiple programs only have a score of four or five of a possible 12, the results also indicated that some E/I programs have educational content that is extremely tangential to the narrative content, and thus might well be a difficult lesson for children to comprehend. One limitation of the distance measure in this study is that the weight of importance of clarity, integration, direct address, and redundancy was not taken into consideration. For example, the number of times a character directly addresses the audience may influence the how tightly the lesson is interwoven into the narrative more than the redundancy does—or, lacking empirical validation, vice versa. Thus, a more accurate and reliable index should be created in order to truly measure the semantic distance between educational and narrative content.

Research Question 1 examined the relationship existed between pace and distance. The content analysis revealed that no statistically significant relationship was found between the two variables. This indicates that there is no direct relationship between the pace of E/I programs and how interwoven the narrative and educational content are. However, future research should examine how the target audience's age factors into the interaction of pace and distance, for this may be a factor in how distance and pace are presented to children. Additionally, Research Question 2 dealt with the interaction and main effects on the pacing index when distance interacted with show type, show format, and network type. The analysis found no significant main or interaction effects, which further indicated that distance and pace do not interact. However, it should be noted that the interaction of network type and distance did approach significance.

Quasi-Experiment

Overall, results of the quasi-experiment overwhelmingly support the concept that children acquire narrative content before educational content. The results reveal that as pace increased, children's ability to process information decreased. ANOVA's indicated that pace, distance, and children's cognitive maturity played a significant role in the acquisition of information, as well as liking and recognition. However, the sensitivity of these variables varied. Additionally, the results revealed that the distance of the educational content from the narrative content plays a major factor in the processing of information, because children responded correctly to questions derived from stimuli with a slow pace significantly more often than segments with a fast pace. Finally, the results indicated that children's cognitive abilities also play a significant role in how correctly they respond to questions derived to test information acquisition of educational and narrative content.

Participants and media habits. In this study, parents were asked a variety of demographic questions, as well as questions about family media habits. According to the parents' self-reports, children averaged watching slightly less than under 2 hours of television per day, less than half of what the Kaiser Family Foundation has recently reported as the national average (4.5 hours per day) (Rideout, 2007; Rideout, Foehr, & Roberts, 2010). Thus, it is difficult to say how much television a child is truly watching, for parents may not be reporting accurately. In addition to demographic questions, parents were asked to rate their perceptions of the E/I programming. An interesting finding is that 90.37% of all the parents surveyed indicated they believed their child watched an "average," "below average," or "well below average" amount of television. Although the data do indeed support this on one sense, as the average time watched is well below the national average, this again rationally leads about to question the quality of parental reports. One is reminded of the population of Garrison Keillor's *Lake Wobegon* "where all the children are above average"—or in this instance, below average.

Perhaps more critically, results examining the relationship between parents' *opinions* of E/I programming and the amount of television they reported their children watched indicated a strong positive correlation. In other words, the more positive the parent believed E/I programming to be, the more they allowed their child to watch television. Future research should explore these relationships further. It is also interesting to note that the amount of television that the parent watched had no relationship with how they felt about E/I programming.

Pretests. As previous studies have indicated, a strong correlation, with high reliability, exists between Piagetian levels and PPVT raw scores (e.g., Pasnak, Willson-Quayle, & Whitten, 1998). All of the preschool children involved in this study participated in the PPVT-4 test, which provided an index for vocabulary development and acts as a measurement of cognitive development (Casey, Bronson, Tivnan, Riley, & Spenciner, 1991). Results indicated a wide range of scores on the PPVT, with results ranging from some children barely able or willing to communicate responses to children who were in the 98th percentile for their age group ($\mu = 107.87$, $SD = 11.809$). Thus, although the demographic data did not vary greatly in the sample, the range on scores for children's intelligence and cognitive maturity did.

Research Question 3 searched for relationships between the PPVT score, marital status, and demographic characteristics—such as parent's educational level, age of the child, and income—as well as media use. As expected, as a child aged, the PPVT score increased. However, this only accounted for only half of the variance in the scores. Regarding demographics, the results indicated no significant differences between the PPVT scores of children whose parents were married (n = 115) versus unmarried (n = 20). However, a significant relationship between the PPVT standard score and the parent's educational accomplishments was found. Children with parents who had academic degrees beyond high school level the tended to score higher on the PPVT test.

Finally, no significant relationship between PPVT standard score and a family's income level was found. So, for all practical purposes, we may say that income was not found to be statistically significantly related to Standard PPVT scores.

Additionally, the amount of television exposure was statistically significantly related to the PPVT scores at the .10 level. According to these results, children who watched one hour or less ($\mu = 106.00$, $SD = 1.464$) of television each day had Standard PPVT scores that were significantly lower than the Standard PPVT scores of children who watched two hours or more ($\mu = 109.42$, $SD = 1.391$) of television each day. This result is somewhat surprising, but may be explained by the concept that children who watch a larger amount of television may be exposed to a wider range of vocabulary than children who do not watch as much television. For example, when one child was asked to show the researcher a "clarinet," the child exclaimed "I know what that is! It's the instrument that Spongebob plays!" Whether the child would have gotten that question correct without watching *Spongebob Squarepants* is unknown.

Narrative content versus educational content. Research Questions 4 sought to explore the relationships between children's information acquisition between narrative and educational content. Hypothesis 1 posited that narrative content would be more easily recalled than educational content. As previously mentioned, the data showed quite consistently that narrative content was recalled by children at a greater rate than was educational content. The following sections explore this relationship and the results therein.

Participants watched six stimulus segments that covered a combination of pacing (slow, medium, fast) and distances (slow, fast). For each program, the frequency of correct narrative and educational content answers per segment were analyzed and compared. The analysis indicated that for *The Electric Company, Can You Teach My Alligator Manners, Word Girl, Dora the Explorer,* and *Teletubbies,* information from narrative content was acquired at a greater rate than educational content ($p < .001$ in each program), thus supporting H1. This narrative dominance is not surprising, as one of the core concepts within capacity model is that children will give priority to processing narrative content first (Fisch, 2000).

However, one program, *Imagination Movers,* resulted in a significantly greater rate of information acquisition with educational content as opposed to narrative content. Thus for the fast pace/small distance program, H1 was not supported. Although not supported, it can be surmised that the results may be related to several factors in the program itself. First, the beat of the music in the program may have some influence on children's ability to process information. As studies have indicated, an educational program that has music with a fast, rhythmic tempo may reduce children's attention to it, creating a depression effect; thus creating potential difficulties in processing of the content within it (Wakshlag, 1982). If the tempo of the music is too fast, it makes the program too complex, and the acquisition of information would, logically, decrease. This type of depression effect is one of the limitations of McCollum and Bryant's (2003) pacing index is that it did not incorporate the tempo of the music in the measurement of the scale. Thus, a song that has an extremely fast tempo could be too complex for children to process in working memory. In such a case, the demands of the task exceeded the available resources in working memory, causing the material processed ineffectively, leading to cognitive overload (Fisch, 2004a; Gopher & Donchin, 1986; Hart, 1986).

Second, since the data from this single program indicated that educational content was acquired more easily than narrative content, we should consider the questions asked about each type of content. The educational question, "How many days of the week are there?," is relatively straightforward, and may be a lesson that preschoolers have already begun to learn in the curriculum at the preschool or even discussed at home. Additionally, the lesson that was given was repeated numerous times throughout the segment, and a giant seven was paraded around and the character danced. Thus, it would be relatively simple for participants to acquire the lesson—if cognitive overload had not occurred already. Additionally, the narrative content question, "Can you tell me what the Imagination Movers did on Saturday?," had much less exposure and screen time than the educational content question. In fact, in the 90-second clip, it was only discussed for a couple seconds. However, it is extremely important to note that if another narrative question was used, it would have likely had the same amount of screen time, as the tempo of the music was extremely fast—it was an allegro 132 in a quarter beat, when the standard default tempo for music is 120 for a moderate tempo. Also, this narrative content question was more open-ended and complex that the educational content question, requiring higher-order thinking skills. With a program such as *Imagination Movers,* one would assume, under the concepts within the capacity model, that children would automatically default to devoting more working memory to narrative content (Fisch, 2004a). However, since this is not the case, it is important to explore this topic further in future studies. The question remains, however, as to where the cut-off point for cognitive overload might be.

In order to find further support for H1, the total narrative and total educational scores were compared. According to the data, there was still a significant difference between the mean of the educational responses and the mean of the narrative responses. Thus, H1 is supported, because the frequency of correct answers to narrative question was dramatically more than the frequency of correct answers to the educational question. This indicated that narrative content was recalled more frequently than educational content.

Pace. Research Questions 5, 6, and 7 and Hypotheses 2 and 3 further examined the results of the quasi-experiment to determine what level of pacing yielded the greatest amount of information acquisition of narrative and educational content, and how pace mediates the acquisition of narrative and educational content. Overall, the results indicated some relatively expected findings for pace, and some surprising findings for pace. Previous literature (e.g., Singer, 1980) has suggested that a program with a high density of formal features can overburden a young child's attentional capacity and not allow them to be able to think about the information presented. Therefore, educational programs may need to have a slower pace to help children understand curricular messages (Singer, 1980). This study's findings are concurrent with this literature.

One interesting finding from ANOVA's that were run in this study, is that the variable of pace had a significant influence on retention of narrative content. However, the variable does not have a significant influence on information acquisition until children's cognitive capabilities are controlled for. This suggests that narrative content can be recalled regardless of age, but children need a certain amount of cognitive maturity to process educational content.

Additionally, the capacity model's supposition that as the complexity of the program increases and requires a greater amount of resources, the ability to recall educational content decreases is correct. For fast-paced shows, participants answered 17.0% (*n* = 46) of the educational content questions and 37.8% (*n* = 102) of the narrative questions correctly. For the medium pace category, participants answered 31.1% (*n* = 84) of the educational content questions and 75.9% (*n* = 205) of the narrative questions correctly. For the slow paced programs, participants answered 66.7% (*n* = 180) of the educational content questions correctly, and 86.3% (*n* = 233) of the 270 narrative content questions correctly. The results indicated that the pace with the most correct answers to both the educational and narrative content was the slow pace.

Based on the findings from the ANOVA's and chi-squared analyses in this study, we can conclude that narrative dominance occurred throughout the various pacing levels. The results showed that when there are high demands for processing narrative, and the cognitive complexity (i.e., pace) of a program increased, then fewer resources were available for processing educational content and narrative content. Thus, the two processes competed for resources, and the overall scores for both of these levels decreased. Hypothesis 3 is supported by the results of this study, for the acquisition of the educational content did indeed decrease as pace increased. However, H2 was not supported. Rather, as pace increased, the acquisition of narrative content decreased, as cognitive overload likely became more common among the test subjects.

Distance. Research Questions 8, 9, and 10 and Hypotheses 4 and 5 further examined the results of the quasi-experiment to determine which semantic distance level (small, large) had the greatest amount of information acquisition of narrative and educational content, and how distance mediates the recall of information acquisition.

Overall, children appeared to be able to process educational and narrative content better when distance was small. Participants answered 71.9% (n = 291) of the educational content questions correctly, and 67.4% (n = 273) of the 405 narrative content questions correctly when distance was small, as opposed to 22.2% (n = 90) of the educational content questions correctly, and 65.9% (n = 267) of the narrative content questions when distance was large. Upon further investigation, however, the ANOVA's yielded no statistically significant differences in the acquisition of narrative content between the two types of semantic distance. Thus, these findings do not support H4. However, as the distance level increased, the means indicated that the acquisition of narrative content decreased, lending support to H5. As semantic distance between narrative and educational content became more tangential (larger), the acquisition of educational content decreased. These findings indicate that that the acquisition of educational content is more sensitive to influence than narrative content is—a consistent finding in this research.

One interesting finding from the ANOVA's ran in this study, is that the variable of semantic distance alone does not have a significant influence on retention of educational content. However, the variable did have a significant influence on information acquisition of educational content once children's cognitive maturity was taken into account. Additionally, distance had no significant influence on the acquisition of narrative content. This suggests that narrative content can be recalled regardless of age, but children need a certain amount of cognitive maturity to process educational content. Indeed, participants were able to recall educational content more easily when the distance between the narrative and educational content was small.

Based on the findings from the ANOVA's and chi-squared analyses in this study, we can conclude that narrative dominance occurred throughout the various pacing levels. The results showed that when there are high demands for processing narrative, and the cognitive complexity (i.e., pace) of a program increased, then fewer resources were available for processing educational and narrative content. Thus, the two processes must competed for resources, and the overall scores for both of these levels decreased.

The distance construct predicted that comprehension of educational content will be stronger when the distance of that educational material was small (Goodman, Rylander, & Ross, 1993)—a concept that was supported by the results of this study. The data showed that when distance was tangential to the story, educational and narrative content competed for working memory; however, as the results showed, children's working memory was generally more devoted to processing the narrative content of the program. As Fisch (2000) posited, it is at this point—when educational and narrative content compete for working memory—that children will have difficulty processing the educational content in the program. However, it is interesting to note that the distance of the educational content from the narrative content did not have a statistically significant influence on the acquisition of narrative content. The fact that there were no significant changes in the acquisition of narrative content when pace was slow versus fast, indicates that working memory continues to devote resources to the story so that the continuity of the story remains whole. The data revealed that when distance was large, acquisition of educational content fell to the wayside, but when distance was small, the processing of the two variables became synchronous. However, when the distance was small, the educational content was integrated with the narrative content and the two worked in correspondence with each other (Fisch, 2004a), which was reflected in the means of the educational and narrative content questions. When distance was large, the difference between the means was greater than when the distance was small.

Interaction effects. Research Question 11 referred to the interaction effects between distance and pacing on the acquisition of educational content and narrative content. Since research has shown that the complexity of formal features can influence the depth of processing in young children, scholars have indicated that the ideal pace of these formal features is one in which children can best grasp the information (Singer & Singer, 1998). Therefore, Hypothesis 6 posited that a small distance and slow pace would yield the greatest information acquisition of educational content.

The overarching statistical analysis of this data indicated that pace and distance interacted to significantly influence the acquisition of both narrative and educational content. Moreover, interaction effects showed that children's cognitive maturity had a significant interaction effect with pace and distance on educational content, but not narrative content. The findings again indicated that the acquisition of educational content was more sensitive to external variables than acquisition of narrative content. The data also indicated that children acquired the greatest amount of educational content from programs with a slow pace—such as *Dora the Explorer* ($\mu = .77$, $SD = .422$) and *Teletubbies* ($\mu = .77$, $SD = .422$)—and small distance—such as *Imagination Movers* ($\mu = .30$, $SD = .458$)*, Can You Teach My Alligator Manners?* ($\mu = .56$, $SD = .498$)*,* or *Dora the Explorer*. Thus, the data supports H6 that a small distance and a slow pace will yield the greatest amount of information acquisition of educational content.

Age. Research Question 12 referred to the influence of age on the information acquisition of educational and narrative content. Previous research had shown that older children have more complex schemata for processing as they mature (Bickham et al., 2001), and will thus be able to simultaneously process both educational and narrative content (Zillmann, 1982). In order to understand how age impacts the acquisition of educational and narrative content, a simple linear regression found statistically significant relationships between age and the acquisition of educational content as well as the acquisition of narrative content. The results indicated that the age of the child could predict between 25.4% to 29.1% of the correct responses to both the educational and narrative content. The results also indicated that, as Piagetian literature suggests, children developed as they aged, and thus these results are not surprising. Although children's cognitive development can predict a great deal of the PPVT score, it did not predict all of it and ample room is left for further research. However, in a reversal from previous findings, ANOVA's indicated that when age and pace interacted, there was a significant influence on narrative content, but not educational content.

PPVT. Research Questions 13 and 14 referred to the relationship between PPVT and narrative and educational content. Previous studies examining the relationship between children's comprehension of and attention to educational content on television have posited that the skills needed to comprehend and process television usually develop between the ages of two and five years old—a time when cognitive skills and the ability to engage with the television develop significantly (Anderson & Lorch, 1983). Although age is a significant factor, the PPVT is a better method of measuring children's cognitive maturity, especially during Piaget's preoperational level. Therefore, Hypothesis 7 posited that as children became more cognitively mature, they would be able to process narrative content more easily, and would allocate more resources to processing educational content. The findings indicated that as a child's cognitive process matured, their ability to acquire educational and narrative content also increased; however, the cognitive maturity of the child could only predict 40.8% of the correct responses to educational content, and 26.0% of narrative content. Therefore, cognitive maturity plays a role in the acquisition of educational and narrative content, thus, supporting H7.

Television exposure. Research Question 15 referred to whether the amount of television a child watched had any influence on the amount of information acquisition that will occur. A simple linear regression examined the relationship between the child's total minutes of television watched per week and the acquisition of narrative content, educational content, and total response, but found no significant relationships. This indicated that although the amount of television could influence how well a child might do on the PPVT (at a .10 significance level), it could not necessarily influence how an individual responded to narrative and educational content.

Liking. According to the capacity model, a child's prior knowledge of a program may influence how the child attends to the information presented in a program. In essence, Fisch (2009) posited that by establishing these scripts and schemata about a program, children can acquire information from the program more easily and reduce the demands of processing it. Research on these schemata have indicated that understanding the basic story structure of a program can aid in comprehension of narrative content (Fisch, 2000; Mandler & Johnson, 1977; Thorndyke, 1977), by reducing processing effort and increasing prior knowledge of the narrative (Meadowcroft & Reeves, 1989). In other words, a child's interest in a show's characters can influence how much attention the child gives to a show, which, in turn, can enable a child to acquire more information.

Research Question 16 referred to how correctly children responded to the narrative and educational content questions based on their "liking" of the clip. Results indicated that pace had a significant impact on how much a child "likes" a program. As the pace of a program increased, the more children "liked" the program. Although distance did not have any influence how much children "liked" a program, the interaction of distance and pace approached significance, suggesting further research could clarify the relationship. How much a child liked or disliked the video clip had no impact on how they answered the questions. However, significance was approached for the fast pace, small distance show, *Imagination Movers*. Thus, future studies should explore this concept more thoroughly, as the structure of this question may have skewed the answers, and potential for further research is evident.

There are several limitations to consider when interpreting the "liking" results. First, although the research used a smiley-face Likert scale to measure children's enjoyment of the stimulus segments, the Likert scale had to be cut down to a three-point scale, so that children could understand the question more easily. Second, when some participants responded to how much they "liked" the video segment in the experiment, they may have merely been repeating the last option given to them on the smiley face scale. In order to prevent this, the experimenters consistently alternated the order of how they asked the "liking" question. However, this recency effect may have influenced how children responded to the question and, thus, skewed the data. How much the data may have been skewed by this is unknown.

Recognition. Research Question 17 examined the relationship between recognition of a character and how correctly children responded to the narrative and educational content questions. Although significance was not found at every level, several significant relationships emerged. According to the data, recognition of the fast pace/large distance show, *The Electric Company,* led to significantly higher correct responses to educational content. Additionally, recognition of medium pace/small distance program, *Can You Teach My Alligator Manners?,* led to significantly higher correct responses to narrative content questions. Finally, recognition of the medium pace/large distance program, *Word Girl,* led to significantly higher correct responses to both narrative content and educational content questions.

ANOVA's indicated that recognition of a program was influenced by both pace and distance, but not the cognitive maturity of the child. Thus, for fast and small paces, as the distance increased, recognition of the programs decreased. The medium pace maintained a level amount of recognition between the programs. However, this was likely influenced by the specific programs that were used in the stimulus segments.

What is unknown in these relationships is what may have been an influencing factor in the recognition of these shows. How often do these children watch these programs on television? And does this familiarity to the character serve as an index for the acquisition of information? As Fisch (2002, 2009) suggested, the greater the amount of exposure and prior knowledge a child has about a program, the greater the amount of processing. We now know—on a very basic level—that children's prior knowledge of a character can indeed ease their processing efforts, and increase their ability to acquire educational and narrative content. Although it was not uniform across the board, information processing did improve on several levels.

One program of interest in this situation is *Dora the Explorer.* Since nearly all the children recognized the character, and nearly all of the children answered both the narrative and educational content questions correctly, there may not have been enough children who did not recognize the character in our survey, and thus, we cannot know how influential recognition is in this case. Observationally, we noted that multiple children exclaimed “I want to watch Dora!” upon seeing the *Dora the Explorer* clip in the DVD. A measure for the strength of recognition and familiarity of the character should be developed, seeing that it is difficult to test recognition’s influence in processing information without truly understanding how recognizability of a character. The strength of the recognition may have a significant impact on the ease of processing for a child, potentially leading to automatic learning (Norman & Bobrow, 1976; Shriffin & Schneider, 1977). Do the children merely recognize the character, or do they like the character as well? How do pace and distance influence the relationship between recognition and the narrative and educational content scores?

Because the demands of processing narrative and educational content can ease with prior knowledge, the understanding of formal features of programming may also ease the processing of information (Fisch, 2000). If a child can comprehend a fast-paced program, then they should not have difficulty understanding the narrative and educational content in the program. However, the frenetic nature of such programs may not permit the deeper processing of such content (Huston & Wright, 1983; R. A. Smith, Anderson, & Fischer, 1985). For, as the results indicated, there were deviations in how children could recall content from fast, medium, and slow paced programs. This leads to the question; does the recognition of and response to formal features differ between heavy and light television viewers? These questions leave ample opportunity for future research.

Limitations

Like all studies, this research project has been delimited by a number of factors. This section will outline some additional limitations not previously discussed. For this study, the author examined children's E/I programs from three networks—PBS Kids, Nick Jr., and Playhouse Disney—and although all of the programs on these stations were E/I and within the parameters of this study, it is important to note that children do not necessarily watch E/I programs. In fact, during this study, the parents of one of the 3-year-old participants indicated that the child preferred *Family Guy* as his favorite program. Although this is an adult-oriented show, and most parents listed children's programs when asked about their child's favorite show, it should not be surprising that it appeared on the list. Despite the inappropriate nature of the content for children, the watching of programs such as *Family Guy* may be indicative of the household habits of many Americans—children watch what is on the television, whether it is intended and appropriate for them or not. Thus, other stations that air programming that targets children should be examined—regardless of E/I classification. Also, based on the *Family Guy* listing, even stations and programming that *don't* (intentionally) target children may need to be examined.

An additional limitation includes the age restriction (children between the ages of three and five years old) that was placed on eligibility for preschool interviews. Although Piagetian literature suggests that children in the symbolic function substage of the preoperational level of cognitive development are around this age, restricting interviews to preschool children within the age range of three to five may have excluded younger children who were capable of participating.

Another limitation worth considering is the homogeneity of the sample itself. Because the data were collected through convenience sampling, it is unclear how generalizable the findings are to the rest of the population—especially considering that the majority of children came from families that were predominately white, married, and from upper-middle class households. Future studies should attempt to seek a more diverse population. Because the majority of these children were from similar backgrounds, the question remains as to how other socio-economic factors might influence the results, thus a more diverse population is needed. It is not known how different races and cultures' results might differentiate. Additionally, all the children that participated in this study were enrolled in preschool. Therefore, there is some sort of exposure to educational curriculum in their day-to-day life. However, what of the children who are *not* enrolled in preschools? If this study were replicated with children who are not enrolled in preschool, would it yield the same type of results? Also, do the children's results vary from preschool to preschool? If cognitive maturity can influence the scores of the narrative and educational content, can the curriculum of individual preschools influence how well a child does? This is not known, for even individual classrooms may lead to differences in the data.

Also, the quasi-experimental design of this study is not as strong in controlling for threats to the internal and external validity as the true experimental design. Because it was necessary to employ convenience sampling and random assignment of the treatments, a controlled experimental design was not feasible. Thus, without a control group, it cannot be assumed that the data are necessarily generalizable to the rest of the population. Rather, this study could be considered an exploratory study, as—to the best of the author's knowledge—this is the first experiment that has tested the capacity model.

Also, that there is no way to ensure that the curricular lesson in the stimuli segment was one that children could easily understand. *Word Girl,* for example, is one to consider. Despite the fact that *Word Girl* is a popular program and is watched by young children, the curricular lesson in the stimuli may be intended for an older sibling. The curricular lesson about the electoral process may be too complex and distant of a lesson for a child to truly comprehend. However, just because a lesson seems difficult, it should not necessarily by excluded from the study; rather, it should be controlled for, as many young children watch programming that is chosen by an older sibling. Although the programs selected for the stimuli were E/I programs that are intended for children, not every lesson is comprehensible by the child.

In future work, a more thorough examination of the types of questions used to measure educational and narrative content should be completed. By presenting questions that have the same structure, and feature appropriate content questions, it may give a more accurate measure of the acquisition of narrative and educational content. Additionally, in order for a more accurate analysis of the data, it is essential that more questions be asked for both the educational and narrative content to allow for a more continuous scale—the use of dichotomous answers was a major limitation in the analysis of the study.

Additionally, it is not known if the children were primarily viewing these programs for the purposed of entertainment. If the child were watching for entertainment purposes, they would have automatically defaulted to processing narrative. However, despite the best efforts of the researchers to make the session seem fun and enjoyable, the children may have noticed underlying cues that could have altered how they processed the narrative and educational content. If the children picked up on the educational nature of the session, then they may have devoted more working memory to processing educational content, a supposition that is based on the concept that children's comprehension of television is influenced by their motives for viewing (Salomon & Leigh, 1984).

Although this study's research assistants were trained thoroughly, it is likely there are some discrepancies in the experiment itself—for something as minor as vocal intonations may influence an answer. Finally, another limitation to the study was the fact that not all of the participants completed the entire study. Although this is hardly unexpected in research with children, the length of time that a child's attention can be held is extremely limited, and should be taken into consideration in future capacity research. It is unknown how many of the children that completed the survey became disinterested or disengaged before the end of this study.

Future Research

Although the topic of children and media has been examined by scholars for many years, the study of capacity model is still in its infancy. Proposed in by Fisch in 2000, this study is rife with possibility for future exploration. Not only does semantic distance need to be explored more in-depth, but also one of the keys for future research will be determining the best way to measure distance. As of the time of this project, this was the first study to measure semantic distance in relation to capacity model, and thus the reliability and validity of the measurements is unknown. It will be essential to future research and for the understanding of the capacity model that the scale to measure distance can accurately provide these measurements. Currently, we do not have a scale or index to indicate how significant direct address (Fisch, 2004b; Rice et al., 1986), clarity (Wilson, Kunkel, & Drogos, 2008), integration, and redundancy are to measuring distance in the capacity model.

Although we now know that narrative content is acquired and processed either before or better than educational content, the findings suggested that the character recognition can influence how much attention is paid to the program. Future research should examine how recognition of character is a factor in the acquisition of educational and narrative content. Because 93.3% of the children recognized *Dora the Explorer*, 91.3% of the children answered the show's educational content question correctly, and 100.0% answered the show's narrative content question correctly, character recognition and involvement may be key in the processing of narrative content. The question remains: How much of a factor did Dora play in children's acquisition of information? Did the high information acquisition for this program occur because of the small distance and slow pace, or was it because the children recognized Dora and were immediately highly involved in the clip? Although this is an exciting opportunity for future research, the "Dora Factor" is also a significant limitation. Therefore, the author proposes a future experiment examining how influential character recognition can be. In such a study, children should be exposed to different treatments—one that is easily recognizable and another that has an unrecognizable character but contains the same narrative and educational content.

Additionally, an interesting study would involve examining how the advertorial strength of a character might influence how the child acquired information from the program. We know that children learned best with a slow pace and small distance; however, what we do not know is how much children's interest in the segment increased because of the characters that they saw. Therefore, the author proposes testing children's information acquisition of narrative and educational content for multiple programs that have a slow pace and small distance, but have different levels of saturation in the market. For example, if a child has a *Go, Diego, Go!* backpack, eats *Diego* yogurt, and plays *Diego* video games, the child would certainly be interested in watching a *Diego* video. However, that child may not have the same level of interest for a character that is similar in nature, which they know nothing about. Being able to understand and measure the strength of recognition is essential for understanding the capacity model.

Finally, it would be extremely beneficial to those studying the capacity model to emulate the current study, and expand it to an older age group. Ideally, this study should be replicated with children between the ages of five and seven who are in the intuitive thought substage of the preoperational stage of cognitive development. By doing so, it would allow researchers to learn more about how children of different ages and cognitive maturity acquire and process narrative and educational content from E/I programming. In the same vein, it would also be extremely interesting to see at what age younger children begin to learn from video—which studies have indicated that it is at some point between the second and third birthday (Troseth & DeLoache, 1998).

Conclusions

The current study does not comprehensively answer the all-encompassing question of how children learn from television. It does, however, provide crucial insight to how children acquire information from television based on the parameters of the capacity model. At the present time, no other study has applied and examined the parameters of the capacity model, and, thus, this study does offer much insight into the three basic components of capacity model—the processing of narrative content, the processing of educational content, and the semantic distance between the two. From this study, we, as scholars, can conclude that Fisch's (2000, 2009) suppositions on the processing of narrative content and educational content are correct—that children will routinely process narrative content first, and when the information is too complex, the ability to process said information will dramatically decrease.

The findings from this study bring many new questions about capacity model that must be answered if scholars hope to develop their understanding of how children interact with and learn from television. A variety of factors—such as prior knowledge, story complexity, clarity of information, need for inferences, and cognitive ability of the viewer (Fisch, 2000)—all have been shown to influence how children process educational and narrative content. Although we can learn a great deal about this process, it is only when all of these factors have been fully investigated that we can truly understand children's learning process through the capacity model.

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Appendix A

Pacing and Distance Coding Book

Pacing and Distance Coding Book

Pacing Code

Pacing employs the following criteria to evaluate segments: (a) frequency of camera or editing actions, (b) frequency of change to an essentially new visual scene, (c) percentage of active motion, (d) frequency of auditory change (e.g., change from man's voice to music), (e) percentage of lively music, (f) percentage of aroused, active talking, and (g) segment length. Use the following information to code for both pace and distance. Each show has its own page. For each shift or change mark it down on the coding sheet. Each change get its own individual mark. At the end of the five minute segment, total the number of recorded marks and enter it into the gray section. For the amount of time, use the stopwatch to record how long each individual active talking/music/motion occurs. At the end of the 50-minute clip, total the number of seconds in the gray box.

1. **Frequency of unrelated shifts = 20%.** As Lang et al. (1993) explained, these cuts occur when the scenes on either side of the cut are completely unrelated to one another, either by audio content, message content, or visual setting. Typically, these are abrupt, unexpected, even artificial changes in both the program and the message, similar to what occurs when a person is watching television and another person unexpectedly changes the channel. Examples from the children's programming that we coded include the following: (a) on *Sesame Street*, a cut from Bert and Ernie's kitchen to a cartoon segment featuring the letter *q*; (b) on *Looney Tunes*, a dissolve from the *Looney Tunes* board to the title card for a *Bugs Bunny* cartoon; and (c) a dissolve from the closing credits of a *Dudley Do-Right* cartoon to the opening credits of a *Bullwinkle* cartoon.

2. **Frequency of related shifts, or changes to a new visual scene that semantically related to the prior scene = 15%**. Examples include the following: (a) *Reading Rainbow's* LeVar Burton, in the studio, introduces a segment about how books are made, followed by a dissolve to a book bindery; (b) Scooby Doo and Shaggy explore a haunted house, followed by a cut to Daphne in the swamp; (c) the trolley on *Mister Rogers* rolls from the living room to the Land of Make-Believe; and (d) *Speed Racer* cuts to a commercial, after which the show picks up at a different scene, but still part of the story.

3. **Frequency of camera cuts, or editing actions, within a single scene = 15%.** Camera zooms, pans, or tilts from one character to another, do not count. Two examples follow: (a) a cut from a close-up of Fred Flintstone to a two-shot of Fred & Wilma, and (b) a cut from a long shot of a crowd to a medium shot of Batman.

4. **Percentage of active motion = 20%.** Coders considered criteria presented by Anderson et al.'s (1977) and Huston et al.'s (1981) studies. These included any activity by characters that took place at a pace faster than a walk: running, jumping, dancing, and so on. Examples include the following: (a) flying planes, spaceships, hoverboards, and so on; (b) fast-moving cars, bikes, trucks, and other vehicles; (c) a character running in place; (d) *Sesame Street* cartoon numbers "morphing" quickly from 1 to 10; (e) a scene containing busy traffic; (f) a close-up of pouring water; (g) a close-up of a waterfall; (h) a heavy rain; (i) quick pans or tilts of the camera; (j) a stationary camera mounted on a moving object, such as the front of a roller coaster; (k) a close-up of two characters playing patty-cake; (l) a close-up of a dog shaking water out of its fur; (m) a cartoon lightning bolt hitting the ground; and (n) a car, plane, or runner disappearing into the horizon.

5. **Frequency of auditory changes, as delineated by Anderson et al. (1977) =10%.** This was defined as a change from one qualitative type of sound to another. Examples of auditory changes include: (a) from a man's voice to a woman's voice, (b) from a woman's voice to a child's voice, (c) from a child's voice to animal sounds, (d) from a man's voice to sound effect, and (e) from music to sound effect. The following would not represent examples of this category: (a) conversation between two men, (b) conversation among five children, and (c) change from one type of music to another, similar type of music.

6. **Percent of active music = 10%.** This category typically included instrumental music that was above low-key. A steady bed of background music would not count, if it was slow and soft. Other examples would be musical sound effects, such as a slide whistle.

7. **Percent of active talking = 10%.** This category is devoted to talking above low-key background talk. A normal on-screen conversation would count. Other examples in this category were singing, barking, roaring, or other animal sounds. The data is normalized by transforming the frequencies into percentages. For example, *Beetlejuice* led all other programs, with 144 auditory changes: It was assigned 100% for that category. *Blue's*

Clues, then, with 112 auditory changes, was assigned 78%.

Therefore, the following formula yielded each program's pacing index:
[(normalized percentage of unrelated shifts) °— .20] + [(normalized percentage of related shifts) °— .15] + [(normalized percentage of camera cuts) °— .15] + [(percentage of active motion) °— .20] + [(normalized percentage of auditory changes) °— .10] + [(percentage of active music) °— .10] + [(percentage of active talking) °— .10] = pacing index. Table 2 demonstrates how the pacing index for *Blue's Clues* was derived.

Distance of E/I Episodes

We assessed distance by focusing on the message strategies employed to convey the primary lesson in each clip. In other words, our quality criteria for judging distance were applied strictly to the dominant focus of the clip. This tactic ensures that programs that included supplemental or minor lessons would not be penalized if those efforts received only modest attention in the show. We used four criteria to measure the overall educational quality of each episode: clarity, integration, redundancy and direct address. Each of these variables was judged on a 1-3 scale (1 = low/no, 2 = medium, 3 = high). To assess overall distance of the clips, we summed the scores for the four criteria. The resulting quality index could range from 4 to 12. Scores ranging 4 to 8 were categorized as a "large" distance, and scores of 9-12 were categorized as having a "small" distance. Coders considered only the primary lesson when assessing the measures.

Clarity - Lesson clarity refers to how directly and explicitly the primary lesson is presented. A lesson that is high in clarity is easy to decipher, straightforward, and transparent. A child would easily understand such a lesson. A lesson that is low in clarity is not articulated clearly and may be muddled by distractions, unclear dialogue, or competing sub-plots within an episode. A child would miss this lesson. A lesson that has a medium level of clarity may at times appear straight-forward, but may not be prevalent in the dialogue or visual elements. The child may or may not remember seeing such a lesson.

Integration - Lesson integration refers to the extent to which the primary lesson is incorporated into the narrative of the clip. A lesson that is high in integration will be a contiguous part of the plotline and works with the narrative to get the educational lesson across. The educational lesson would not appear at all separate from the narrative, but rather a contiguous part. A lesson that has a medium level of integration may not appear to be a continuous part of the clip, but rather it's own independent section using the main characters. A lesson that is low in integration is isolated or separated from other program content, does not include the main characters, and may appear to be tangential to the main plot or storyline.

Redundancy - Lesson redundancy refers to the extent to which the primary lesson is repeated throughout the program. A lesson that is high in redundancy will be emphasized or demonstrated multiple times throughout the clip. A lesson that has a medium level of redundancy may only appear or be mentioned a couple by the characters in a clip. A lesson that has low redundancy is only mentioned once or not at all in the clip.

Direct Address - Direct address refers to whether a character directly addresses the audience members in regards to the educational content of the show. A lesson that his a high amount of direct address is one which a main character addressed the audience and waits for a response. This may occur multiple times. A lesson that a medium level of direct address is one in which the characters or narrators speaks directly to the audience but only once. The characters do not wait for a response. A lesson that is low in direct address only does not have any main character addressing the audience. In low direct address, the narrator may be guiding the story, but does not directly ask the audience any questions.

Distance Level - To help clarify the overall findings, group program segments into two categories. Those with scores of 3 or less are classified as having a *large distance*; episodes in this group typically had a "low" rating (score of 0) for at least one of the criteria and never had more than one "high" rating across all six criteria. Episodes with scores of 4 to 6 were classified as having a *small distance*.

Show: ______________ Episode: ______________ Time Run: __________

Frequency Unrelated Shifts	Frequency Related Shifts	Frequency Camera Cuts	Frequency Auditory Changes	Active Motion start	stop	Total Sec.	Active Talking start	stop	Total Sec.	Active Music start	stop	Total Sec.
Totals				Total seconds			Total Seconds			Total Seconds		

Distance

	Low	**Medium**	**High**
Clarity	1	2	3
Integration	1	2	3
Redundancy	1	2	3
Direct Address	1	2	3

Distance Score ________ Add Numbers Above

Distance Score	**Circle one**
4-8 Large Distance	0
9-12 Small Distance	1

Appendix B

Letter to Parents

Cynthia Nichols
The University of Alabama
Office for Graduate Studies
College of Communication and Information Sciences
P. O. Box 870172
Tuscaloosa, AL 35487-0172

Dear Parent or Guardian:

I am a doctoral student at the College of Communication and Information Sciences at the University of Alabama here in Tuscaloosa. Currently, I am trying to complete my dissertation research in order to graduate during the summer of 2010. My dissertation is titled, "How Fast Can They Learn? Developmental Differences in Information Acquisition of Educational and Narrative Content from Through Pacing and Distance." Whew! It sounds complex, but it really isn't.

With this research, I hope to find out how fast or slow programs need to be in order to help kids remember the educational information from it the best. Studies show that children like to watch different types of television shows at different ages, and remember content differently as they age. Because of this, you will often find that programs for younger children will have a slow pace and be very calming; whereas programs for older children have a much more rapid pace. However, it is not known at what pace children of different ages learn the best.

This is where my research comes into play. For this study, I have created a 10-minute video with clips from a variety of children's programs. These clips are all from shows that your child would normally find on television, and are TV-Y. I will ask your child several questions after the viewing is completed to see what he or she feels and remembers from the video. Hopefully, the responses will show strong results of what types of programming that children learn from the most.

I would greatly appreciate your child's participation in this project. Both your school's principal as well as your child's teacher have granted me permission to conduct this research on school grounds. Your child will be taken out of the classroom for approximately 25 to 30 minutes for the duration of the study. There is no foreseeable risk to your child and participation is voluntary. To complete this project, I need 150 2- to 7- year olds to participate. Your help is extremely important.

I will be in your child's classroom in the next two weeks to conduct this research. To give permission for your child to participate, <u>please read and sign the attached Informed Consent Form and return it to school with your child</u>. If you do not give permission, your child will not be penalized in any form. Any information that is gathered from the surveys will be kept in the strictest confidence, and will not be released to anyone. I plan to identify the school only as "An elementary/preschool in the southeastern United States." Please be assured, every measure will be taken to ensure your child's confidentiality. If you have any questions, please don't hesitate to call me at (205) 454-3500 or email Nicho026@crimson.ua.edu.

Sincerely,

Cynthia Nichols, M.A.
University of Alabama

Appendix C

Informed Consent Form

INFORMED CONSENT STATEMENT
"How Fast Can They Learn? Developmental Differences in Information Acquisition of Educational and Narrative Content Through Pacing and Distance."
Primary Investigator: Cynthia Nichols

Your child is being asked to be in a research study. This study is called "How Fast Can They Learn? Developmental Differences in Information Acquisition of Educational and Narrative Content Through Pacing and Distance." The study is being done by Cynthia Nichols, who is a doctoral student at the University of Alabama. Dr. Jennings Bryant, whose credentials include being the Associate Dean for the College of Communication & Information Sciences at University of Alabama, will be the supervising professor for this research.

Approximate Duration of the Study: 25 minutes

What is this study about? With this research, I hope to find out how fast or slow programs need to be in order to help kids remember the educational information from it the best. Studies show that children like to watch different types of television shows at different ages, and remember content differently as they age. Because of this, you will often find that programs for younger children will have a slow pace and be very calming; whereas programs for older children have a much more rapid pace. However, it is not know at what pace children of different ages learn the best.

Why is this study important—What good will the results do?
This is where my research comes into play. The findings will help scholars be able to learn more about how children learn from television, and will help determine at what pace children learn best. This could help create programming that is beneficial for children at a variety of ages.

Why have I been asked to take part in this study?
For this study, we need to work with children who are between the ages of 3 and 5 in local area preschools. Your preschool director has been kind enough to support this study in your school by allowing me to conduct the study at your school. Because of this, the preschool directors and teachers have allowed me to pass out this information packet to parents.

How many other people will be in this study?
The investigator hopes to interview roughly 120 children from several preschools in the Tuscaloosa area within the next two months.

What will I be asked to do in this study?
If you agree to be in this study, Cynthia Nichols or a research assistant will ask you to fill out a short survey about your family's media habits to return to your child's school with the permission form. After permission has been given by the parent or guardian, each child will watch 10 minutes of clips from Educational/ Informative (E/I) programming. These clips are all from shows that your child would normally find on television, and are G-rated. I will ask your child several questions after the viewing is completed to see what he or she feels and remembers from the video. Hopefully, the responses will show strong results of what types of E/I programming that children learn from the most.

How much time will I spend being in this study?
Filling out the survey should only take about 10 minutes. It will only take roughly 25 minutes for to watch the video and ask your child questions about the educational content.

Will being in this study cost me anything?
The only cost to you from this study is your time.

Will I be compensated for being in this study?
There will be no compensation for participating in this study.

What are the risks (problems or dangers) from being this study?
The study presents minimal risk to the participants. The participants may experience mild boredom in completing the survey and questionnaire, but all participants will be informed at the beginning of the study that if they are uncomfortable about any of the questions asked they are free refuse to answer, without penalty. All video clips are from educational/informative programs that are targeted to children, and pose little risk to the child. Many of the clips will have been pulled from episodes that many of the children have already been exposed to. The benefit to the participants is that the students may find pleasure in seeing and recognizing images and characters with whom they are familiar.

What are the benefits of being in this study?
There are no direct benefits to you unless you find it pleasant or helpful to describe your household media habits in the survey. You may also feel good about knowing that you have helped a PhD student finish her dissertation and allowed scholars to develop a better understanding about how children learn.

How will my privacy be protected?
You are free to decide how much information to fill out on the parental demographic survey. The researchers have taken a training course through the National Institute of Health to ensure that participants information will remain private. The researcher will not discuss the results with anyone.

How will my confidentiality be protected?
The only place where your name appears in connection with this study is on this informed consent. The consent forms and data will be stored in a locked file cabinet in Phifer Hall Room 458 on The University of Alabama campus. Data will be destroyed after the study. This should occur within one month of the interview. Subjects will be assigned a subject number in the experiment in which they are participating. No link between subject name and number will be retained. While all data will carry the subject number, we will not know which subject name goes with which subject number. Only the participant number will be used to store all data. Participant names will appear only on the parental permission form, and will be used only to ensure that the parental survey matches the child's data. After this, there will be no linkage of participant's names with their participant number.

Any information my child gives during the participation may be recorded and employed for research purposes only. All results that are reported from this research will involve reports of responses from groups of people. No identifying information will be used when reporting the results of this research.

Your child's participation is confidential and will not be personally identified in any reports of the results of this study. The information in the study records will be kept confidential. At no time will your child ever be asked any identifying information. Data will be stored securely and made available only to people conducting the study. Your child's name will not be stored with the data we collect. All data will be reported in terms of group average. We will write research articles on this study but participants will be identified only as "children from the preschools in a near a large, Southern University," No one will be able to recognize you or your child, as all data will be reported in terms of aggregates and groups.

What are the alternatives to being in this study?
The only alternative is not to participate.

What are my rights as a participant?
Being in this study is totally voluntary. It is your free choice. You may choose not to be in it at all. If you start the study, you can stop at any time. Not participating or stopping participation will have no effect on your relationships with the University of Alabama or your child's preschool.

In addition, your child's participation in this study is voluntary; and he or she may decline to participate without penalty. If your child decides to participate, he or she may withdraw from the study at any time without penalty. If they do withdraw from the study, his or her data will be destroyed. Students will not suffer any sort of grade or academic penalty if they choose not to participate.

The University of Alabama Institutional Review Board is a committee that looks out for the ethical treatment of people in research studies. They may review the study records if they wish. This is to be sure that people in research studies are being treated fairly and that the study is being carried out as planned.

Who do I call if I have questions or problems?
If you have questions about this study right now, please ask them. If you have questions at any time about the study or the procedures please contact Cynthia Nichols (email: Nicho026@crimson.ua.edu) at 205-454-3500, or Dr. Jennings Bryant (email: jbryant@ua.edu) at (205) 348-8593 If you have questions or complaints about your rights as a research participant, call Ms. Tanta Myles, the Research Compliance Officer of the University at 205-348-8461.

You may also ask questions, make a suggestion, or file complaints and concerns through the IRB Outreach Website at http://osp.ua.edu/site/PRCO_Welcome.html. After you participate, you are encouraged to complete the survey for research participants that is online there, or you may ask Ms. Nichols for a copy of it. You may also e-mail us at participantoutreach@bama.ua.edu.

I have read and understand the above information. I have received a copy of this form and have had a chance to ask questions. I hereby grant permission for my child to participate in this study. I certify I am at least 19 years of age.

___

Signature of Research Participant Date

Child's Name: ________________________ Child's Age: _______ years _________months

Child's Teacher: ______________________ Child's Gender: ____Male or ____Female

___

Signature of Investigator Date

Appendix D

Child's Assent Script

Child’s Assent Script

The following passage was read aloud to each participant by the experimenter before the research study began:

Hello. During the next few minutes, you will be watching a video of several kids shows. Please pay close attention to what’s shown onscreen. I will ask you a few questions about what you saw after the video ends. Would you like to do this? Do you have any questions?

Upon giving verbal assent to participate, each child proceeded with the study and begin watching the video.

Appendix E

Demographic Survey to Parents

Survey to Parents #________

Thanks for allowing your child to participate in this research project. I greatly appreciate your help. Please complete the following survey to provide background information on participants and their families. Please note: Your answers are strictly confidential. You may choose to leave any of the questions blank. In no way will you or your child be identified by this survey.

Please place a check mark in the blank of the answer that best describes your family or child.

1. Are you 1____Female or 2____Male ? 2. What is your age? ____ years

3. Ethnicity (put a check beside one or more answers that best represents you):
1____Caucasian/White
2____African American/Black
3____Hispanic/Latino
4____Asian/Asian American
5____American Indian/Native American
6____Pacific Islander
7____Other:______________________

4. What is the highest level of education you have completed?
1_____Less than high school
2_____High school/GED
3_____Some college
4_____Associates' degree/Bachelor's degree
5___Master's degree
6___Doctoral degree (Ph.D.)
7___Professional degree (J.D., M.D.)

5. What is the income level of your current household? (put a check beside one answer)
1____less than $15,000
2____$15,000 to $30,000
3____$31,000 to $50,000
4____$51,000 to $75,000
5____$76,000 to $100,000
6____$100,001 to $250,000
7____more than $250,000
8____unknown

6. What is your current marital status?
1____single, never married
2____married
3____divorced
4____separated
5____widowed
6____ in a permanent relationship

7. What is the sex of your child participating in this study? 1____Female or 2_____Male

8. What is your child's age? _____ years 9. Child's Birthday: ___________

10. Child's ethnicity (check all that apply):
1____Caucasian/White
2____African American/Black
3____Hispanic/Latino
4____Asian/Asian American
5____American Indian/Native American
6____Pacific Islander
7____Other:______________________

11. How many children (under 18) live in your household? ______ children
12. Ages: ________________

13. Does your child live in a two-parent household? 1_____yes 2_____no 3_____no comment

Please turn to next page and answer the remaining questions based on your family's media use.

14. Please circle the number of the following items you have in your household:

Number of TV sets	0	1	2	3	4	5	6	7	8
Number of DVD players	0	1	2	3	4	5	6	7	8
Number of VCR players	0	1	2	3	4	5	6	7	8
Number of video game players	0	1	2	3	4	5	6	7	8
Number of computers	0	1	2	3	4	5	6	7	8
Number of digital music players	0	1	2	3	4	5	6	7	8
Number of cell phones	0	1	2	3	4	5	6	7	8

15. Approximately, how many days per week do you watch television? 0 1 2 3 4 5 6 7

16. Approximately, how many days per week does your child watch TV? 0 1 2 3 4 5 6 7

17. On a typical day, how much time do you usually spend watching TV? ____Hours ____Mins

18. On a typical day, how much time does your child spend watching TV? ____Hours ____Mins

19. Would you say that the time your child spends in front of a television set is
    1____well below average
    2____below average
    3____average
    4____above average
    5____well above average

20. Does your family watch television together at night or on weekends? 1____yes 2____no

21. Does your child have a television set in his/her bedroom? 1____yes 2____no

22. Does your child have a computer in his/her bedroom? 1____yes 2____no

23. Does your child have a video game player in his/her bedroom? 1____yes 2____no

24. Do you attempt to limit or control your child's TV use? 1____yes 2____no

25. If yes, please explain. ____

26. Do you attempt to limit or control your child's computer use? 1____yes 2____no

27. If yes, please explain. ____

28. Do you attempt to limit or control your child's video game play? 1____yes 2____no

29. Have you ever heard of a v-chip? 1_____yes 2____no

30. Does your household use a v-chip to limit TV program access? 1_____yes 2____no

31. Does your household watch PBS? 1_____yes 2____no

32. Does your household watch Nick Jr.? 1_____yes 2____no

33. Does your household watch Playhouse Disney? 1_____yes 2____no

Do you agree or disagree with the following statements?

34. I believe that educational/informative programming positively influences my child.

1_____strongly disagree
2_____ disagree
3_____ neither agree nor disagree
4_____ agree
4_____ Strongly agree

35. I believe that educational/informative programming helps my child learn.

1_____strongly disagree
2_____ disagree
3_____ neither agree nor disagree
4_____ agree
4_____ Strongly agree

36. Please list your child's 4 favorite shows.

1. ____________________________________
2. ____________________________________
3. ____________________________________
4. ____________________________________

Appendix F

Interview Protocol

Interviewer Initials:_______ 1. Participant # ___________________ (same as parents' #)

2. Child's Name: __________________________ 3. Child's Teacher: _____________

4. Child's sex? 1_____Male or 2_____Female 5. Child's Age: _______________

READ THE FOLLOWING TO CHILD:

Hello. During the next few minutes, we are going to play some games and watch a video. Make sure you pay close attention to what's shown onscreen, because I will ask you a few questions about what you saw after the video ends. Would you like to do this? Do you have any questions?

6. Does child agree to participate? _____Yes or _____No*
*If no, research stops. Recruit another.

7. Do you have any favorite television shows? What are they? Maybe we'll get to see some in the clip after we play this game. (Write answers below.)

____

NOW, PROCEED WITH THE PEABODY SKILLS TEST. PLEASE FOLLOW ASK THE CHILD TO POINT TO THE PICTURE GIVEN TO YOU IN THE PEABODY SCRIPT, AND ENCOURAGE THE CHILD THROUGHOUT WITHOUT REVEALING ANSWER. FOR EACH PICTURE, INDICATE ON THE INSTRUMENT WHETHER THE CHILD WAS ABLE TO IDENTIFY A PICTURE. IF A CHILD ANSWER CORRECTLY, CIRCLE YES. IF THEY ARE NOT CORRECT OR DO NOT KNOW THE ANSWER, CIRCLE NO. THE FIRST SET THAT HAS 8 INCORRECT ANSWERS IS THE CEILING SET. STOP THERE.

Start Age 3 years		**Set 1**	**Start Age 4 years**		**Set 2**
1. Ball	Yes	No/DK	13. Pencil	Yes	No/DK
2. Dog	Yes	No/DK	14. Cookie	Yes	No/DK
3. Spoon	Yes	No/DK	15. Drum	Yes	No/DK
4. Foot	Yes	No/DK	16. Turtle	Yes	No/DK
5. Duck	Yes	No/DK	17. Red	Yes	No/DK
6. Banana	Yes	No/DK	18. Jumping	Yes	No/DK
7. Shoe	Yes	No/DK	19. Carrot	Yes	No/DK
8. Cup	Yes	No/DK	20. Reading	Yes	No/DK
9. Eating	Yes	No/DK	21. Toe	Yes	No/DK
10. Bus	Yes	No/DK	22. Belt	Yes	No/DK
11. Flower	Yes	No/DK	23. Fly	Yes	No/DK
12. Mouth	Yes	No/DK	24. Painting	Yes	No/DK
	No. of Errors: ____			**No. of Errors: ____**	

Set 3

25. Dancing	Yes	No/DK
26. Whistle	Yes	No/DK
27. Kicking	Yes	No/DK
28. Lamp	Yes	No/DK
29. Square	Yes	No/DK
30. Fence	Yes	No/DK
31. Empty	Yes	No/DK
32. Happy	Yes	No/DK
33. Fire	Yes	No/DK
34. Castle	Yes	No/DK
35. Squirrel	Yes	No/DK
36. Throwing	Yes	No/DK

No. of Errors: ____

Start Age 5 Set 4

37. Farm	Yes	No/DK
38. Penguin	Yes	No/DK
39. Gift	Yes	No/DK
40. Feather	Yes	No/DK
41. Cobweb	Yes	No/DK
42. Elbow	Yes	No/DK
43. Juggling	Yes	No/DK
44. Fountain	Yes	No/DK
45. Net	Yes	No/DK
46. Shoulder	Yes	No/DK
47. Dressing	Yes	No/DK
48. Roof	Yes	No/DK

No. of Errors: ____

Start Age 6 Set 5

49. Peeking	Yes	No/DK
50. Ruler	Yes	No/DK
51. Tunnel	Yes	No/DK
52. Branch	Yes	No/DK
53. Envelope	Yes	No/DK
54. Diamond	Yes	No/DK
55. Calendar	Yes	No/DK
56. Buckle	Yes	No/DK
57. Sawing	Yes	No/DK
58. Panda	Yes	No/DK
59. Vest	Yes	No/DK
60. Arrow	Yes	No/DK

No. of Errors: ____

Start Age 7 Set 6

61. Picking	Yes	No/DK
62. Target	Yes	No/DK
63. Dripping	Yes	No/DK
64. Knight	Yes	No/DK
65. Delivering	Yes	No/DK
66. Cactus	Yes	No/DK
67. Dentist	Yes	No/DK
68. Floating	Yes	No/DK
69. Claw	Yes	No/DK
70. Uniform	Yes	No/DK
71. Gigantic	Yes	No/DK
72. Furry	Yes	No/DK

No. of Errors: ____

Start Age 8 Set 7

73. Violin	Yes	No/DK
74. Group	Yes	No/DK
75. Globe	Yes	No/DK
76. Vehicle	Yes	No/DK
77. Chef	Yes	No/DK
78. Squash	Yes	No/DK
79. Ax	Yes	No/DK
80. Flamingo	Yes	No/DK
81. Chimney	Yes	No/DK
82. Sorting	Yes	No/DK
83. Waist	Yes	No/DK
84. Vegetables	Yes	No/DK

No. of Errors: ____

Start Age 9 Set 8

85. Hyena	Yes	No/DK
86. Plumber	Yes	No/DK
87. River	Yes	No/DK
88. Timer	Yes	No/DK
89. Catching	Yes	No/DK
90. Trunk	Yes	No/DK
91. Vase	Yes	No/DK
92. Harp	Yes	No/DK
93. Bloom	Yes	No/DK
94. Horrified	Yes	No/DK
95. Swamp	Yes	No/DK
96. Heart	Yes	No/DK

No. of Errors: ____

Start Age 10			**Set 9**
97.	Pigeon	Yes	No/DK
98.	Ankle	Yes	No/DK
99.	Flaming	Yes	No/DK
100.	Wrench	Yes	No/DK
101.	Aquarium	Yes	No/DK
102.	Refueling	Yes	No/DK
103.	Safe	Yes	No/DK
104.	Boulder	Yes	No/DK
105.	Reptile	Yes	No/DK
106.	Canoe	Yes	No/DK
107.	Athlete	Yes	No/DK
108.	Towing	Yes	No/DK
		No. of Errors: ____	

Start Age 11-12			**Set 10**
109.	Luggage	Yes	No/DK
110.	Directing	Yes	No/DK
111.	Vine	Yes	No/DK
112.	Digital	Yes	No/DK
113.	Dissecting	Yes	No/DK
114.	Predatory	Yes	No/DK
115.	Hydrant	Yes	No/DK
116.	Surprised	Yes	No/DK
117.	Palm	Yes	No/DK
118.	Clarinet	Yes	No/DK
119.	Valley	Yes	No/DK
120.	Kiwi	Yes	No/DK
		No. of Errors: ____	

Start Age 13			**Set 11**
121.	Interviewing	Yes	No/DK
122.	Pastry	Yes	No/DK
123.	Assisting	Yes	No/DK
124.	Fragile	Yes	No/DK
125.	Solo	Yes	No/DK
126.	Snarling	Yes	No/DK
127.	Puzzled	Yes	No/DK
128.	Beverage	Yes	No/DK
129.	Inflated	Yes	No/DK
130.	Tusk	Yes	No/DK
131.	Trumpet	Yes	No/DK
132.	Rodent	Yes	No/DK
		No. of Errors: ____	

Start Age 14-16			**Set 12**
133.	Inhaling	Yes	No/DK
134.	Links	Yes	No/DK
135.	Polluting	Yes	No/DK
136.	Archaeologist	Yes	No/DK
137.	Coast	Yes	No/DK
138.	Injecting	Yes	No/DK
139.	Fern	Yes	No/DK
140.	Mammal	Yes	No/DK
141.	Demolishing	Yes	No/DK
142.	Isolation	Yes	No/DK
143.	Clamp	Yes	No/DK
144.	Dilapidated	Yes	No/DK
		No. of Errors: ____	

Start Age 17-18			**Set 13**
145.	Pedestrian	Yes	No/DK
146.	Interior	Yes	No/DK
147.	Garment	Yes	No/DK
148.	Department	Yes	No/DK
149.	Feline	Yes	No/DK
150.	Hedge	Yes	No/DK
151.	Citrus	Yes	No/DK
152.	Florist	Yes	No/DK
153.	Hovering	Yes	No/DK
154.	Aquatic	Yes	No/DK
155.	Reprimanding	Yes	No/DK
156.	Carpenter	Yes	No/DK
		No. of Errors: ____	

			Set 14
157.	Primate	Yes	No/DK
158.	Glider	Yes	No/DK
159.	Weary	Yes	No/DK
160.	Hatchet	Yes	No/DK
161.	Transparent	Yes	No/DK
162.	Sedan	Yes	No/DK
163.	Constrained	Yes	No/DK
164.	Valve	Yes	No/DK
165.	Parallelogram	Yes	No/DK
166.	Pillar	Yes	No/DK
167.	Consuming	Yes	No/DK
168.	Currency	Yes	No/DK
		No. of Errors: ___	

Total Number of Errors ________ Total Number of Pictures Shown _________
8. PPVT-4 Score (Pictures – Errors) ________

READ THE FOLLOWING TO CHILD:
Do you want to watch the videos now? Okay, pay close attention because I'm going to ask you some questions after.

9. Experimental condition (indicate which video showed first):

1_____ fast pace, large distance – The Electric Company
2_____ fast pace, small distance – Imagination Movers
3_____ medium pace, large distance – Word Girl
4_____ medium pace, small distance - Alligator
5_____ slow pace, large distance - Teletubbies
6_____ slow pace, small distance – Dora the Explorer

BEGIN VIDEO. PRESS PLAY. DO NOT ENGAGE THE CHILD IN CONVERSTATION WHILE WATCHING THE VIDEO. AT THE END OF EACH VIDEO CLIP, HIT PAUSE & ASK IF THE CHILD RECOGNIZES THE CLIP:
Do you know who we just saw in the video?

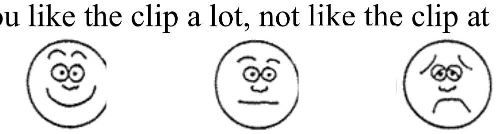
10. The Electric Company
____ Child Answered Correctly ____ Child Answered Incorrectly
11. Imagination Movers
____ Child Answered Correctly ____ Child Answered Incorrectly
12. Word Girl
____ Child Answered Correctly ____ Child Answered Incorrectly
13. Can You Teach My Alligator Manners?
____ Child Answered Correctly ____ Child Answered Incorrectly
14. Teletubbies (Po)
____ Child Answered Correctly ____ Child Answered Incorrectly
15. Dora the Explorer
____ Child Answered Correctly ____ Child Answered Incorrectly

WHEN VIDEO ENDS, TURN THE DVD PLAYER AROUND AND THEN PLACE SMILEY FACE CARD & PICTURE OF THE IMAGINATION MOVERS IN FRONT OF CHILD AND SAY: *I am now going to ask you questions about what we just watched.*

16. Can you tell me what the Imagination Movers did on Saturday?
____ Child Answered Correctly ____ Child Answered Incorrectly

17. How many days of a week are there? (Seven)
____ Child Answered Correctly ____ Child Answered Incorrectly

18. So did you like the clip a lot, not like the clip at all or was it just okay?



Liked it A lot — It was okay — Didn't Like It
3 — 2 — 1

SHOW THE CHILD THE PICTURE OF THE ELECTRIC COMPANY.

23. Can you tell me what happened to the floor when the people started singing & dancing?

____ Child Answered Correctly ____ Child Answered Incorrectly

24. Can you tell me what the foot bone is connected to? (Ankle Bone)

____ Child Answered Correctly ____ Child Answered Incorrectly

25. So did you like the clip a lot, not like the clip at all or was it just okay?

Liked it A lot	It was okay	Didn't Like It
1	2	3

SHOW THE CHILD THE PICTURE OF AL THE ALLIGATOR.

26. Can you tell me what Al the Alligator was trying to take from the little girl?

____ Child Answered Correctly ____ Child Answered Incorrectly

27. What did the little boy suggest that Al the Alligator do to be polite? (Share)

____ Child Answered Correctly ____ Child Answered Incorrectly

28. So did you like the clip a lot, not like the clip at all or was it just okay

Liked it A lot	It was okay	Didn't Like It
1	2	3

SHOW THE CHILD THE PICTURE OF WORD GIRL.

29. Can you tell me what happened to Becky's ideas? Who stole them?

____ Child Answered Correctly ____ Child Answered Incorrectly

30. Do you remember the word they told you to listen for that means a person who is running for office? (Candidate)

____ Child Answered Correctly ____ Child Answered Incorrectly

31. So did you like the clip a lot, not like the clip at all or was it just okay?

Liked it A lot	It was okay	Didn't Like It
1	2	3

SHOW THE CHILD THE PICTURE OF DORA.

32. Can you tell me what happened to the super babies blanket?

____ Child Answered Correctly ____ Child Answered Incorrectly

33. What colors were in the pattern on the super babies blanket? (Red & Blue)

____ Child Answered Correctly ____ Child Answered Incorrectly

34. So did you like the clip a lot, not like the clip at all or was it just okay?

Liked it A lot	It was okay	Didn’t Like It
1	2	3

SHOW THE CHILD THE PICTURE OF TELETUBBIES.

35. Can you tell me what happened when it stopped raining?

____ Child Answered Correctly ____ Child Answered Incorrectly

36. What did Po see reflecting in the water? (Clouds)

____ Child Answered Correctly ____ Child Answered Incorrectly

37. So did you like the clip a lot, not like the clip at all or was it just okay?

Liked it A lot	It was okay	Didn’t Like It
1	2	3

READ THE FOLLOWING TO THE CHILD:

Thank you very much for helping me out. Your did a great job at these games. Do you have any questions? I hope you had fun. Thanks again.

TAKE STUDENTS BACK TO THE CLASSROOM. THANK YOU!

Appendix G

Child Debriefing Script

Child Debriefing Script

The following passage will be read aloud to each participant after the interview is over:

Thank you very much for playing with me. I really appreciate your help! This research, including your responses, will be used to find out how kids learn best from television. Do you have any questions? I hope you enjoyed this project. Thanks again.

The participant then completed the experiment and was escorted out of the testing location, back to his or her classroom.

Appendix H

Stimuli Reminder Images

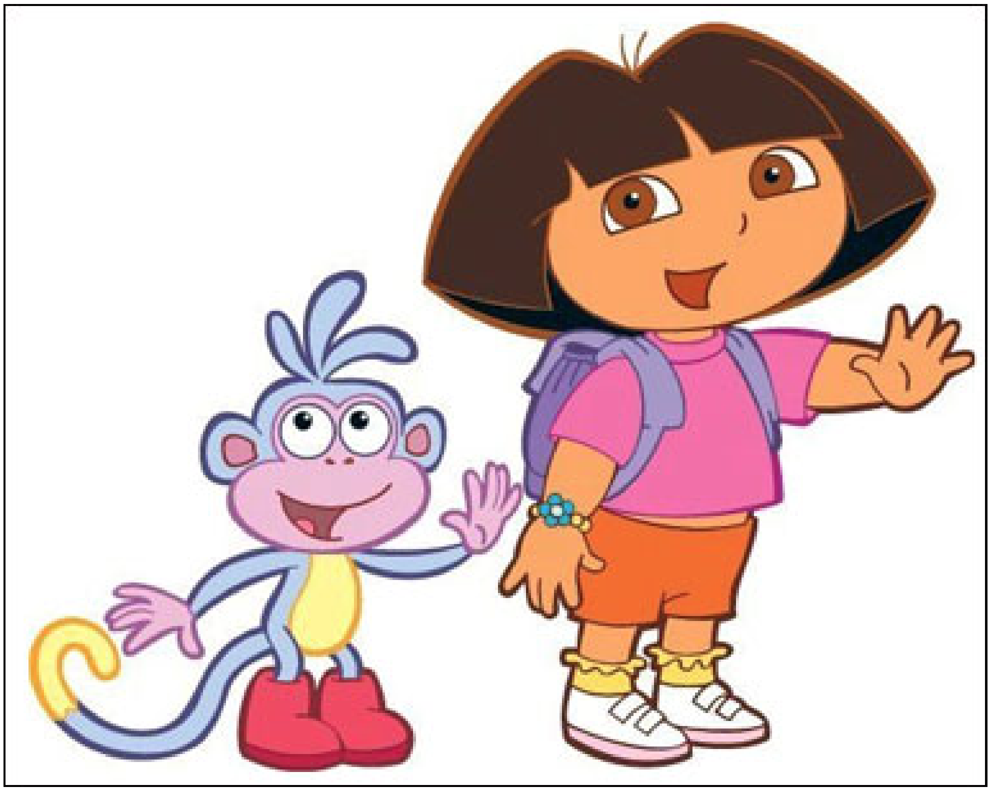
Stimuli Reminder Images

Imagination Movers – Fast Pace, Small Distance

The Electric Company – Fast Pace, Large Distance

Can You Teach My Alligator Manners? – Medium Pace, Small Distance


Word Girl - Medium Pace, Large Distance



Dora the Explorer – Slow Pace, Small Distance

Teletubbies – Slow Pace, Large Distance

Appendix I

Video Scripts

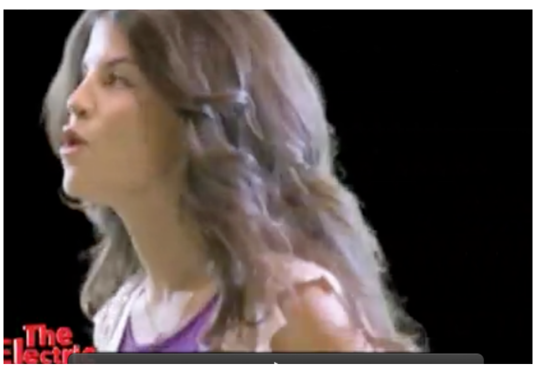
Program: The Electric Company   Producer: CPB, Sesame Workshop
Length: 1:03   Clip   Page 1 of 6   "Electric City"

VIDEO | AUDIO

WYCLEF JEAN: Can you feel my energy?

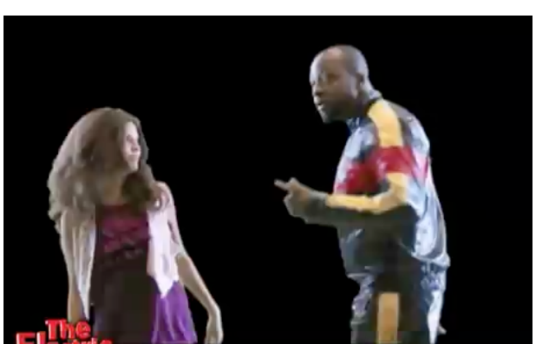
(Electric City music up.)

WYCLEF JEAN: Old School, Old School… Right about now.



NIKKI: Come on! New School, New School

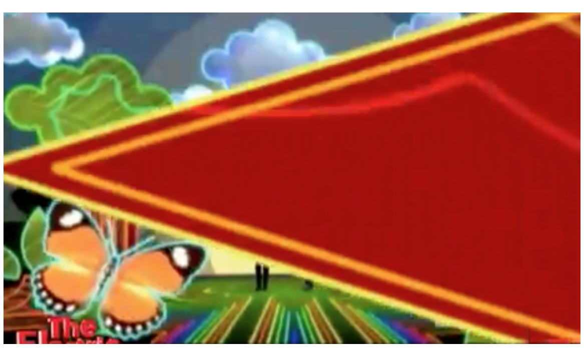
WYCLEF JEAN: You want the Old School and the New School right here on the dance floor
NIKKI: Uh huh, Uh huh



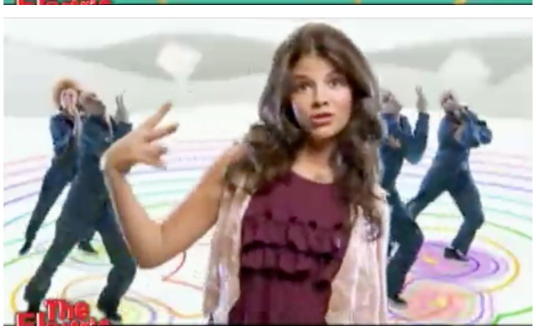
WYCLEF JEAN: This right here is called the slide.

-more-

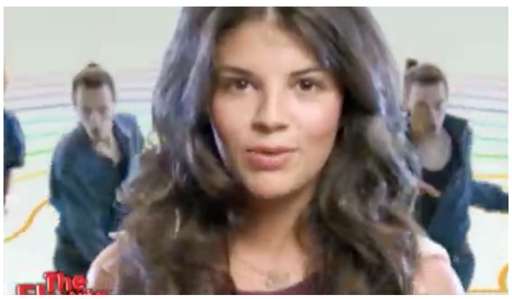
VIDEO	AUDIO
	WYCLEF JEAN: We gotta do it. NIKKI: Welcome to my city y'all.
	WYCLEF JEAN /NIKKI: Slide.
	WYCLEF JEAN: Two steps to the left. WYCLEF JEAN /NIKKI: It's electric.
	WYCLEF JEAN: Two steps to the right. WYCLEF JEAN /NIKKI: She's electric.
	WYCLEF JEAN: Two steps to the front. WYCLEF JEAN/NIKKI: That's electric. -more-

VIDEO	AUDIO
	WYCLEF JEAN/NIKKI: Now slide. Slide.
	WYCLEF JEAN: Two steps to the back. WYCLEF JEAN/NIKKI: You're electric.
	WYCLEF JEAN/NIKKI: Hands up now freeze. NIKKI: In my Electric City, yeah.
	WYCLEF JEAN: Slide.

-more-

VIDEO	AUDIO
	NIKKI: My toe bone’s connected to my foot bone.
	NIKKI: My foot bone’s connected to my ankle bone.
	NIKKI: My ankle bone’s connected to my leg bone.
	NIKKI My leg bone’s connected to my feet feet feet.
	NIKKI: One two feel that beat. Three, Four, Tweet. Tweet. Tweet.

-more-

VIDEO	AUDIO
	NIKKI: Like a mocking mocking bird, I repeat.
	NIKKI: Tweet. Tweet. Tweet.
	NIKKI: It's okay to read now.
	WYCLEF JEAN: Dumbing it down…
	WYCLEF JEAN: ….ain't for me, I wanna know how many planets in the solar system.

-more-

VIDEO	AUDIO
	GROUP: Nine.
	WYCLEF JEAN: I wanna know how many teach are in your mouth. GROUP: Thirty-two
	WYCLEF JEAN: Now what's thirty-two plus nine? GROUP: Forty-one. # # # # #

VIDEO	AUDIO

GROUP: Seven days a week you know
I'm learning and I'm growing.
Seven days a week I'm finding
something new to do.

("Seven Days a Week" music up.)

GROUP: Seven days a week…

GROUP:…I'm having fun you know it's
showing.

GROUP: Seven days a week….

-more-

VIDEO	AUDIO
	GROUP: …I'm having lots of fun with you.
	GROUP: Monday the one day the one day hey!
	GROUP: Tuesday the two day the two day hey!
	GROUP: Wednesday Wednesday Wednesday hey!

-more-

VIDEO AUDIO

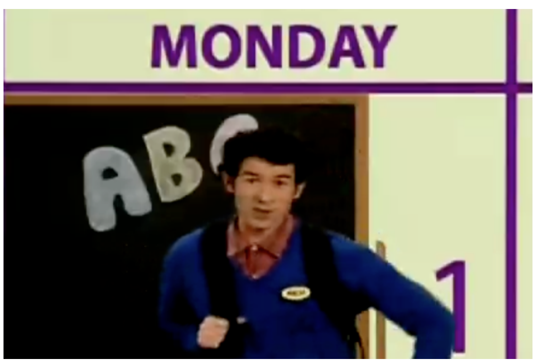
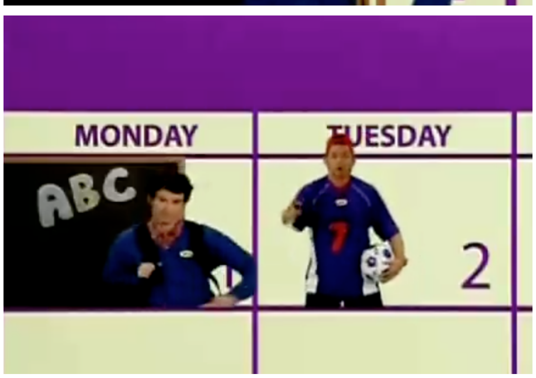
GROUP: Thursday

GROUP: Friday too.

GROUP: Saturday and Sunday
Saturday and Sunday
Saturday and Sunday
Saturday and Sunday

GROUP: Saturday and Sunday

-more-

VIDEO	AUDIO
	GROUP: Saturday and Sunday
	GROUP: Having fun with you.
	RICH: Monday and I go to school, learn my A-B-Cs. GROUP: A-B-C!
	DAVE: Tuesday on the soccer field they're chasing after me.

-more-

VIDEO AUDIO

SCOTT: Wednesday I'm in the kitchen helping mom with dinner.
SMITTY: Thursday and I'm playing a game, but guess what I'm the winner.

RICH: Friday I'm getting out of school.

DAVE: Saturday, I'm going to the pool.

SMITTY: Sunday, I'm playing with my friends.
GROUP: Go to sleep at night and do it over again.

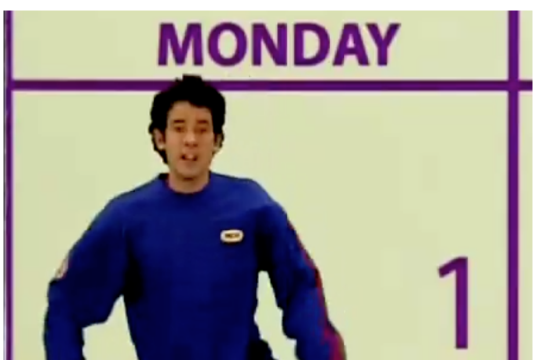
-more-

VIDEO	AUDIO
	
	SMITTY: OH!
	GROUP: Seven days a week…
	GROUP: ….you know I’m learning

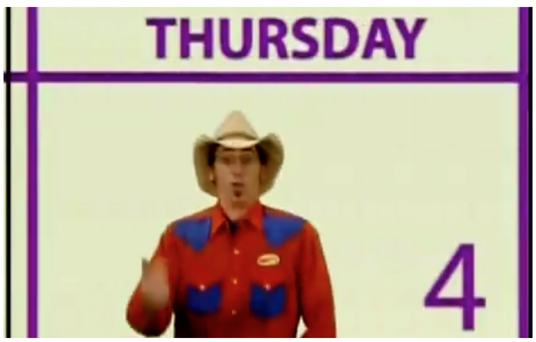
-more-

VIDEO	AUDIO
	GROUP: …and I'm growing.
	GROUP: Seven days a week I'm finding…
	GROUP: …something new to do.
	GROUP: Seven days a week….

-more-

VIDEO	AUDIO
	GROUP: ....I'm having fun you know it's showing.
	GROUP: Seven days a week…
	GROUP: I'm having lots of fun with you.
	GROUP: Monday the one day the one day hey!

-more-

VIDEO	AUDIO
	GROUP: Tuesday the two day the two day hey!
	GROUP Wednesday Wednesday Wednesday hey!
	GROUP: Thursday…
	GROUP: …Friday too.

-more-

VIDEO	AUDIO
	GROUP: Saturday and Sunday Saturday and Sunday Saturday and Sunday Saturday and Sunday Saturday and Sunday Saturday and Sunday
	GROUP: Having fun with you!

# # # # #

Program: Word Girl Producer: CPB
Length: 1:30 Clip Page 1 of 5 "A Vote for Becky"

VIDEO	AUDIO
	MOM: I'm someone who's trying to convince enough people to vote for me so I can win the election. That makes me a candidate.
	NARRATOR: Hey kids! Listen for the words "elect" and "candidate."
	DAD: Let's hear your speech Becky.
	BECKY: Okay, I'm still working on it.
	BECKY: But, um… [clears throat]… -more-

VIDEO | AUDIO

BECKY: Fellow students, my name is Becky Bottsford, and I'm the candidate for class president…

MOM: Woo!
BECKY: [Awkward laughter]…

BECKY: Every student must decide for themselves which candidate they think will do the best job. So if I'm elected, here are some of the changes I would like to make. I would add an art class!

MOM: Woo hoo!

BECKY: Make the food in the cafeteria more tasty!

-more-

VIDEO	AUDIO
	MOM: Oh, that’s been a long time coming.
	BECKY: Get new benches for the playground….
	BECKY: And plant a shade giving tree at the bus stop.
	TOBY: Shade giving tree… [maniacal laughter]
	TOBY: If you elect me, I promise to add an art class…

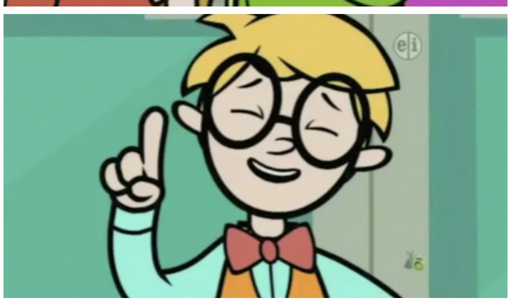
-more-

VIDEO	AUDIO

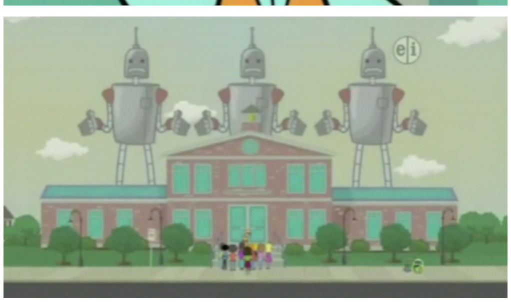
TOBY: …make the food in the cafeteria more tasty…
Becky: What?

TOBY: Get new benches for the playground…
BECKY: Huh?
TOBY: … and plant a shade giving tree at the bus stop.

BECKY: Those are my ideas.



TOBY: I also promise to make my best robots available…



…on election day to count all the votes…

-more-

Length: 1:30 Clip

VIDEO AUDIO

TOBY:…in my favor… he he he he.
GROUP: That's awesome.

TOBY: So vote for me…. And speaking of voting for me, I've just learned that Word Girl is officially supporting me as her favorite candidate.

BECKY: What!?!
GROUP: [Mumbling] … I relate more with robots.

TOBY: What do you think about *that* Becky Botsford?

# # # # #

Program: Can You Teach My Alligator Manners? Producer: Disney
Length: 1:30 Clip Page 1 of 5 "Playground Manners"

VIDEO AUDIO

MIKEY: The playground looks like fun, huh, Al?
AL: Uh huh…Ah… oooh hooo.
MIKEY: go ahead, check it out.

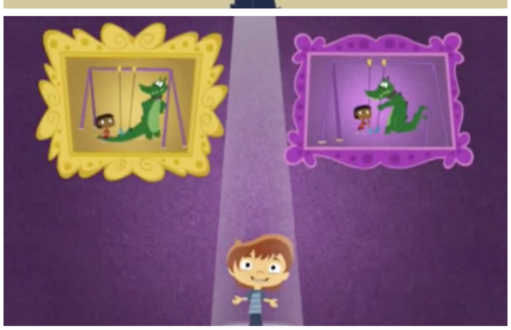
AL: Oooh…. Hee hee hee.

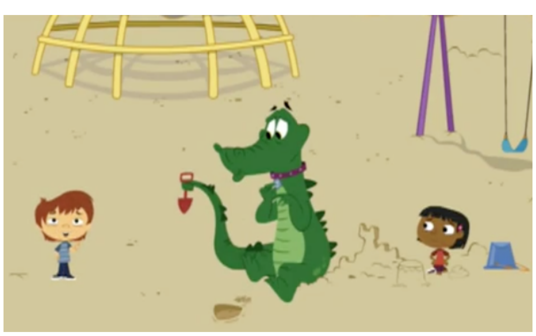
MIKEY: Hey look at me Al!

MIKEY: Al?
GIRL: Hey!
MIKEY: Al!

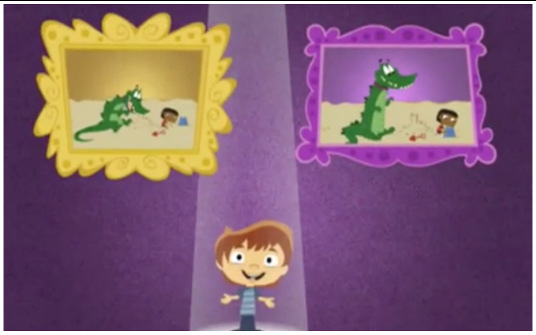
GIRL: Let go! I was here first.

-more-

VIDEO	AUDIO
	GIRL: Huh?
	GIRL: Hey… hump. MIKEY: Aw… Al. You don’t want to be a rude reptile do you?
	MIKEY: I need your help here. Can you teach my alligator manners please?
	MIKEY: Which square shows Al having good manners?
	MIKEY: The yellow one… GIRL: Thanks, Al. -more-

VIDEO	AUDIO
	MIKEY: …Or the purple one…. GIRL: Let go.
	MIKEY: Yeah, that's it. The yellow square is right.
	MIKEY: Taking turns is always the way to be polite. Thanks. GIRL: Higher!
	GIRL: [Humming] AL: hehe…. Ooooh. GIRL: Huh? That's my shovel. I was using it.
	MIKEY: Here we go again. AL: Hmmm? MIKEY: Can you please teach my alligator manners? -more-

Length: 1:30 Clip

VIDEO	AUDIO
	MIKEY: In which square is Al being polite?
	MIKEY: The yellow square… Girl: Huh?
	MIKEY: … or the purple square?
	GIRL: Huh? Oh, here you go.
	MIKEY: The purple square is right. -more-

VIDEO	AUDIO
	MIKEY: If you want to play with someone's toy, ask if you can borrow it first. Today was awesome. You really helped Al become a polite pal. AL: Ha ha! MICKEY: Whoa!

# # # # #

Program: Dora the Explorer | Producer: Nickelodeon
Length: 1:30 Clip Page 1 of 3 | “Super Babies' Dream Adventure”

VIDEO	AUDIO
	SFX: BACKGROUND MUSIC
	
	DORA: Uh oh! The babies super blankies fell off. BOOTS: They can’t fly without their blankies. DORA/BOOTS: Whoa! DORA: We’d better get the blankies, so the super babies can super fly again.
	BOOTS: Diermo’s blankie has a rip.
	DORA: Isabella’s blankie has a rip in it too. -more-

Length: 1:30 Clip

VIDEO	AUDIO
	DORA: And that's their mommy's blanket shop.
	DORA: Hola, Camila. [English: Hello, Camilla.] CAMILA: Hola Dora. [Hello, Dora] DORA: Mira [Look] CAMILA: Yo te ayudo. Mi Mami me enseñó a hacer mantas. [I'll help you. My mama showed me how to sew blankets.]
	DORA: Camila's mommy taught her how to make blankets in Guatemala. She can help us fix the super babies' blankies.
	MOTHER: Hola, ninos. [Hello, kids] DORA/BOOTS: Hola [Hello.] BABIES: Goo Goo.
	DORA: Camila is going to fix the super babies' blankies with her mommies loom. CAMILA: Me puedes ayudar escoger los colores? [Can you help me choose the colors?] DORA: Let's choose what colors to use to fix the blankets. Look!

-more-

“Super Babies' Dream Adventure”

Length: 1:30 Clip

VIDEO	AUDIO
	DORA: The diamonds on Isabella’s blankie follow a pattern. The pattern is rojo [Red], azul [Blue], rojo, azul, rojo… what comes’s next? Azul! Right!
	CAMILA: Azul! [Blue!]
	DORA: Great!
	DORA: Yeah! You helped fix the superbabies’ blankie.
	BABIES: [babbling] DORA: Gracias Camila. [Thanks, Camila!] # # # # #

Program: Teletubbies Producer: BBC/Ragdoll Limited
Length: 1:24 Clip Page 1 of 3 "Playing in the Rain"

VIDEO	AUDIO

SFX: RAIN AND LIGHT MUSIC

SFX: BABY LAUGHING

PO: Fitchy Fitchy Fitchy.
Fitchy Fitchy Fitchy ball.
[Giggling]

-more-

VIDEO	AUDIO
	SFX: SPLASHING OF WATER
	PO: Uh Oh.
	
	
	

VIDEO	AUDIO
	
	
	PO: Helle?
	# # # # #

Appendix J

IRB Approval

IRB Approval

10-OR-069

PM4:22FEB15'10RCVD

IRB Project # :
UNIVERSITY OF ALABAMA
INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN SUBJECTS
REQUEST FOR APPROVAL OF RESEARCH INVOLVING HUMAN SUBJECTS

I. Identifying information

	Principal Investigator	Second Investigator
Name:	Cynthia Nichols	Dr. Jennings Bryant
Department:	Graduate Studies	TCF
College:	College of Communication & Information Science	College of Communication & Information Science
University:	The University of Alabama	The University of Alabama
Address:	Box 870172 Reese Phifer Hall	Box 870172 Reese Phifer Hall
Telephone:	205-454-3500	348-8593
FAX:	348-5162 (fax)	348-5162 (fax)
E-mail:	Nicho026@crimson.ua.edu	jbryant@ua.edu

Title of Research Project: "How Fast Can They Learn? Developmental Differences in Information Acquisition of Educational and Narrative Content Through Pacing and Distance."

Date Printed: Funding Source: NONE

Type of Proposal: _X_ New ___Revision ___Renewal ___Completed ___Exempt

Attach a renewal application

Attach a continuing review of studies form

Please enter the original IRB # at the top of the page

UA faculty or staff member signature: Dr. Jennings Bryant, PhI

II. NOTIFICATION OF IRB ACTION (to be completed by IRB)

Type of Review: ______ Full board __✓__ Expedited

IRB Action

___Rejected Date:__________

___Tabled Pending Revisions Date:__________

___Approved Pending Revisions Date:__________

_✓_Approved—this proposal complies with University and federal regulations for the protection of human subjects

Approval is effective until the following date: 3-10-11 (initials)

Items approved:
___ Research protocol: dated
___ Informed consent: dated
___ Recruitment materials: dated
Other: dated

Approval signature ___Date 3/10/2010