ENHANCING VOCABULARY ACQUISITION THROUGH SYNTHETIC LEARNING EXPERIENCES: IMPLEMENTING VIRTUAL FIELD TRIPS INTO CLASSROOMS

by

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ABSTRACT

A Synthetic Learning Environment (SLE) the Virtual Field Trip (VFT) was designed to increase vocabulary acquisition and knowledge by utilizing simulation based technologies and leveraging sound educational findings. Vocabulary acquisition is considered a prerequisite to becoming a good reader and therefore a critical predictor of academic and lifelong success for early learners, however, teachers report that students lack the real world knowledge required for vocabulary knowledge. The VFT provides a meaningful context for anchored and situated instruction. Second grade students were assigned to either use the VFT or to listen to stories read aloud by a researcher on a video tape. While results did not indicate significant vocabulary acquisition on a series of 3 vocabulary tests; students who used the VFT did use significantly more words in a post exposure writing sample than students in the story group indicating an increase of words known at a level of depth sufficient to warrant their use in a writing sample. Students who used the VFT also reported increased motivation to use SLEs like the VFT for future learning objectives and that VFTs were fun. Findings related to the self-efficacy of students as measures immediately following each vocabulary test did not reveal a significant increase for VFT users. Students using the VFTs did not report learning more words than those students assigned to the story group. Limitations of the current study and directions for future research are discussed.
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<td>ANOVA</td>
<td>Analysis of Variance</td>
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<td>COTS</td>
<td>Commercial off the Shelf</td>
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CHAPTER ONE: INTRODUCTION

The acquisition of vocabulary at an early age has been show to be a critical predictor of later success (Becker, 1977; Joshi, 2005; Neuman, 2006 & 2005). Vocabulary size has been linked to academic achievement (Baumann & Kameenui, 1991); as a predictor of overall reading comprehension (Yovanoff, Duesbery, Alonzo & Tindal, 2005); and is said to affect the ability to think at a deeper cognitive level, the ability to express ideas clearly, and the ability to learn new ideas more quickly (Neuman, 2006). The inability to read has many detrimental effects to the progress of students, including low self-esteem, lack of attendance, and disciplinary problems (Hasslebring, Goin, Taylor, Bottge, & Daley, 1997). The problem appears to be large scale, with as many of 36% of fourth graders reading below age appropriate levels and more prevalent in minority cultures such as Black, Hispanic, and Native American (Perie, Grigg & Donahue (2005).

While some children learn vocabulary well through the use of incidental learning often accomplished by reading age appropriate stories (Rupley & Nichols, 2005), several other factors seem to contribute to the lack of vocabulary. Prior knowledge seems to emerge as a relevant factor in some research (Griswold, Gelzheiser, & Shepherd, 1987; Hasselbring et al., 1997; Kintsch, 1994). Lack of prior knowledge can be linked to a lack of activity outside of school and in some cases low SES (Chall & Snow, 1982). Students of low socioeconomic status (SES) for example, seem to fall behind in their vocabulary knowledge (Graves, 1986), often early in elementary education (White, Graves & Slater, 1990).
Problem Statement

In initial attempts to define the problems associated with vocabulary acquisition, researchers interviewed representatives from a local school district. Those representatives expressed concern that some students lacked the real world experiences (and hence, vocabulary) necessary to understand the content of grade-level reading material, often resulting in failing scores on state-wide standardized tests of reading comprehension. One example of this type of failure is how is a life-long Floridian child to understand dog sledding in Alaska? Unfortunately, some school systems currently lack the financial resources to take their students on the field trips that would allow them to build this basic knowledge. Moreover, as in the case of Alaskan sledding dogs, children in many areas would never have the chance to be exposed to such an environment. Yet without this essential knowledge base, many of these children will struggle to understand reading material, continue to perform poorly on measures of reading comprehension, and remain at-risk.

Purpose of Study

The use of simulation technology in classroom could provide students with artificial experiences that closely resemble the real world. By providing students with synthetic experiences in which to encounter vocabulary words within their appropriate context; it may be possible to increase their ability to learn vocabulary and to learn it in a deep and meaningful way. Technologies like SLEs use multimedia and simulation technology to bring the world into the classroom via Virtual Field Trips (VFTs). Founded on the principles of experiential learning and anchored instruction, VFTs utilize state-of-the art technologies to create an immersive, multi-
sensory, interactive experience with real world environments and with targeted vocabulary. They are designed to be an integral part of a technology-enabled educational system that can supplant prior contextual knowledge, when necessary to learners.

While several technology and multimedia based solutions directed towards increasing vocabulary have been implemented in classrooms few have been vigorously researched (Hasselbring, 1991). These technologies are varied in form from media based stories to games designed to target vocabulary words. Given the importance of vocabulary knowledge in other developmental processes such as reading ability and comprehension, and the need for identifying and testing tools prior to the development of reading problems that have the potential to increase and/or facilitate vocabulary acquisition; this proposal seeks to evaluate the utility of Synthetic Learning Experiences (SLEs) in early vocabulary acquisition and retention.

Research Questions

This research asserts that learning tools such as VFTs will motivate students and provide a productive tool for learning. This research seeks to determine the effectiveness of SLEs: in vocabulary acquisition, self-efficacy, motivation, and depth and breadth of vocabulary knowledge. Will VFT significantly increase performance on a vocabulary test, and also in a writing sample will be explored. Will students report higher levels of self-efficacy when they have used the VFT and will be more motivated to learn will also be investigated.
Definition of Terms

**Anchored Instruction**: Instruction that provides a contextual basis, or anchor, in order to increase the ability of students to process and assimilate new learning material.

**Breadth of Vocabulary**: The number of words a learner has knowledge of (Qian, 1999)

**Constructivism**: An educational philosophy which holds that learners ultimately construct their own knowledge that then resides within them, so that each person’s knowledge is as unique as they are (Asynchronous Learning Networks, 1997).

**Depth of Vocabulary Knowledge**: A measure of a learner’s knowledge of a given word (Qian, 1999)

**Episodic Memory**: A recollection of events including time, place, and associated emotions (Wikipedia).

**Experiential Learning**: Using experiences to facilitate learning or through the use of real world situations, role plays, or synthetic learning environments such as simulations and games.

**Generational Poverty**: Being in poverty for two or more generations (Payne, 1996).

**Goal Orientation**: A construct that seeks to explain behavior by relating purposeful actions to the satisfaction of a goal.

**Hot Spot**: An interactive target within a virtual reality environment which can be used to provide additional information or further interactivity.

**Mental Model**: An internal representation of a person’s comprehension of how concepts and objects in the real world exist (Wikipedia).

**Motivation**: The initiation, intensity and persistence of behavior (Geen, 1995 in Wikipedia).

**Node**: A virtual reality environment that represents a single place.
Schemata: An individual’s framework of knowledge (Bartlett, 1958).

Self-efficacy: A rating of an individual’s ability to produce a desired action (Bandura, 1997)

Semantic Memory: Memories of meanings, understandings and other factual knowledge (Wikipedia).

Situated Learning: Learning content as a function of the activity, context, and culture in which it most often occurs (in Kearsly, 2002)

Synthetic Learning Environments: Systems that attempt to create, augment, extend, or supplant a trainee’s actual experience in the world through the use of simulations and virtual/immersive environments (Cannon-Bowers, Sanchez, Sawyer & Greenwood-Ericksen, 2006)

Virtual Field Trips: Synthetic learning experiences utilizing virtual reality to provide experiential learning.
CHAPTER TWO: LITERATURE REVIEW

In order to establish the effectiveness of any specific tool for teaching, an understanding of how humans learn must first be achieved. The importance of the learning objective, in this case vocabulary knowledge and its acquisition, must also be clarified. A review of current tools being used to address vocabulary acquisition will next be reviewed. Finally, an understanding of Synthetic Learning Environments and the components that make them relevant as tools will be outlined. A review of critical research in each of the areas to be considered in this proposal was completed. Specific areas of interest include: cognition; vocabulary acquisition; multimedia and technology approaches to vocabulary instruction; and SLEs and their characteristics.

Cognitive Theory: A Brief Review

Cognitive processes are defined by Bandura (1994) as thinking processes that acquire, organize, and use information. Cognitive processes can involve the way a person views the world around them or the way they view themselves as part of it. Cognition in the broadest sense involves the act of knowing and how that information is applied. Two theories, cognitive learning theory and social cognitive theory and how they relate to knowledge acquisition will be described here.

Cognitive Learning Theory

Cognitive learning theories focus on how humans acquire, process, store, and retrieve knowledge; and how the environment affects their learning. With origins in philosophy
stemming from Plato and Descartes: cognitive psychology has evolved through the decades into strategies used today that incorporate the new environment we live in. In 1986, Bell-Gredler reviewed cognitive theories and synthesized their findings. Beginning with Gestalt, cognition was defined as the human process of organizing stimuli that gave it meaning. Gestalt theorized that when stimuli were introduced to humans, they would organize those stimuli cognitively and that stimuli could only be utilized when the purpose of the stimuli was understood. He argued that how an individual initially perceives an object could determine their application of that object. This gave way to the idea of frameworks within human cognition and the relationships between them.

According to Bell-Gredler, Frederic C. Bartlett developed the idea of schemata in the 1930’s. Schemata are the frameworks in which new stimuli or information can be stored. Bartlett’s (1958) research indicated that gaps in schemata were filled in using expectations until confirmation could be reached through the acquisition of new stimuli. This was evidenced in an experiment conducted in which successive patterns were shown to individuals who were able to predict the final display without seeing it.

The storage framework, schemata, served as structures in which new information could be assimilated and processed. New information or stimuli were encoded during the assimilation process into existing schemata. Understanding came from the ability to make relationships with new information and evolving schemata. Baron & Byrne (1977) offered further insight on the process of assimilating new information by theorizing that the encoding process involved changing the new information in order to fit it into an individual’s existing schemata, changing or distorting it based on that individual’s perceptions, interests, and motivations.
The cognitive constructivist work of Bruner (1966) provided a unifying understanding of human cognition as an active process. This active process incorporated new information into existing knowledge. When learning activities were relevant and engaging, students could construct their own understanding of the information based on their prior knowledge; therefore each individual would understand things slightly differently. His approach to education was to allow students to make connections between new information and their existing knowledge themselves, continually adding to the existing knowledge structures. Key to constructivism were three components of effective learning: anchored or situated learning; cognitive apprenticeships, and social negotiation of knowledge (Asynchronous Learning, 1997).

Craik & Lockhart (1972) developed a framework involving levels of processing that was intended to explain how information was stored. Within this framework, stimuli were processed simultaneously within multiple stages including sensory, working, and long-term memory. Attention and existing knowledge provided the basis for the depth of processing. Stimuli that received attention or were identified as related to previous knowledge would be processed more deeply and therefore more durable as memories.

Several facets of memory and information storage were filtered into 3 key known components to memory: short-term memory (STM), working memory (WM), and long-term memory (LTM). Incoming stimuli were first held in a buffer that had unlimited capacity prior to assimilation. This buffer would hold information, but dispose of it quickly if an individual’s attention on the information did not transfer it into STM. Short term memory could hold approximated seven pieces of information at a time for a short period of time, approximately 15-30 seconds. This information was active and readily accessible and usually included sensory
input information and items retrieved from LTM (Miller, 1956). Information needed for a specific purpose would be transferred from the buffer into WM, where it could be held temporarily and manipulated (Baddeley, 1986; 2000). Long term memory held an unlimited storage capacity and information could be held there indefinitely. Information held in LTM was organized in a meaningful way (i.e., frameworks and schemata) and was available for recall based on need (Bower, 1975).

In Bell-Gredler’s 1986 review of cognitive theory, two types of LTM were discussed: semantic and episodic. Semantic memory was information from the environment that was received directly while episodic knowledge was based on an individual’s experiences. These two types of memory could be readily decoded and made available for further processing, or could be modified and expanded by encoding of new information.

Based on these findings, Bell-Gredler also discussed two theorists who made further classifications on how knowledge was prioritized and encoded. Edward Tolman put forth the idea of purposive behaviorism in which learning specific information was related to the need of that information in meeting a goal. This indicated that behavior and learning were goal oriented and involved the fulfillment of an individual’s expectations in order to remain in their schemata. Kurt Lewin theorized that motivation played a large role in learning, suggesting that an individual’s motivation to learn would predict their learning, or in essence, people only learn what and when they want to.
Social Cognitive Theory

Social Cognitive Theory considers an individual to be constantly affected by influences from behavioral, cognitive, and environmental forces. When applied to a learning context, Social Cognitive Theory suggests influences regarding, for example, an individual’s performance, their learning, and the strategy of teaching might influence an individual’s experience. It is generally believed that individual behavior can be predicted by past experiences regarding success and failure at a given task. People who have had a positive experience with something are more likely to do it again, while people who have had negative experiences are less likely to do something again (Bandura, 1997). On a more basic level, a person’s expectations regarding an outcome might affect their willingness to invest effort into a task. These expectations might be based on a person’s beliefs regarding their own ability to be successful at this task, also known as self-efficacy.

Self-Efficacy

Bandura (1999) theorized that self-efficacy was a belief system internalized by all humans that served as a central foundation for motivation. Self-efficacy is considered to play a large role in an individual’s decision making process regarding whether or not they will undertake a challenge. Self-efficacy is also considered to influence an individual’s rationalization regarding their own success or failure. Those with high self-efficacy who do not successfully complete a task are more likely to consider their failure to be attributable to insufficient effort and not their inability to complete that task. Those with lower self-efficacy might attribute failures to their own low ability, which could reduce their motivation to succeed at a task. Self-efficacy has been shown to be a highly effective predictor of a student’s motivation.
Within the learning realm, self-efficacy can have a large impact on a student’s ability to succeed academically. It is believed that the foundations for academic preferences are made prior to a student entering middle school. These preferences are partially related to individual self-efficacy beliefs regarding abilities in multiple academic content areas. Fennema and Sherman’s (1978) findings suggested that elementary school students generally believed they were able to succeed in verbal and mathematical tasks. As these students progressed, however, differences between gender and mathematics efficacy began to emerge with male students self-reporting higher on math related subject even though there were no performance related differences. A later study indicated that student’s perceptions regarding their ability to succeed at mathematics and gender stereotyping were able to predict performance in mathematics significantly (Sherman & Fennema, 1978).

Accordingly, self-efficacy was also later measured with respect to its ability to impact performance. A study by Parajes & Miller (1994) found self-efficacy to be a significant predictor of mathematics performance. While mathematics performance has a strong relationship with self-efficacy, it has also been considered as a predictor of writing (Faigley, Cherry, Jolliffe, & Skinner, 1985 in Pajaras, Miller, & Johnson, 1999), especially when considered in relation to gender (Pajares, Miller, & Johnson, 1999).

While Zimmerman (2000) dictated that self-efficacy should measure only a person’s beliefs regarding their ability to perform on future events in order to more accurately estimate the impact of self-efficacy on motivation, the use of a self-efficacy measurement immediately following a performance could also provide insight into the role of self-efficacy in learning.
A need for research regarding measurement of performance based self-efficacy and measurement of children in lower grade levels (Pajares, Miller & Johnson, 1999) was established. Previous research has not been sufficient to draw conclusions regarding self-efficacy in the core academic constructs at lower grade levels; especially as directly related to performance.

**Motivation**

Motivation or the driving factor behind a behavior is often separated into two subsections: intrinsic or extrinsic. Intrinsic motivation is defined as the desire to engage in a behavior for no other reason than enjoyment, while extrinsic motivation has been defined as the desire to engage in a behavior due to an external force, such as a reward or penalty (Berlyne, 1960; White, 1959). Social Cognitive Theory considers motivation to be a product of self-efficacy and as such a measure of the effort that is exerted on a task such as learning (Zimmerman, 2000). For example, a student with a high low self-efficacy might have lower extrinsic motivation for pleasing the teacher and lower intrinsic motivation because they view their chances of succeeding as low.

In learning tasks, these two motivations are not two opposing forces as was originally proposed by Harter (1981). While researching motivation to read, Harter used the two scales to determine explicitly if their motivation was due to intrinsic motivational factors such as enjoyment or extrinsic motivational factors like pleasing the teacher. Later, researchers Lepper, Corpus, & Iyengar (2005) found that these two types of motivation could exist simultaneously and increase learning motivation, for example if a student enjoyed reading and pleasing a
teacher. They also extended the use of this scale to diverse populations and varying age groups to address issues of generalizability of their metric.

Motivation becomes increasingly important when retention and depth of learning are considered. Hatano & Inagaki (1987, in Brown 1988) in a recipe for making sashimi uncovered levels of mastery ranging from the ability to follow the recipe, or low level mastery to the ability to understand the relationships between the steps and to understand why the recipe worked, or high level mastery. They believed that interactive learning in the question answer format would increase depth of processing as they believed the ability to ask questions would lead to increased comprehension. According to theories of memory, deep meaningful learning that can be applied and transferred requires effort and this effort could be a result of motivation.

In summary, cognitive theories articulate how information is stored and how understanding of information develops through relationships with existing information. The motivation for storing and/or understanding information is also an important construct for teaching strategies. This viewpoint provides valuable insight into instructional design and the process of teaching.

Vocabulary Acquisition

Research findings have all reached similar conclusions regarding the importance of vocabulary acquisition; that it is a critical component reading comprehension. Neuman (2005) theorized that vocabulary development was an integral part of school readiness, a reference to the motivational behaviors and the common knowledge and experiences that are necessary for
children to enter into school meaningfully. Students who exhibited school readiness were more likely to be successful in school and to have more productive and happy lives.

Neuman (2006) later concluded that vocabulary knowledge was related to the ability for a child to progress through their education with minimal difficulty. Specifically, findings indicated that vocabulary size was related to the ability to perform deeper cognitive processing, the ability to express oneself more clearly, and to learn things more quickly. She also suggested that vocabulary size could be equated to word power, which built upon itself to create more knowledge. Conclusions included that world knowledge and communicative language critical factors relating to reading comprehension.

Joshi (2005) cites a close relationship between vocabulary and reading comprehension to be an effect known as the Matthew Effect. The Matthew Effect (first described in Coleman et al., 1966), when applied to vocabulary and reading comprehension, suggests that students with smaller vocabularies read less and learn fewer words while students with larger vocabularies read more and learn more words. Findings suggest that falling behind in vocabulary acquisition could snowball as a student progressed through their education, falling further and further behind.

Converse results were uncovered by Aarnoutse & van Leeuwe in 2000, in their longitudinal study into poor and good readers and the learning curves associated with reading ability; including word recognition, reading comprehension, vocabulary and spelling followed similar patterns of growth. This finding suggests that the Matthew Effect, or the notion that the gap in knowledge grew consistently for students with poor vocabularies was not the case.
Learning curves between poor and good readers were found to increase through education at similar rates.

One possibility for the conflicting results could be theorized in differences in the strategies used to learn the words. Individual differences of strategy could explain the difference in vocabulary acquisition. Griswold et al. (1987) tested a group of students that included disabled and non-disabled 8th graders in using sentence completion in order to determine if their strategies differed when given a list of words to study. Their findings showed that neither group used differing strategies in studying the words and that there was no variation in the amount of time taken to study the list of words. These researchers proposed that the outcomes of their study indicated that prior knowledge was a larger predictor of the ability to acquire vocabulary than their strategies.

More importantly, research by Kintsch (1994) uncovered a relationship with prior knowledge and text-based learning. Specifically, in order for text to be comprehended and processed; an existing structure or related knowledge needed to be present in which to assimilate learning content into. This provides insight on learning new materials when no existing structure or knowledge or faulty ones may be present and the inability for learners who lack context knowledge to learn.

Feuverstein (1980) found that students who had no previous story knowledge were unable to achieve in language. He suggested that students whose cognitive strategies were deficient in prior knowledge and language would be unable to fully comprehend new information, as much as 50% of text on a page could be missed due to lack of comprehension. He proposed that mediation could serve to provide students with language difficulties with
guidance on what important stimuli were, meaning (or context) to the stimulus and strategies for incorporating the stimulus into new and previous knowledge structures.

Chall & Snow (1982) found, as part of an 18 month longitudinal study of fourth and fifth graders, that vocabulary was influenced by home activities. Vocabulary was also found to be related to the amount of time a child spent with his/her parents as opposed to time spent in non parent related activities such as television or time spent with other children. This implies that enriching activities away from school play an important part in an individual’s ability to learn vocabulary.

Research completed by Stahl and Fairbanks (1986) concluded that providing students with definitions was not sufficient to enhance vocabulary learning, instead the words needed to be learned with a meaningful context. They recommended that new words be introduced in the context of stories or sentences.

Additional support comes from a research program aimed at improving context related reading comprehension. Five Midwestern schools were targeted for analysis with test results and informal statements related to the low reading comprehension of students in multiple grade levels. Durley, Emlen, Knox, Meeker, & Rhea (2001) related these deficiencies in reading comprehension to be attributable, in part, to lack of vocabulary. As such, vocabulary acquisition was targeted for intervention and results indicated that reading comprehension increased, anecdotally, with vocabulary knowledge.

With the importance of vocabulary acquisition to reading comprehension established, researchers sought to uncover the sustainability of the vocabulary importance. Yovanoff et al. (2005) found, that grade level was irrelevant to the importance of vocabulary knowledge. Their
research suggests that vocabulary knowledge was a predictor of reading comprehension overall. They considered oral fluency as a construct within a model in which together with vocabulary, it would predict reading comprehension; but found vocabulary knowledge to be the constant predictor. Their findings suggested that once a minimal level of reading fluency was reached, vocabulary emerged as the more important component within the model. These findings provide support for the concept of education beginning with learning to read, then transitioning to reading to learn, exemplifying the paramount importance of the ability to acquire vocabulary.

Acquisition of vocabulary impacts reading in several ways. It is not enough to recognize and be able to identify a word, the words meaning must be understood in order to make that word a tool. Notably, Stahl (1983) categorized word knowledge into three levels: association, comprehension, and generation. These three levels describe the depth of processing of vocabulary words. Word knowledge need not pass through these levels as if they were stages, but each represents an increasing depth of knowledge regarding the word. Association knowledge is characterized by the ability to hold a single definition for a word or to understand it in a single context. Comprehension involves a more generalized understanding of the word characterized by the ability to categorize a word, understand its use in a sentence and understands similar and dissimilar words and their relationships. Finally, generation is the ability to use the word without cues by creating sentences with the word and appropriately defining the word without clues.

Beck & McKeown (1991) also concluded that vocabulary knowledge included levels related to the ability to store, use, and recall the word and that vocabulary development goaled instruction could create greater understanding of words if strategies related to the depth of word
knowledge were employed. Specifically, the levels of understanding could help determine the learning strategies to be employed.

Vocabulary acquisition and the lack of vocabulary acquisition has been the topic of much speculation. In two landmark studies complete by Graves in 1986 and White et al. in 1990, when large disparities between vocabulary sizes were found for comparisons of low to middle income student and low and middle socioeconomic status (SES) schools. These findings indicated that SES was an important predictor of vocabulary size with differences in words ranging from 900 to 1300 more words known by middle SES students.

Baker, Kameenui, Simmons & Stahl (1994) also argued that SES status impacted vocabulary. They postulated that poverty was related to literacy, and academic achievement and their related outcomes. They also theorized that the relationship was not a direct one, or that poverty did not cause illiteracy, but that poverty created a non causal effective with literacy because of the factors that surround poverty.

The concept of generational poverty may provide insight into the phenomena of reduced vocabulary acquisition in low SES students by proposing the existence of hidden rules within socioeconomic classes that place a low emphasis on the value of education (Payne, 1996). These students were found to have necessitated more time spent on survival with lower emphasis placed on education and language acquisition (Feuerstein, 1980). This could result in the use of casual registers (Joos, 1967 in Payne, 1996). Casual registers demonstrate lack of vocabulary knowledge and are characterized by broken sentences and non-verbal assists.

Rupley & Nichols (2005) distinguished between the impacts of vocabulary teaching strategies and their potential effects on reading skills. Teaching vocabulary explicitly, a strategy
in which vocabulary is targeted for learning and incidental learning of vocabulary, a process by which vocabulary is learned during reading or other activities were highlighted for their combined benefits and were recommended as strategies that should be combined for use in the classroom. Incidental learning could involve reading without a lexical supplement or without specific focus on vocabulary words or scaffolding. There may, however, be ways to combine incidental learning with exploration based learning.

Research completed by Stahl and Fairbanks (1986) concluded that providing students with definitions was not sufficient to enhance vocabulary learning, instead the words needed to be learned with a meaningful context. They recommended that new words be introduced in the context of stories or sentences. Later findings by Nash & Snowling (20066) supported the finding that context learning methodologies created deeper learning experiences for children with both normal and poor vocabulary knowledge.

Motivation could be an important factor in an individual’s acquisition of vocabulary. Ediger (2001) found that extrinsic motivation, testing in particular, could be a large force in motivation to read. Individuals learning plans aimed at increasing intrinsic motivation and teacher based extrinsic motivation were identified as the best combination in motivating children to read.

Sweet & Gurthrie’s (1996) introspect on motivation to read related intrinsic motivation to long-term literacy. They speculated that intrinsic motivation demonstrated that enhanced long term learning commitments such as spending time searching for books, reading, and learning while extrinsically motivated students had short term behaviors that controlled behavior for reasons such as competition. Extrinsic behaviors were linked to work-avoidance and minimized
the importance of positive behaviors. Cameron & Pierce (1994) additionally found that when extrinsic rewards were attached to learning objectives, intrinsic motivations decreased in their meta-analysis of 150 related studies.

Goal oriented learning as a facet of vocabulary acquisition could also do much to clarify vocabulary acquisition. Learning words for the purpose of passing a test or gaining favor from the teacher, or performance goal orientation could result in less depth of processing. Learning words for goal orientation could provide a deeper understanding of the word and the ability to demonstrate this depth of process by transferring vocabulary into writing.

Multimedia and Technology Supporting Vocabulary Acquisition

Methodologies for teaching vocabulary usually involve drills of practicing the word, but do not provide contextual information about the word or applications of the word that allow for semantic knowledge building. The ability for students to acquire words depends on a number of factors; described above, but tools for vocabulary building do exist and are making progress. With an increasing number of computers in the classroom and of games and simulations geared towards educational enhancement, a selection of vocabulary building technologies and multimedia approaches will be discussed here with an emphasis on the characteristics of each tool that lend to their success.

The use of multimedia in the classroom has resulted in mixed findings. While the choice of the media has been shown to have little pedagogical impact, the ability to alter delivery via those media can have a significant impact on learning (Clark, 1983). Richard Mayer, a prominent figure in multimedia for learning research summarized findings from a decade of research to
include four prominent effects related to media and learning (2003). The first effect, a multimedia effect results from several studies that indicated that the combination of words and illustrations promoted deeper learning, or learning that could transfer to problem solving, than words alone. The second effect, the coherence effect suggests that deeper learning could be achieved when only necessary information was included and all “extraneous material” (p. 132) was removed. The third effect, the contiguity effect suggested that deeper learning could occur when words and pictures were in close proximity to each other. The fourth and final effect was the personalization effect which suggested that deeper learning could be promoted when text and spoken words were informal rather than formal.

Richard Mayer (1997, 2002, 2003a, 2003b) has contributed extensive research to the investigation of how and why medium, mode, and modality of instruction can impact learning. His findings have suggested various guidelines for the implementation of instruction based on the chosen delivery medium (i.e., computer vs. textbook); on the mode of instruction (i.e., text vs. illustrations); and on the modality of the instruction (i.e., printed text vs. spoken text). His findings have even been specific enough to indicate where on the screen text should be placed (2003b). His results generally indicate a positive effect on learning.

Mixed results have been generated on the use of games and simulations in the classroom. A study by Randel, Morris, Wetzel & Whitehill (1992) examined 68 studies that used games and simulations in the classroom to enhance learning. Finding indicated that of the 68 studies in which games and simulations were considered, 22 of them enhanced student performance. Twelve of the studies also indicated that students were more interested in games and simulations than traditional classroom instruction. Thirty-eight of the studies had no impact on student
performance, however, making the implementation of games and simulations into classrooms a risky notion. Ricci, Salas & Cannon-Bowers (1996) supported these findings by explaining that although games could stimulate more interest than traditional classroom based instruction, they might not provide any additional value to the education.

Ediger (2003) recognized the need for multimedia to provide valuable context based experiences designed to enrich learning experiences. Her principles of learning in multimedia called for increases in motivation in students by making multimedia interesting, stimulating, balanced within a curriculum, and capable of attending to individual differences in learning needs. A need for evaluation of student achievements made with the use of multimedia and the documentation of successes and failures were also part of the principles put forth. A need for quality of the multimedia product and validation of the tools was identified.

A theory for Media Richness, formed by Heeren, Verwijs & Moonen (1998), advised selection criteria and/or media development for educational purposes by providing guidelines regarding the potential fit of the media. Two approaches; rational-choice approaches and social-influence approaches were defined and operationalized for use by media designers and teachers. Three guidelines regarding the selection and/or development of media were provided in which both approaches were combined with rational-choice/social influences approaches and bottom-up/top-down approaches. Conclusions found no unified approach to decisions regarding media selection as each learning objective would necessitate customized approaches. Instead, the theory can be defined best as Gilman & Turner (2001) stated: “Proponents of media richness theory suggest that media choice is a rational process resulting from a match between the characteristics of the medium and the content requirements of a message”. This suggests that outcomes and the
appropriate technologies must be considered for appropriateness relative to learning strategies prior to implementation or investment in any multimedia educational tools.

Technology, when used appropriately however, can be an interesting and stimulating medium and a powerful stimulator of motivation to participate in behaviors that facilitate learning. Tobin, 1999, found that students wanted to use technology in the course of science education, but that there was a lack of availability of them. When computers and technology were implemented into the classrooms, student motivation increased.

Several other multimedia technology based tools targeted at increasing reading comprehension through vocabulary acquisition exist; but seem to have no empirical data available or locatable regarding their effectiveness. These include ReadAbout and Riverdeep field trips.

Other researchers have also begun to consider the relative impact that the use of technology has on students. Johnson (2005) recently discovered that while students did not want to replace teachers with technology, the motivational potential of the use of technology in the classroom was a necessary evolution. Building upon the theories of other researchers that a new generation existed, a “Net Generation” in which students viewed technology as “embedded in society”; Johnson shared in the argument that the educational system has to change in order to reflect this change.

Kenny & Gunter (2004) capitalized on the advent of multimedia use and technology when launching a technology based program geared at stimulating interest in reading and literature for a population of “media-centric” youth. Their contention was that the rapid fire media that today’s youth have become increasing adapted to has necessitated a change in
traditional teaching methodologies. Digital Booktalk, a web portal, provided movie style trailers for books and a database that enabled users to match their interests in reading with grade appropriate reading suggestions. They additionally identified the ability for students to become involved with deeper levels of processing by facilitating the creation of movie style book trailers by K-12 students. This type of high impact media use serves as an example of the potential of media technology in the classroom.

The ability for students to become immersed within a multimedia software tool was the focus of a study by Shaver & Wise (1990). Their research utilized a computer based program, Writing to Read (IBM) designed for kindergarten and first grade students. The software was designed to enhance reading and writing skills by using multimedia for vocabulary based sounds, words, and sentences. Findings demonstrated increases on word recognition and vocabulary acquisition as well as increases in concentration and self-confidence.

In 2001, Julie Wood completed a comprehensive content analysis of commercial off the shelf (COTS) software packages directly and indirectly marketed to increase vocabulary in 3-5 graders. Her findings indicated that software directly marketed for increases in vocabulary presented words in a general format; the indirectly marketed COTS software used specific subject vocabulary, often involved in a theme. Additionally, while direct marketed COTS software utilized teaching practices often associated with practices used for print based products such as matching vocabulary, puzzles and rote memorization; indirect software packages utilized an “incidental teaching model”. She related indirect software packages and the “incidental teaching model” (in Chall & Snow, 1982) to be parsimonious with deeper processing of vocabulary. This type of learning occurred through the use of rich environments designed to
trigger semantic relationships between vocabulary words and their contextual bases, often based on prior knowledge. Chall & Snow proposed that rich learning environments could provide deeper processing. Table 1. details findings of mechanisms within multimedia COTS software packages designed to increase vocabulary deemed to be important to learning. When considered together, many of the components identified by Woods are important components in SLEs, which are described in depth below.
Table 1  
Wood’s Identification of Media Based Teaching Strategies That Could Contribute to Vocabulary Acquisition

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animations</td>
<td>When used judiciously can add visual and auditory information to word meaning.</td>
</tr>
<tr>
<td>Video Clips</td>
<td>Can offer demonstrations of concepts that could aid in their comprehension.</td>
</tr>
<tr>
<td>Sound Components</td>
<td>Voice-overs can provide narration and pronunciation.</td>
</tr>
<tr>
<td>Hyperlinks to Related Information</td>
<td>Can be utilized to promote exploration of topics and provide scaffolding.</td>
</tr>
<tr>
<td>Ability to Create One’s Own Pathway Through Information</td>
<td>Can increase engagement and motivation by providing the ability to pursue specific topics of interest to specific users.</td>
</tr>
<tr>
<td>Ability to Pause, Repeat Information, or Replay Video Clips</td>
<td>Allows for repetition of words and content.</td>
</tr>
<tr>
<td>Hints or Clues Related to Word Meanings</td>
<td>Often manifested in a tour guide who can provide content related information and increase scaffolding.</td>
</tr>
<tr>
<td>Multimodal Presentation of Information</td>
<td>Increases engagement and accommodates learning styles.</td>
</tr>
<tr>
<td>Online Definitions, Glossaries, or Thesauruses</td>
<td>Serve as reference materials and are enhanced by voice-overs and illustrations.</td>
</tr>
</tbody>
</table>
Synthetic Learning Environments (SLEs)

Learning games, software toys, and educational simulations share a number of common features, and may be referred to by the collective term “Synthetic Learning Environments,” or SLEs. Over the last several years, the concept of using SLEs for teaching and training has gained a considerable amount of popular support in a wide array of fields. Unfortunately, this growth in public acceptance has not been paralleled by a cohesive body of scientific research. To date, only a handful of studies have shown significant impact of the use of SLEs as teaching tools (Vogel et. al., in press). Considerable theoretical and empirical work is needed to combine existing research in the areas of instructional design, SLE design, learning theory, simulation and training, education, and expertise studies into a coherent picture of the state of knowledge regarding learning tools of this type. This work is a necessary step in identifying those areas in which additional research is needed to draw a conclusive picture of the ways in which SLEs can enable learning, and the means by which they achieve this end.

The use of technology in the classroom has yielded mixed results. While some research findings indicate that the availability of technology in classrooms and the home have not yielded increases in basic literacy skills (Clark, 1983; Postman, 1995); some findings have indicated the use of technology and multimedia specifically have created gains. Getkham (2005) conducted research with a group of foreign language students utilizing multimedia based technology. Findings indicated that students who used the multimedia technology learned more vocabulary words than those who did not. While most students forgot some words; a delayed test indicated that those using the multimedia technology retained more words than those who did not use the
multimedia technology. These results seem to indicate deeper processing of vocabulary when multimedia is used as an instructional tool.

A landmark project, Orange County Literacy, was launched in 1994 to provide middle school students who were unable to read with remediation. Students used the Peabody Learning Lab, designed by the Peabody College of Vanderbilt for a non-disruptive period of time each day to increase their vocabulary and reading skills. Using essential characteristics from synthetic learning research, this software focused on word recognition, reading comprehension and spelling skills for middle aged students. The software incorporates videos to provide situational, contextual and prior knowledge of a concept, then asks students to read associated passages with the help of an animated instructor named Melvin. Results of this research indicated significant increases in vocabulary and reading comprehension, as well as reported increases in self esteem (Hasselbring et al., 1997).

In 2002, Garris, Ahlers & Driskell performed a review of literature surrounding video games, a distinct type of synthetic learning environments, their findings on motivation, can however, be generalized to all SLEs. They found 3 characteristics of motivated learners to be enthusiastic, focused and engaged in learning. They also found those types of learners, motivated learners, to be intrinsically motivated and to enjoy what they are doing. This type of learner certainly sees enhanced learning.

Researchers examining the science of learning have identified instructional design principles based in cognitive theory that are common to SLEs and have been shown to have relationships with key aspects of learning.
Experiential Learning

Experiential learning (or learning through experiences) has been cited as a fundamental human process (Kolb, 1984). With roots in philosophy and the origins in the works of Dewey, Lewin, and Piaget, experiential learning is defined as “the process whereby knowledge is created through the transformation of experience” (p. 41). In this process experience affects all new information and how it is processed and continuously modified. According to Kolb, there are four processes that new information must pass through in order to be learned: concrete experience, reflective observation, abstract conceptualization, and active experimentation. In this model, learning is considered a holistic adaptive experience.

The process of learning through experience does have remarkable implications when applied to the use of technology based instruction like SLEs. Synthetic Learning Environments provide users the opportunities to have experiences that they might not be able to have otherwise such as exploration of a new planet or the Amazon River. These types of learning experience can also be useful as a substitute for prior knowledge based learning (Anderson, Wilson & Fielding, 1988), in which future vocabulary and learning constructs can be assimilated into existing schemas formed through exposure and experience.

Herbert (1995) continued research using experiential learning in the classroom. He considered experiential learning to be a continuum which ranges from passive learning to active learning. Passive learning was defined as students taking no role in the acquisition of knowledge, with teaching being a simple transmission of information from someone or something to the learner. Active learning was defined as pursuing knowledge and forming relationships with the knowledge and its potential applications. Herbert identified five variables related to the success
or failure of experiential learning in the classroom. First, the reality of the experience was seen as an important variable as it related to the passive or active acquisition of information. Second, a level of risk had to be perceived by the user in order to provide a sense of reality. This risk leads to discordance in knowledge and promotes assimilation of information. Third, a sense of responsibility provides increased levels of interaction as there are consequences associated with the behaviors. Fourth, predictability and planning surround the unpredictability of experiential learning in the classroom and calls for the consideration of the range of possible outcomes. Fifth and finally, reflection provides an opportunity for students to review what they feel they’ve learned from the experience either to themselves, or with a group. These five components of experiential learning provide a basis for learning based on classroom based activities that can provide a greater depth of processing of learned information. Simulations such as SLEs can capitalize on these tenets and expand the possibilities in learning.

Educators and instructional theorists have converged on the conclusion that active participation by learners is a key element of good learning (Zimmerman, 2000), and that courses emphasizing interactive education and active involvement in learning activities showed better results in students regardless of the quality of the instructor. Active learning is a component of experiential behavior that describes the process of being actively engaged with the learning tool in the learning process.

Mayer, (2001) distinguishes between behavioral activity and cognitive activity in learning citing cognitive activity to be the crucial behavior necessary for learning. The appearance of active participation may not be as important as the appearance of inactivity so
long as cognitive activity is occurring. These findings strongly support the contention that interactive learning tools such as SLEs are a critical element in improved learning.

**Anchored Instruction/Situated Learning**

Anchored instruction and situated learning are two constructs that are based on the pedagogical principle that in order for learning to be effective, it must be presented in a meaningful context to the learner (Bransford, Sherwood, Hasselbring, Kinzer, & Williams, 1990). Supported by constructivism and based on the premise that students should be presented with useful information, the model of anchored instruction provides a structure for providing a relevant base of knowledge that can serve as the anchor, or base for other information to be built upon. Bransford et al. recognized the ability of emerging technology to provide these types of experiences by relating the anchored instructions to media based videos.

The Cognitive Technology Group at Vanderbilt (CTGV, 1992) further discusses anchored instruction as one possible solution to the problem of providing irrelevant information to learners. Specifically, their goal was, “creating environments that permit sustained exploration by students and teachers and enable them to understand the kinds of problems and opportunities that experts in various areas encounter and the knowledge that these experts use as tools.” This often happened in video based encounters designed to stimulate learning and that included participation from the students. While their work does not specifically target SLEs, they do recognize their potential so long as they are teacher and budget “friendly” (CGTV, 1997). Instruction could be “situated” within these video encounters, usually in the form of a story; moving a teacher from the role of provider of information to a part of the learning experience.
This theory proposes that students will be likely to transfer the skills learned in situated learning experiences if when the experiences are authentic and facilitate the building of skills that are learned or situated within their relevant application.

Several software packages have been deployed in accordance with concepts of Situated Learning and Anchored Instruction. The Jasper series, for example, centralizes around the adventures of Jasper Woodbury, and was designed to increase math and problem solving skills. Based in video and designed by the Learning Technology Center of Vanderbilt University, the Jasper series anchors learning in an interesting and motivational way, transforming the instructor into a participant (CGTV, 1997).

Other learning software designed in anchored instruction and situated learning include Virtual Quests. These software packages often track a real life expedition on a fact finding mission and provide the real life team with research findings and decision made in classrooms. Classroom Connect and the Jason Project are two producers of these types of classroom augments and have found then to be effective; however difficult in implementation as instructors often don’t feel comfortable implementing this type of technology.

Learning experiences within a simulated environment can be varied and reinforced by providing opportunities for learners to catalog instances in a way that enables them recall those experiences when necessary and provides a greater breadth of situations for them to use as the basis for future decisions. Anchored instruction increases novice information organization to be more similar to the information organization of experts (Bransford, Brown, & Cocking, 1999). This type of knowledge acquisition, also called learning for understanding can also lead to
facilitated transfer of the knowledge by supporting task-relevant knowledge structures that can be easily accessed and utilized.

Motivation to learn has been shown to be a key element in learning (Clark & Wittrock, 2000). Synthetic Learning Environments of all kinds have significant advantages over traditional instruction methods in promoting self-efficacy, goal setting, meta-cognition and self-regulation, and engagement (Fiore, Cuevas & Scielzo, 2002). SLEs also have a role in enhancing the meaningfulness of material, and the involvement of students in the emotional content of knowledge.

The necessity for sustained motivation has been recognized by at least two authors, Luna, Urbanski & White (2002) cited sustaining motivation to read as critical factor in motivating to read programs. Bond (1971) also recognized in the area of computer aided instruction that sustaining interest would be a factor in the success of certain educational implementations. No studies to date could be found regarding the sustainability of motivation in the use of multimedia educational tools, games, or simulations. While there is certainly a level of novelty involved with any diversion from regular classroom instruction, as it is the norm, the ability for a SLE to lose its novelty is of interest to the ability for SLEs to keep students motivated in their use. Therefore, it is important to consider this factor in researching the effectiveness in SLEs and to consider it in the design of SLEs and educational software.

*Virtual Field Trips*

In 2005, researchers including Dr. Jan Cannon-Bowers at the University of Central Florida developed a multimedia educational tool named Virtual Field Trips or VFTs. Their goal
in the creation of this software was to provide pre-reading exposure to vocabulary words that students lacking in real world knowledge might have difficulty recognizing in their grade level reading curriculum.

Based on the Houghton-Mifflin second grade reading series, researchers compiled vocabulary words into similar genres of words and created a VFT surrounding nature and parks called Nature Walk. Vocabulary words are specifically targeted in this VFT to be the basis of an experiential learning adventure. The VFT begins with a video of a school bus arriving at a park for a field trip. A “teacher” gives instructions on the use of the VFT software and students progress to the edge of the woods where they find “Ranger Randall”. Ranger Randall gives instructions on what to see and do within the node and tells students that if they have any questions, they can contact him via a Walkie-Talkie. He also tells them they’ll be accompanied on their field trip by Scooter, a robot avatar, who will experience things with them (see Figure 1). Following this introduction, students find themselves within a cubic virtual reality world called Blanchard Prairie. This VR represents one of four “nodes” or VRs in which students can explore. They are provided with a map to aid in their navigation of the four nodes and move between nodes via a video that shows them walking from one area to another.
While specific architectural specifications of the VFT can be found in Appendix A, within each node, vocabulary words are embedded in “hot spots”. These hot spots are objects within the node that can be clicked on in order to learn more about them. A list of vocabulary words by node can be found in Table 2. The hot spots are separated into 3 types: those that provide more information and are supplemented by video tapes, usually narrated by Scooter;
those that involve discussions with Ranger Randall that are supplemented with video; and video
games. These three distinctions are made to students when mousing over a hot spot by the mouse
turning into a walkie talkie, a magnifying glass, or into a video game controller. Videos are
played on Scooter’s robot screen face as scooter zooms into the main viewing area.

Table 2
Vocabulary Words by Node

<table>
<thead>
<tr>
<th>Node 1</th>
<th>Pebbles</th>
<th>Banks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muddy Pond</td>
<td>Fox</td>
<td>Turtle</td>
</tr>
<tr>
<td></td>
<td>Pond</td>
<td>Raccoon</td>
</tr>
<tr>
<td></td>
<td>Edge</td>
<td>Stone</td>
</tr>
<tr>
<td></td>
<td>Tracks</td>
<td>Trail</td>
</tr>
<tr>
<td></td>
<td>Mussels</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Birds</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Node 3</th>
<th>Acorns</th>
<th>Oak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grassy Clearing</td>
<td>Berries</td>
<td>Termites</td>
</tr>
<tr>
<td></td>
<td>Seeds</td>
<td>Dragonflies</td>
</tr>
<tr>
<td></td>
<td>Moss</td>
<td>Lantern</td>
</tr>
<tr>
<td></td>
<td>Beetles</td>
<td>Squirrel</td>
</tr>
<tr>
<td></td>
<td>Bees</td>
<td>Trees</td>
</tr>
<tr>
<td></td>
<td>Blueberries</td>
<td>Photographer</td>
</tr>
<tr>
<td></td>
<td>Tent</td>
<td>Nest</td>
</tr>
</tbody>
</table>
Vocabulary words, when encountered are displayed on Scooter’s monitor screen face, are transferred to a list on the left hand side of screen, and then subsequently transferred to a journal feature. The journal stores all words encountered within the VFT, then allows students to review these words again in a multimedia lexicon. Words in the journal can be spoken aloud by a narrator, seen and heard in a sentence, and can be printed out for later review and further integration into lesson plans (See Figures 2 & 3).
School Bus

Map

Notebook

Figure 2: VFT Icons
The VFT represents a SLE that has considered all of the characteristics important to SLE success. Specific characteristics of the VFT can be found in Table 3. Specifically, the VFT was designed to be an exploratory experience that provides the basis for vocabulary acquisition by providing vocabulary knowledge to users.
<table>
<thead>
<tr>
<th>VFT Characteristics</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exploratory</td>
<td>Students can explore within each node at will. Hot spots draw attention through the use of audio cues on mouse over, icon change, and persistent visual clues</td>
</tr>
<tr>
<td>Anchored</td>
<td>Vocabulary words are presented in their environment in order to provide a meaningful context</td>
</tr>
<tr>
<td>Situated</td>
<td>Vocabulary words are presented in their context and transfer is facilitated by multiple use</td>
</tr>
<tr>
<td>Multi-Modal</td>
<td>Text &amp; voice narration are used</td>
</tr>
<tr>
<td>Video Clips</td>
<td>Video clips are used to supplement topics related to multiple vocabulary words</td>
</tr>
<tr>
<td>Lexical</td>
<td>A journal provides each word, its pronunciation, and its use in a sentence</td>
</tr>
<tr>
<td>Repeatable</td>
<td>Students can repeat any section of the VFT at will</td>
</tr>
<tr>
<td>Scenario Based</td>
<td>Ranger Randall &amp; a Teacher provide a scenario in which the user is on a class field trip</td>
</tr>
<tr>
<td>Navigable</td>
<td>An interactive map provides the ability to jump to any hot spot within a node and displays check marks when that area has already been explored to assist with completion</td>
</tr>
<tr>
<td>Interactive</td>
<td>Scooter, a robot friend provides opportunities for conversations with Ranger Randall on the user’s behalf</td>
</tr>
</tbody>
</table>
In order to learn more about how multimedia, and SLEs in particular can be used as tools for vocabulary acquisition, the VFT will serve as a testing platform for this research project. This research seeks to begin a systematic inquiry into the SLEs and their utility.

Figure 3: VFT Screen Cap
CHAPTER THREE: METHODOLOGY

In order to determine the effectiveness of SLEs in vocabulary acquisition as defined here, a research project was conceived and executed as follows.

Hypotheses

H1: Students who use VFT will acquire more vocabulary words than students who watch video-taped stories about field trips.

H2: Students who use VFT will demonstrate greater long term retention of vocabulary words than students watch video-taped stories about field trips.

H3: Students who use VFT will demonstrate greater breadth of vocabulary words than students who watch video-taped stories about field trips.

H4: Students who use VFT will demonstrate greater depth of vocabulary knowledge than students who watch video-taped stories about field trips.

H5: Students who use VFT will report higher self-efficacy on vocabulary tests than students who watch video-taped stories about field trips.

H6: Students who use VFT will report that they have learned more words than students who watch video taped stories about field trips.

H7: Students will report higher motivation to use VFT than to watch video-taped stories.

H8: Students will expect VFT to result in easier learning of vocabulary words than watching video-taped stories.
Participants

Participants were recruited from nine second grade classrooms of a large southern elementary school immediately following the 4th week of classes at the beginning of an academic year. Participants included 105 parents and 123 students enrolled in 2nd grade. Student participants included 61 males and 62 females ranging from ages six to seven. Each of the nine classrooms was randomly assigned into one of two groups: control and experimental. All participants were treated in accordance with the “Ethical Principles of Psychologists and Code of Conduct” set forth by the American Psychological Association (1992).

Procedure

Parents of children in the 2nd grade classes of a large elementary school were asked to fill out an informed consent and a demographic information survey prior to their child’s participation in this experiment. A full version of the parental consent letter, parental informed consent, adult informed consent, and the demographic data form can be found in Appendix B. The student participants were additionally asked to provide verbal and written assent to participate in the experiment prior to testing. Students were asked to take three vocabulary tests during the three day data collection period followed by measures of self-efficacy, and to write two paragraphs about a hypothetical field trip to a local park. Several additional measures regarding motivation prior to and immediately after the intervention were also collected. Full versions of all measures completed by students can be found in Appendix C. A full schedule of
data collection can be found in Table 4. Participants in the experimental condition were exposed to two VFT nodes on one day, while students in the control condition watched a DVD of a researcher reading a story that paralleled the Virtual Field Trip (VFT) content of two nodes. After the data collection period ended, all participants were thanked for their participation, given the opportunity to ask questions regarding their participation, and debriefed.

Table 4
Data Collection Schedule

<table>
<thead>
<tr>
<th>Day</th>
<th>Children</th>
<th>Parents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>Assent</td>
<td>Informed Consent</td>
</tr>
<tr>
<td></td>
<td>Writing Sample 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vocabulary Test 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Self-efficacy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Motivation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Demographic Info</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Survey</td>
</tr>
<tr>
<td>Day 2</td>
<td>VFT Nodes 1 &amp; 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>VFT Stories</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vocabulary Test 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Motivation Reflection</td>
<td></td>
</tr>
<tr>
<td>Day 3 (one week after Day 2)</td>
<td>Writing Sample 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vocabulary Test 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Self-efficacy</td>
<td></td>
</tr>
</tbody>
</table>
Measures

Parents

Demographic Data. Parent participants were asked to complete a demographic information survey prior to their child’s participation in this experiment. The demographic information survey captured data related to the parent such as age, race, number of children, and primary language; and data related to their child such as age, race, and lunch program qualifications.

Students

Vocabulary Tests. Student participants were administered three vocabulary tests, regardless of the condition of their classroom. Students were given 10 minutes to complete the vocabulary tests. Each vocabulary test was comprised of twenty words randomly selected from the twenty-seven vocabulary words targeted within nodes 1 and 3 of the VFT. Only words that could be represented with a picture were included in the words available for use in vocabulary tests. All twenty seven words appear in Table 5 and a complete list of VFT words per node are included in Appendix A. Students were instructed to match the vocabulary words with color images that represent the word. If the student could not read the word, the word would be read aloud to them. Students were asked to take one pretest, prior to exposure to the intervention, one posttest immediately after exposure to the intervention, and a long term retention posttest one week after exposure to the experimental condition. Each vocabulary test and its corresponding sheet of pictures are included in Appendix C. These vocabulary tests were scored for accuracy.
Self-efficacy. Following each vocabulary test, students were asked how many of the 20 vocabulary questions they got right on the preceding test in order to measure each student’s self-efficacy regarding their word knowledge. They were also asked to indicate on a Likert scale how they did on that vocabulary test. The self-efficacy measure can be found in Appendix C.

Writing Sample. In order to collect a baseline measurement of each child’s breadth and depth of knowledge, student participants were asked to write a paragraphs consisting of 5 sentences about a field trip to the woods prior to administration of the pretest vocabulary test. A second writing sample was collected prior to the administration of the long term retention posttest one week after the intervention. Writing samples were collected prior to vocabulary tests in order to prevent students from having recently viewed a list of vocabulary words prior to writing. Students were given 10 minutes to complete their writing sample. Students were not instructed to use the vocabulary words in the post-intervention writing sample (Appendix C),

The writing samples were coded for word use as an indication of depth vocabulary knowledge and breadth of vocabulary measured by the number of different vocabulary words used and relevance of the entire paragraph.
**Motivation.** To measure and understand each student’s motivation for wanting to use several mediums to learn vocabulary words, students answered several questions related to their desires immediately after completing the pretest and immediately following the intervention. These measures sought to determine which medium the student would prefer to use to learn vocabulary words, reading, video or virtual world; which medium they would find more motivating to learn; which medium they would be more motivated to use regardless of learning; and why. The measures can be found in Appendix C.

**Interventions**

Students in the experimental, or VFT, condition used the VFT software during their normal weekly computer lab time. Students used two nodes of the VFT: Node 1 Muddy Pond and Node 3 Grassy Clearing. Students used each node for 10 minutes each.

**SLE VFT Nature Walk**

**Node 1 Muddy Pond.** This node focuses on animal tracks, human tracks, footprints in the mud, and evidences of organisms and activities not directly seen. This node includes a mini game (indicated by a game controller icon) in which a user matches animal tracks to the appropriate animal; human footprints in fresh mud that Ranger Randall explains (indicated by a walkie talkie cursor); finding a mussel that Ranger Randall explains a raccoon has been eating (indicated by a walkie talkie cursor); a turtle sunning himself on a stone explained by Ranger Randal (indicated by a walkie talkie cursor); and the water’s edge and depth supported by a video narrated by Ranger Randall (indicated by a magnifying glass cursor). Figure 4 shows a map of Node 1.
Node 3 Grassy Clearing. This node further explores animal food, the role of insects in the forest, and camping. This node includes a mini game in which a lizard eats bugs (indicated by the game controller cursor); acorns as animal food explained by Ranger Randall (as indicated by a walkie talkie cursor); finding a bird’s nest in a tree explained by Ranger Randall (as indicated by a walkie talkie cursor); coming across a tent in the woods explained by Ranger Randall (as indicated by a walkie talkie cursor); and finding a log covered with insects explained by Ranger Randall (as indicated by a walkie talkie cursor). Detailed information regarding all of the VFTs functionality can be found in Appendix A. See Figure 5 for a map of Node 3.
Figure 5: Node 3 Grassy Clearing Map

*Field Trips Stories*

In order to provide a basis of comparison, stories were authored based on the VFT. Each node of the VFT was turned into one story that included the main characters of the VFT; the teacher, scooter and Ranger Randall. Each targeted vocabulary word included in each node of the VFT was included in the story. Two stories, each corresponding to the two nodes of the VFT students would be using in the experimental condition were read by a researcher and video taped.
to minimize extraneous effects. The video took roughly 20 minutes to view. A full text version of the VFT stories appears in Appendix D.

*Story 1 Muddy Pond.* This story will encompass all of the Node 1 learning opportunities including how animals leave tracks, what animals eat, why turtles sun themselves, and the waters edge and how deep the water is.

*Story 2 Grassy Clearing.* This story encompass all of the Node 3 learning opportunities including animal foods, bird’s nests and camping.
CHAPTER FOUR: RESULTS

Although not related to any hypotheses and despite random sampling of classrooms; several demographic variables were used to ensure equality between the two conditions in this study. Lunch status, a measure of socio-economic status, was collected in the parent demographic data survey. A student’s lunch status was found in no way to be related to a student’s performance on any of the three vocabulary tests or in the two writing samples. Gender and race were also in no way found to be related to vocabulary tests or the writing samples. Finally, condition itself was analyzed and found in no way to be related to any of the vocabulary tests or the writing samples. This result indicates that prior knowledge as tested on vocabulary test 1 and in the writing samples do provide an accurate representation of each student’s knowledge. Frequencies associated with the demographics variables are shown in Table 6.
Table 6
Demographics Frequencies

<table>
<thead>
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<th>Condition</th>
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<tr>
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<td>VFT</td>
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<td>Female</td>
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<table>
<thead>
<tr>
<th>Race</th>
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<td>44</td>
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<tr>
<td>African American</td>
<td>31</td>
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<tr>
<td>Asian</td>
<td>4</td>
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<tr>
<td>Hispanic</td>
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<table>
<thead>
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<td>Free</td>
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<tr>
<td>Reduced</td>
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<tr>
<td>Regular</td>
<td>51</td>
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Vocabulary Acquisition

Hypotheses 1 and 2 related directly to vocabulary acquisition as tested using a series of vocabulary tests. Students using the VFT should have significantly increased vocabulary acquisition compared to students who watched the video taped stories as demonstrated on those vocabulary tests in order to support Hypothesis 1. Students using the VFT should have significantly increased long term retention of vocabulary words when compared to students who watched the video taped stories as demonstrated on the third vocabulary test in order to support Hypothesis 2.
The number of words acquired during the experiment was tested using three vocabulary
tests, a pretest taken during Day 1 of the study, a posttest taken immediately after the
intervention, and a long term retention posttest taken one week after the posttest. A repeated
measures mixed model Analysis of Variance (ANOVA) indicated that students who used VFTs
did not acquire significantly more vocabulary words than students who watched video-taped
stories about field trips as hypothesized in Hypothesis 1, $F(2, 198) = .903, p > .05$. Means of
these three tests are shown in Table 7.

Table 7
Vocabulary Test Means and Standard Deviations

<table>
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<tr>
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<th>SD</th>
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<td>VFT Group</td>
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<td>2.11</td>
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</table>

Students who used VFTs did not demonstrate significantly greater long term retention of
vocabulary words than students who watched video-taped stories about field trips as
hypothesized in Hypothesis 2. This was determined through the use of an independent samples t-
test using only the third vocabulary test taken by the students, $t_{(108)} = -.54, p > .05$. Table 5
contains the means on the long term posttest used to reach this conclusion.
Depth and Breadth of Vocabulary Knowledge

Hypotheses 3 and 4 were tested using findings from the two collections of the writing sample. Students using the VFT were expected to use significantly more words in the writing samples when compared to those students who watched video taped stories in order to support Hypothesis 3. Students using the VFT were expected to use words with context significantly more often than those who watched video taped stories in order to support Hypothesis 4.

Students who used VFTs did indicate a significantly increased breadth of vocabulary when compared to students who watched a video-taped story about field trips as demonstrated in a Repeated Measures Mixed Model ANOVA. In support of Hypothesis 3, results indicated that students who used the VFT used significantly more words ($M = 3.06$) than those who had watched video-taped stories about field trips ($M = 1.84$) on their writing samples, $F(1,101) = 12.45$, $p = .001$. Table 8 reports the writing samples’ means and standard deviations.

In order to further investigate vocabulary knowledge, independent coders were tasked with determining if each vocabulary word used in the writing samples was used appropriately within context. Inter-rater reliability was established using Tinsley & Weiss’s (1975) $t$ variation of Lawlis & Lu’s (1972) chi-square test and was calculated to be $t=.86$, an acceptable inter-rater agreement rate. After accounting for the aforementioned increase in word use, the number of words used appropriately did not significantly differ by condition, $F(1, 96) = 1.042$, $p > .05$. Therefore, it was determined that students who used the VFT did not demonstrate increased depth of vocabulary knowledge, a finding that was not in support of Hypothesis 4.

54
Table 8
Writing Sample Means and Standard Deviations

<table>
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<th>SD</th>
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<td>Percentage of words used correctly</td>
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<td>VFT Group</td>
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<tr>
<td>Number of words used</td>
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<td><strong>Writing Sample 2</strong></td>
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<tr>
<td>Number of words used</td>
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<tr>
<td>Percentage of words used correctly</td>
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<tr>
<td>Number of words used</td>
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<tr>
<td>Percentage of words used correctly</td>
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<td>.94</td>
<td>.11</td>
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Self-efficacy

Hypothesis 5 was tested using a measure of self efficacy collected immediately following the three vocabulary tests. Students using the VFT were expected to indicate significantly higher levels of self efficacy than those students who watched video taped stories in order to support Hypothesis 5.
Students in the VFT group did not rate their self-efficacy higher as opposed to those students watching video-taped field trip stories as indicated in a Repeated Measures Mixed Model ANOVA, $F(1, 92) = 1.194$. They also did not indicate that they had gotten more words right on their vocabulary tests than those students who watched video-taped field trip stories, $F(1, 89) = 3.87$, $p = .052$. These findings were not in support of Hypothesis 5. The means of the self-efficacy rating are shown in Table 9.
Table 9
Self-efficacy Means and Standard Deviations

<table>
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<tr>
<th>Variable</th>
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<td>5.87</td>
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<td>0.99</td>
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<td>0.99</td>
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<td>3.04</td>
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<tr>
<td>VFT Group</td>
<td>108</td>
<td>17.54</td>
<td>5.20</td>
</tr>
</tbody>
</table>

Likert scale, 1 = Bad, 4 = So So, 7 = Great

Word Learning

Hypothesis 6 was tested using a likert scale item in which students were asked to report how many vocabulary words they felt they had learned from the intervention. Students who used
the VFT were expected to report having learned significantly more words than students who watched video taped stories in order to support Hypothesis 6.

Students in the VFT condition did not report that they had learned significantly more words than those students who watched video-taped field trip stories as evidenced in a One-way ANOVA, $F (1, 111) = .938, p = .34$. These findings did not support Hypothesis 6. The means for reported word learning are shown in Table 10.

Table 10
Word Learning Means

<table>
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<tr>
<th>Variables</th>
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<th>$SD$</th>
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</thead>
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<td>Story Group</td>
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<td>2.37</td>
</tr>
<tr>
<td>VFT Group</td>
<td>5.78</td>
<td>2.02</td>
</tr>
</tbody>
</table>

$N=113$
Likert scale: Few words = 1, Some words = 4, Lots of words = 7

Motivation

Hypotheses 7 and 8 were tested using items from two measures of motivation; one collected prior to condition assignment, and one immediately following the intervention. In order to support Hypothesis 7 it was expected that students using the VFT would report that they would like to use VFTs to learn in the future significantly more than students who watched video taped stories would report desire to use video taped stories to learn in the future. Students who used the VFT were expected to report significantly more often that the VFT made it easier to learn vocabulary than students watching video taped stories would report video taped stories making it easier to learn vocabulary in order to support Hypothesis 8.
Motivation to either use VFTs or watch video-taped field trip stories by condition in the future were significantly in favor of VFTs as shown in a One-way ANOVA, $F(1, 112) = 12.054$, $p = .001$. Essentially, this finding suggests that students who used VFTs rated their motivation to use things like VFTs for future learning objectives higher ($M = 6.53$) higher than students who watched video-taped field trip stories rated their motivation to use video-taped stories for future learning objectives ($M = 5.21$). This finding supported Hypothesis 7. Students who used VFTs also reported having more fun learning during the intervention as shown in a One-way ANOVA, $F(1, 113) = 18.090$, $p < .01$). Table 11 shows the ANOVA results.

Table 11
Motivation to Use Intervention to Learn

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<tr>
<th></th>
<th>$M$</th>
<th>$SD$</th>
<th>$N$</th>
<th>$F$</th>
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<td>VFT Group</td>
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<td>1.61</td>
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<td>2.37</td>
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<td>VFT Group</td>
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<td><strong>Hard or Easy</strong></td>
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<td>Story Group</td>
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<td><strong>Use in the Future</strong></td>
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</table>
Motivation to use VFTs because they would result in easier learning of vocabulary words when compared to watching video-stories was not significant, $F (1, 113) = 2.570, p > .05$, as had been hypothesized in Hypothesis 8. Table 11 shows these ANOVA results.
CHAPTER FIVE: DISCUSSION

While this study did not yield significant vocabulary acquisition results, the assumption was made that this finding could be due to a ceiling effect on the first vocabulary test. All participants were tested prior to their exposure to the vocabulary words during their normal classroom instruction and therefore, their first vocabulary test scores should be representative of the student’s word knowledge. Pretest cumulative scores leave little room for relative improvement. Vocabulary test 1 and vocabulary test 2 score means appear to increase equally despite the introduction of the intervention immediately preceding vocabulary test 2. Vocabulary test 3 shows a slightly larger increase but is still insignificant. Delta values between tests 1 and 2 and tests 2 and 3 indicate a word gain of less than one word between tests 1 and 2 and slightly more than 2 to 3 words between tests 2 and 3 irrespective of condition. This could also be attributable to retesting or to insignificant amounts of vocabulary acquisition.

Perhaps more indicative of vocabulary learning, a significant relationship between condition and words used during the pre- and post-intervention writing samples did indicate significant positive increases in breadth of vocabulary knowledge. In previous research cited by Graves (1986) regarding the use of writing samples to demonstrate learning in vocabulary instruction, vocabulary breadth was demonstrate by increased use of the targeted vocabulary words. This type of vocabulary knowledge demonstrates that vocabulary knowledge can improve writing, but often only when writers are explicitly instructed to do so. The current study did not explicitly instruct students to use vocabulary words and offered no formal instruction other than exposure to the words in either a SLE or listening to a story being read on a video yet still an increase in vocabulary words using in the writing sample after the intervention was achieved.
This finding could be attributable to the situated and anchored instruction provided in both groups and the ability for students to recognize the appropriate context and domain use of the targeted words. The VFT group’s use of significantly more words during their post intervention writing sample indicates an increased breadth of vocabulary knowledge resulting from the SLE within an appropriate level of depth. No difference was found between the two intervention groups for the number of words that they used appropriately in their writing sample as both had very high percentages of appropriate word use. This finding supported the assertion that in order for a word to be used, it has to be known at an increased level of depth (Stahl, 1983).

Self-efficacy immediately following vocabulary tests was not found to be different by intervention group. Self-efficacy was measured immediately following each vocabulary test in two ways, first participants were asked to rate on a 7 item Likert scale how well they thought they did (1=Bad, 4=So so, 7=Great). Next participants were asked to estimate how many of the vocabulary words they had gotten right on the immediately preceding test (i.e., how many words did they correctly match with its corresponding picture). While self-efficacy is considered a measure of future performance, it was hypothesized that the use of a SLE would increase self-efficacy and that that increase would be measurable in a posttest performance confidence rating. It was believed that one could expect the self-efficacy ratings and scores made to accurately predict performance on the vocabulary tests. This relationship was also not found, instead ratings of how helpful each participant felt their assigned intervention was predicted by both posttest self-efficacy ratings ($R^2 = .081, F (1,110) = 9.741, p<.05$) and LTR self-efficacy ratings ($R^2 = .142, F (1,102) = 16.869, p<.01$).
Self-efficacy ratings and score means indicated slightly increased self-efficacy ratings and scores for the story group during all three measurements of self efficacy. While there is no clear explanation for this finding some possibilities exist. Self efficacy ratings and scores indicated high self-efficacy regardless of performance. Table 8 indicates rating scores averaging from 6.23-6.57 on a Likert scale with values ranging from 1 to 7 between administrations of the measure and regardless of condition. Additionally, self efficacy ratings and scores were not correlated with test scores with the exception of one negative correlation, $r = -.551$, $p=000$ between long term retention vocabulary test score and its respective self efficacy rating. Table 12 shows correlations between self efficacy ratings and scores and vocabulary test scores.
Table 12
Self Efficacy and Vocabulary Test Score Correlations

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<th>2</th>
<th>3</th>
<th>4</th>
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</tr>
<tr>
<td>Vocabulary Posttest</td>
<td>.576**</td>
<td>-.035</td>
<td>.149</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posttest Self-Efficacy Rating</td>
<td>-.082</td>
<td>.409*</td>
<td>.234*</td>
<td>-.008</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posttest Self-Efficacy Score</td>
<td>-.243*</td>
<td>.217*</td>
<td>.376**</td>
<td>.120</td>
<td>.181</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LTR Vocabulary Test</td>
<td>.527**</td>
<td>-.084</td>
<td>.087</td>
<td>.421**</td>
<td>-.012</td>
<td>-.320**</td>
<td>--</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LTR Self-Efficacy Ratings</td>
<td>-.386**</td>
<td>.260*</td>
<td>.235*</td>
<td>-.079</td>
<td>.318**</td>
<td>.623**</td>
<td>-.551**</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>LTR Self-Efficacy Score</td>
<td>.185</td>
<td>.245*</td>
<td>.318**</td>
<td>.007</td>
<td>.387**</td>
<td>-.015</td>
<td>.172</td>
<td>.058</td>
<td>--</td>
</tr>
</tbody>
</table>

* = p < .05, ** = p < .01

While these results are confusing, they may be indicative of a faulty measure. Table 13 demonstrates the frequencies and percentages associated with the self-efficacy ratings. These findings indicate that across the 3 vocabulary tests, only one student during each test indicated that he or she had done “bad” on the test. This might indicate an inflated confidence on the test.
Table 13
Frequencies and Percentages of Self-Efficacy Ratings

<table>
<thead>
<tr>
<th>Response</th>
<th>Pretest Frequency</th>
<th>Pretest Percentage</th>
<th>Posttest Frequency</th>
<th>Posttest Percentage</th>
<th>LTR Posttest Frequency</th>
<th>LTR Posttest Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Bad)</td>
<td>1</td>
<td>.8</td>
<td>1</td>
<td>.8</td>
<td>1</td>
<td>.8</td>
</tr>
<tr>
<td>2</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>1</td>
<td>.8</td>
</tr>
<tr>
<td>3</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>1</td>
<td>.8</td>
</tr>
<tr>
<td>4 (So so)</td>
<td>19</td>
<td>15.4</td>
<td>15</td>
<td>12.2</td>
<td>7</td>
<td>5.7</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>.8</td>
<td>--</td>
<td>--</td>
<td>2</td>
<td>1.6</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
<td>8.1</td>
<td>6</td>
<td>4.9</td>
<td>12</td>
<td>9.8</td>
</tr>
<tr>
<td>7 (Great)</td>
<td>83</td>
<td>67.5</td>
<td>91</td>
<td>74.0</td>
<td>85</td>
<td>69.1</td>
</tr>
</tbody>
</table>

N = 123

Table 14 demonstrates the frequencies and percentages associated with the self-efficacy scores. While the lower numbers show less frequency of use, a jump in frequency of use for the number 7 might additionally indicate scale related confusion as 13% of students used the number seven as their self-efficacy score on the pretest. This increase in the frequency of use of the score 7 could be a result of the self-efficacy rating Likert scale appearing in the item prior to this one and the number 7 represents a rating of “great”. Of the students reporting a score of 7, 20% of them also indicated a Likert scale rating of 7 or “great”.

65
Table 14
Frequencies and Percentages of Self-Efficacy Scores

<table>
<thead>
<tr>
<th>Response</th>
<th>Pretest Frequency</th>
<th>Pretest Percentage</th>
<th>Posttest Frequency</th>
<th>Posttest Percentage</th>
<th>LTR Posttest Frequency</th>
<th>LTR Posttest Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>.8</td>
<td>1</td>
<td>.8</td>
<td>1</td>
<td>.8</td>
</tr>
<tr>
<td>1</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>1</td>
<td>.8</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>.8</td>
<td>2</td>
<td>1.6</td>
<td>1</td>
<td>.8</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>.8</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>2.4</td>
<td>3</td>
<td>2.4</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>.8</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>.8</td>
<td>3</td>
<td>2.4</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>7</td>
<td>16</td>
<td>13.0</td>
<td>9</td>
<td>7.3</td>
<td>6</td>
<td>4.9</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>.8</td>
<td>1</td>
<td>.8</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>.8</td>
<td>2</td>
<td>1.6</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>10</td>
<td>3</td>
<td>2.4</td>
<td>1</td>
<td>.8</td>
<td>1</td>
<td>.8</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>.8</td>
<td>3</td>
<td>2.4</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>12</td>
<td>3</td>
<td>2.4</td>
<td>3</td>
<td>2.4</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>13</td>
<td>2</td>
<td>1.6</td>
<td>2</td>
<td>1.6</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>14</td>
<td>4</td>
<td>3.3</td>
<td>1</td>
<td>.8</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>15</td>
<td>4</td>
<td>3.3</td>
<td>2</td>
<td>1.6</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>16</td>
<td>4</td>
<td>3.3</td>
<td>3</td>
<td>2.4</td>
<td>4</td>
<td>3.3</td>
</tr>
<tr>
<td>17</td>
<td>5</td>
<td>4.1</td>
<td>8</td>
<td>6.5</td>
<td>6</td>
<td>4.9</td>
</tr>
<tr>
<td>18</td>
<td>7</td>
<td>5.7</td>
<td>7</td>
<td>5.7</td>
<td>2</td>
<td>1.6</td>
</tr>
<tr>
<td>19</td>
<td>7</td>
<td>5.7</td>
<td>15</td>
<td>12.2</td>
<td>20</td>
<td>16.3</td>
</tr>
<tr>
<td>20</td>
<td>44</td>
<td>35.8</td>
<td>13</td>
<td>35.0</td>
<td>66</td>
<td>53.7</td>
</tr>
</tbody>
</table>

N=123

Both of the preceding tables show an overwhelming majority of students indicating high self-efficacy regardless of their performance. In the VFT Group, it was found that 12% of students indicated they did great on the corresponding self-efficacy rating while leaving at least
one vocabulary item blank on the test. Additionally, 3% of participants in the VFT group
reported a perfect score on tests despite having left test items blank. In the Story Group, these
numbers were 15% and 7% respectively.

Findings related to the number of words learned indicated similar responses between
conditions on how many words participants felt they had learned. Both groups reported around a
5.5 on a 7-point Likert scale. This falls roughly in the center of having learned “some” words and
“lots” of words.

Students did demonstrate motivation to use VFTs for future learning objectives, and
reported having more fun than the story group. The amount of effort students invested into
learning vocabulary and the motivation to use a specific medium to learn vocabulary means and
standard deviations are reported in Table 15. Results on medium types do not significantly differ
from one another, but do show a slight preference towards reading to learn vocabulary words.

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Effort</td>
<td>116</td>
<td>5.99</td>
<td>1.98</td>
</tr>
<tr>
<td>Read to Learn</td>
<td>108</td>
<td>6.19</td>
<td>1.61</td>
</tr>
<tr>
<td>Listen to Story to Learn</td>
<td>111</td>
<td>5.86</td>
<td>1.89</td>
</tr>
<tr>
<td>Use Virtual World to Learn</td>
<td>115</td>
<td>5.91</td>
<td>1.89</td>
</tr>
</tbody>
</table>

Likert Scale Items 1=Not at All, 4 = Kind Of, 7 Really Want To

Preferences related to the use of a medium specifically for vocabulary learning are listed
in Table 16. While 52.8% of students reported preferring to use computers for any reason, a
majority of students (41.5%) reported that a book would teach them the most vocabulary (16.3% for video, 35.8% for computer). A slim majority of students rated computers to be the easiest medium for vocabulary learning (41.9%) and books as the hardest medium for learning (44.7%). A slightly increased majority of students rated computers to be the most fun medium for vocabulary learning (52.8%).

Table 16
Motivation to Use Medium Frequencies

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use for any reason</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Book</td>
<td>22</td>
<td>17.9</td>
</tr>
<tr>
<td>Video</td>
<td>26</td>
<td>21.1</td>
</tr>
<tr>
<td>Computer</td>
<td>65</td>
<td>52.8</td>
</tr>
<tr>
<td>Teach you most Vocabulary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Book</td>
<td>51</td>
<td>41.5</td>
</tr>
<tr>
<td>Video</td>
<td>20</td>
<td>16.3</td>
</tr>
<tr>
<td>Computer</td>
<td>44</td>
<td>35.8</td>
</tr>
<tr>
<td>Easiest to Learn Vocabulary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Book</td>
<td>28</td>
<td>22.8</td>
</tr>
<tr>
<td>Video</td>
<td>32.5</td>
<td>34.2</td>
</tr>
<tr>
<td>Computer</td>
<td>39.8</td>
<td>41.9</td>
</tr>
<tr>
<td>Hardest to Learn Vocabulary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Book</td>
<td>55</td>
<td>44.7</td>
</tr>
<tr>
<td>Video</td>
<td>40</td>
<td>32.5</td>
</tr>
<tr>
<td>Computer</td>
<td>21</td>
<td>17.1</td>
</tr>
<tr>
<td>Most Fun to Learn Vocabulary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Book</td>
<td>22</td>
<td>17.9</td>
</tr>
<tr>
<td>Video</td>
<td>29</td>
<td>23.6</td>
</tr>
<tr>
<td>Computer</td>
<td>65</td>
<td>52.8</td>
</tr>
</tbody>
</table>

N=123
CHAPTER SIX: CONCLUSIONS

The present study investigated the utility of synthetic learning environments for vocabulary acquisition, increasing depth and breadth of vocabulary knowledge, motivating students to learn, and increasing self-efficacy in vocabulary tests. It was a preliminary investigation of an experiential learning tool that emphasized discovery based multimedia learning qualities. This tool, a SLE named VFT, was designed to provide a student’s first exposure to vocabulary words taken from a grade appropriate reader in a meaningful contextually appropriate manner.

This experiment was designed to determine if a SLE could increase vocabulary acquisition in second graders when compared to similar content delivered via a story being read aloud. Students using the SLE, the VFT saw pictures and videos associated with words; they saw them in print and in a context in which the word made sense. They also had the opportunity to experience the words in the frame of a field trip. They interacted with words and concepts in accurate and interesting ways such as through games in which tracks were matched with animals, or lizards eating bugs.

Results did not indicate an increase in vocabulary acquisition, however, the type of word knowledge measured by a matching task similar to the type used in the vocabulary test has been considered to be a receptive test (Nash & Snowling, 2006). Receptive tests were determined to measure a student’s knowledge related to a word that does not have to be clearly defined and that could be established through a process of elimination of other choices. Nash & Snowling considered a deeper understanding of a word to come from an expressive test, or one in which students provided additional information about a word such as definitions or generation of
vocabulary words from pictures. Results indicated that the VFT’s rich experiential learning environments filled with contextually appropriate and semantic cues did increase the breadth of knowledge for vocabulary words as demonstrated on a writing exercise within the deeper level of understanding required for a word to be used within a writing sample. In summary, this indicates an increase in words known at that deeper level. Therefore, it could be concluded that students who used VFTs learned words more deeply when this learning was surrounded by contextually appropriate semantic information.

Self-efficacy measures taken during the experiment were inconclusive and flawed. As self-efficacy is normally considered to be a measure of future performance, it was concluded that measuring self-efficacy immediately following performance was inappropriate and unfruitful. Furthermore, both methods of measurement seemed to elicit unlikely responses from students indicating a lack of comprehension of the instructions.

While motivation to use VFTs for future learning endeavors superseded motivation to watch videos of stories, it was also found that motivation to use a particular medium was contingent on the learning objective. In respect to learning vocabulary, a slim majority of students indicated that computers might make vocabulary learning the easiest, a slim majority of students also indicated that books would teach the most vocabulary. A slim majority of students also indicated that books would make it the hardest to learn vocabulary. This finding suggests that while students believe that computers would be fun and easy, that they recognized that books, while harder, would teach them the most.
Limitations of Current Study

While results were in some cases positive, the current study had several limitations. First, the study was completed with a limited sample coming from a single school. Second, while the two modes of presentation were equal in duration (i.e., video and VFT), results were based on a short intervention compared to the amount of classroom time that would normally be dedicated to vocabulary instruction. Also, due to the limitations of the video, this intervention did not utilize all of the VFT’s nodes or tools with no formal direction involving the notebook features that provided word pronunciation, additional context, and additional definitions. This research also did not fully consider the multimedia perspective of learning vocabulary as the stories on video tape did not include pictures or any other type of media. Finally, due to time constraints regarding the completion of this experiment prior to the delivery of instruction within each classroom on the vocabulary words introduced, the long term retention could not be collected any further in time away from the posttest than one week.

Directions for Future Research

The VFT was designed to be a discovery based SLE in which years of research regarding optimal learning strategies such as anchored and situated learning, experiential learning, interactivity, and active participation would culminate into one tool. While these characteristics surely contributed to the positive results found in the current study, the argument could be made that increased learning and deeper processing could result for more guidance within the learning environment. Kirschner, Sweller, & Clark (2006) and Mayer (2004) made sound arguments for increased learning when the constructivist approach was combined with guidance in the learning
experience. Following the constructivist approach, enhanced learning results should be a product of attention directed learning. Discovery learning might not provide sufficient structure to ensure that learning objectives are receiving sufficient attention or being attended to at all. Within the VFT this might be best accomplished by incorporating a story line. An example of a story line that could provide guidance and support to the VFT given its goal of supporting vocabulary acquisition was a scavenger hunt hosted by Ranger Randall. The items in this scavenger hunt could be vocabulary words, and their locations within the VR and within their appropriate contexts could provide further semantic information that could also deepen the learning experience. Future research efforts should be directed towards what potential benefits could be resulted by providing guided instruction and/or intelligent tutoring within the VFT.

Other directions for future research could include a series of studies in which the characteristics of the VFT could be tested in isolation or cumulatively. Specifically, adding multimedia elements to the video taped stories would allow additional conclusions to be reached regarding the role of interaction within learning tools similar to the VFT. Further investigating the role of prior knowledge and individual lexical reading level would also serve as a method for beginning to understand individual differences and the gains SLEs could make given the findings.

Finally, this research did not consider the role of the teacher or the normal teaching of the vocabulary words. Future research should consider implementation issues regarding the VFT as pre exposure, supplemental, or replacement of classroom instruction. How the VFT is imbedded into the curricula should have an impact its effectiveness.
APPENDIX A
VFT ARCHITECTURAL SPECIFICATIONS
Virtual Field Trip

Architectural Specifications
USER INTERFACE

Main Menu Interface

The main menu offers the viewer a list of several options to choose from. By Clicking on one of the options the user will be able to either start there journey, restart past journeys, save their notebook and vocabulary list or leave the program.

If the user clicks on “Start Field Trip” then the user will be able start there journey within Node 1 (Muddy Pond).

If the user clicks on “Resume Field Trip” the user will be able to pick up where they left off in the Virtual Field Trip.

If the user clicks on “Save Notebook” the user’s notebook will be saved with all information found with in the Virtual Field Trip with out losing any information.

If the user clicks on “Save Vocabulary List” the user’s vocabulary list will be saved with all information found with in the Virtual Field Trip.

If the user clicks on “Leave” the user will exit the system.
Once the user is inside the Virtual Field Trip there are icons located at the top of the screen. Each of the icons represents a different function. For instance, the bus will exit the user from the game, the notepad will let the user view their notes and vocabulary words, and the map will show the user where they are located in the Virtual Field Trip.

**Bus**

The bus icon located at the top of the interface menu is a button used for leaving the Virtual Field Trip. Once the user clicks on the bus they are taken back to the main menu.

**Notebook**

The notebook icon located at the top of the interface menu is a button used for viewing the vocabulary words. Once the user clicks on the notebook they are taken to a section that allows the user to choose from a menu of vocabulary words to view and listen to.
The map icon located at the top of the interface menu is used to inform the user of where they are located in the Virtual Field Trip. Once the user clicks on the map they are taken to a close up map that allows the user to choose where they move to. Once the user has been to a specific area a check mark appears on the map of each section to alert the user that they have completed that item.
Icons

The footprint icon located at transition points within the Virtual Field Trip allows the user to move from one node to another. The icon shows up when the mouse is rolled over the transition point.

The game controller icon alerts the user to where games can be played. When the user mouses over a hotspot for games, the icon appears and if clicked, the user will be able to play the game in that particular area.

The walkie talkie is one of the most important icons in the Virtual Field Trip. The walkie talkie serves as a mode of communication between the Ranger and the user. When the user sees the icon pop up, the ranger delivers important information about that specific section of the VFT.
The magnifying glass icon allows the user to view objects in the Virtual Field Trip that couldn’t be seen otherwise.
CHARACTERS

The ‘Nature Walk’ Virtual Field Trip includes three key characters:

- Scooter
- Ranger Randall
- Teacher

Scooter

Scooter is a virtual assistant that helps the user participate in the environment. Scooter reinforces still visuals with sound and video, acting as a pedagogical medium for the unfamiliar environment. Scooter also acts as an entertainment agent, to fill the role of an outgoing friend.
Ranger Randall

Ranger Randall is the authoritative figure within the VFT. Ranger Randall lets the viewer know the rules of the environment and plays the role of the instructor. Ranger Randall will answer questions relating to environment and provide explanatory information about specific items within the environment. The walkie-talkie provides the interface for accessing the ranger’s knowledge. Questions that pertain to the current items or areas on screen will be posed by Scooter and then answered by the ranger.

Teacher

The teacher first appears during the introduction video for the VFT. She helps provide a setting for the experience while transferring important instructional information about the various interface elements. Later, the teacher reinforces vocabulary comprehension by using vocabulary words in sentences that relate to the experiences in which those words were encountered during the virtual field trip.
**NODE DESCRIPTIONS**

Definitions

*Node:* A point in the virtual environment that encompasses a single view point area and all media which can be seen by spinning the view 360 degrees.

*Hot Spot:* An area of the view within the virtual environment that acts as a link to media. Actions occur as a result of mouse over or clicking a hotspot.

*Transition:* The act of passing from one node to another, and all the media which occurs during that time.

Overview

There are a number of areas encountered in the Virtual Filed Trip. After choosing to start a field trip from the menu, the user is first introduced to the general concept and user interfaces in the program through a non-interactive introduction video with live actors. This video is labeled Area 0. The user then enters an interactive mode in the virtual environment of Area 1, from which they can explore and access the other virtual environment areas. Following are descriptions of these areas, including activities and scripts of the voice-overs that can be encountered in each area.

Virtual Field Trip’s four areas, called Nodes.

1. Muddy Pond
2. Acorn Trail
3. Grassy Clearing
4. Cypress Creek
Overview
The video introduces the students to the notion of the field trip, and how to use the software. The students must learn the rudiments of the user interface menu, and buttons and cursors. They are also introduced to the area that they are visiting on this particular field trip (the park) -- there is a generalized portion of the introduction that explains many of the interface elements and an area-specific part.

Most second-graders today have knowledge of mice and virtual buttons. The interface resembles other buttons they have seen, so we will not go over those basic concepts. Virtual Field Trips will not make much use of the keyboard, which tends to be inappropriately-sized for children’s hands and may direct attention away from the screen.

This introductory video should be optional (click-through) for students that are already familiar with the process, or teachers on a time budget. This first introductory video will not introduce vocabulary or themes here except as it relates directly to program usage. The second video introduction module will introduce information specific to the area to be visited. It serves to introduce the students to the area they will be visiting.

Video Descriptions
The bus pulls to a stop. The kids are talking amongst themselves, playing games and talking in their seats. A teacher climbs aboard the bus, and gains the attention of the students.

Teacher: Hey everybody! Can I get you to be quiet for just a minute? [WAITS, CHILDREN GRADUALLY GET MORE QUIET] Thanks so much! I just want to show you some things you’re going to use on the field trip, okay? We have some things you can use. We want to make sure everyone knows how to use them!
You see this walkie-talkie, here? We’re going to give one of these to each of you. If you ever get lost or want to ask us about one of the things you see, just press this button here on the walkie-talkie. That way you can talk to our guide who can answer things for you, okay?

These binoculars here you can use to look at things far away, like birds in trees!

This magnifying glass is for small, close things, like bugs on the ground or tiny flowers nearby.

There are even games you will find in our field trip area! If you see a picture of a game controller, you can play a game in that place.

You might want to keep a record of the things you do and see, so you have a little notepad you can write on. Your camera will even put your photos in your notes for you, so you will remember the things you write about. Your teacher or lab helper can show you how to print out your notes!

Any time you need to take a break from the field trip, you can always come back to the bus. Just have fun and explore!

*The teacher gets off the bus here.*

If the particular field trip needs further introduction by the location-specific human guide, it should be inserted here. In the case of the State Park visit, the location-specific guide is a Park Ranger. He explains to the students what will be found within the Virtual Field Trip.

<RANGER> Hello there. You’re going to be visiting a state park today! This is a special place that the state government saves for people like you and your families to relax and get to know our state’s wildlife. Be sure and keep your trash cleaned up so the park stays pretty for future visits, and don’t take any flowers or rocks home with you—everything has a special job it needs to do here!

I’m also going to give you one word of warning: please look but don’t touch! Some of the plants are poisonous, and some of the animals are dangerous to touch. They’re not trying to be mean, they’re just trying to protect themselves. But you don’t want to get in their way when they are trying to protect themselves, because they might hurt you on accident! If you respect the wildlife and stay in your groups while you explore the park, you will be safe while you’re having fun!

If you watch carefully, there are quite a lot of things to see! See how many different animals and plants you can recognize! They are a little different in every place in every park, which makes every park special.

Now if you have any questions, or just want to chat, just use the walkie-talkie your teacher showed you! I will be glad to answer any questions you have.
Node Overview

Node name & number: Area 1, Muddy Pond
Shooting location: Lake Jessup
Background sounds: N1BG01_ambience, N1BG01_birds
Exits to other Nodes: Transition to Area 2

Concepts that are introduced by this section are:
- Animal tracks and human tracks
- Imprints in mud
- Evidence of organisms and activities not directly seen

Media
QuickTime VR still: pond-side location including mud with footprints in it; a place where the pond opens up, two paths away from the node, one with footprints in it.
Flash mini-game: matching tracks to the appropriate animal
Transition Video: to Node 2

Node Vocabulary
A list of vocabulary words have been chosen to be represented in this environment. The vocabulary words were compiled by using Florida’s FCAT standards and several grade level education books.
<table>
<thead>
<tr>
<th>Across</th>
<th>Banks</th>
<th>Birds</th>
<th>Deeper</th>
<th>Edge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fox</td>
<td>Human</td>
<td>Mud</td>
<td>Mussels</td>
<td>Pebbles</td>
</tr>
<tr>
<td>Pond</td>
<td>Quiet</td>
<td>Raccoon</td>
<td>Shallow</td>
<td>Slipped</td>
</tr>
<tr>
<td>Squishy</td>
<td>Stone</td>
<td>Swim</td>
<td>Touch</td>
<td>Tours</td>
</tr>
<tr>
<td>Tracks</td>
<td>Trail</td>
<td>Turtle</td>
<td>Uses</td>
<td>Wade</td>
</tr>
<tr>
<td>Swim</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Node Diagram**

**Hotspot Descriptions**
(Filenames have the form: N#BG##_description, where “N#” is the node number.

1. Human Footprints, Looking back at the trail where you came from
Vocabulary: human, tracks, trail, tour
Description
Looking down, student sees a number of fresh tracks in the mud. Human footprints lead from the entry bus area to the view area. As long as all the nodes remain unvisited, the Friend insists on staying.

Cursor: walkie-talkie
Graphic: N1HS01_ourtracks.png
Sound: N1FX01_squish.wav
Action:
Play Sound N1VS01_camefrom.wav

<FRIEND> That’s where we came from, look at the tracks of our shoes on the trail!
<RANGER> Humans leave tracks just like animals do.
<FRIEND> There’s so much more to see on our tour, let’s keep looking around.

2. Mussels, finding mussels a raccoon has been eating

Vocabulary: mussel, raccoon, uses

Description
In an area near the, some mussels lay cracked open on the ground with raccoon tracks around it. This reinforces the idea that animals come to the water for different reasons (food).

Cursor: walkie-talkie
Graphic: swap N1HS02_raccoon.png
Sound: N1FX02_musselcrack.wav
Action:
Play Sound: N1VS02_mussel.wav

<RANGER> Everybody has to eat, even raccoons. They like to eat mussels from the water. He uses a stone to crack them open!

3. Turtle, Slips into the water from a stone

Vocabulary: swim, turtle, stone, slipped

Description
To the left of the tracks matching, a turtle sits on a rock, sunning itself.

Graphic: N1HS03_turtle.png
Cursor: walkie-talkie
Sound: N1FX03_turtle.wav
Action
Play Graphic: N1HS03_turtlemoving.png

When she notices our presence, she slips into the water with a “plop.” Afterwards, the turtle’s head can be seen bobbing in the water. This reinforces the presence of animals that live by the water.

Play Sound: N1VS03_turtlesunning.wav

<RANGER> There are loads of animals here, look at that turtle sunning it’s self on a stone!
<FRIEND> Do all animals come here just to drink?
<RANGER> No, silly! Some animals live most of their lives in the water. Some of them can swim better than we can!
<FRIEND> Aww, there he goes, he slipped into the water…

4. Lake Edge, Looking Across the Water
Vocabulary: wade, shallow, edge, pond, touch, deeper, quiet, swim, across, pebbles
Description
Off a little ways from the muddy area, a lake can be seen shimmering in the sunlight.

Graphic: N1HS04_wading.png
Cursor: magnifying glass
Sound: N1FX04_water
Action
Play Sound: N1VS04_wading.wav
Play Video: N1HS04_wading.mov
As an intro to the pond scene, the camera should transition through the reeds (perhaps just a 3-4 second montage) to the pond. At the pond, video shows some rocks being picked up out of the mud of the bank, mud swirling up from the bottom and around the fingers, to show the shallowness of the water. The sound of the fingers splashing into the water should be apparent. While this is happening, dialog occurs:

<FRIEND> Boy, the water sure is shallow on the bank of the pond. That’s what the edge of the pond is called. I can touch the bottom! You can even reach down and grab some pebbles!

The view then looks up to show a person fishing further out in a boat. This introduces the concept of changes in water depth and the ability to see long distances over the water, versus the closed confines of the woods. Trees and shrubs usually block extended sight, but bodies of water provide an extended flat surface that give us a vista on far places.

<RANGER> Look how far you can see across the water… sure is quiet out here!
Camera focuses on the fisherman, who has a fishing pole and life jacket.

<RANGER> Do you see that person in the boat? He’s fishing. The water must be much deeper out there, because he’s in a boat and can’t wade.

<FRIEND> Good thing he has that life jacket. If he fell in the water, he’d have to swim!

5. Animal Tracks, walking in the mud
Vocabulary: mud, squishy, pond, birds, beautiful, fox
Description
Looking down, student sees a number of fresh animal tracks in the mud.
Cursor: game-controller
Graphic: N1HS05_tracks.png
Sound: N1FX02_squish.wav
Action
Play Sound N1VS01_camefrom.wav
<FRIEND> “Ewww! Gross. It’s all cold and wet and squishy! Put your hand in it, I dare ya! Imagine what the birds’ feet felt like in this stuff. Hey! The mud is all over our shoes!”<RANGER> You’ve found some animal tracks? You must be by the pond then! Most of the animals go there for a cool drink of water. The squishiness of the wet mud makes animal tracks stay put much better than in dry dirt! Is it a bird, a fox, a raccoon? How many toes are there? Animals leave all kinds of clues that they’ve been there.

Play Game Flash Tracks Matching Game
This game works well with scoring, although it doesn’t necessarily have to. It’s not time-dependant, so it should be fine for students that don’t have advanced motor skills.

Clicking on the animal tracks in the VR scene should activate a matching game. There is a set of animal tracks on the left side of the screen (horse, dog, bird, cow, fox), and a set of animals on the right side of the screen. Click a track and drag it onto an animal to attempt a match. When a match is made, the name of the animal in text should pop out of the animal’s picture, and be pronounced in audio before fading away. The animal should move around to signify the match as well. If the match was not made, the tracks graphic should snap back to its original position, and the friend’s voice should say, “Wait, that’s not it. Let’s look again.”

When the game is completed before returning to the VR:

<FRIEND> “Well, we think we figured out what animals made these tracks! I wonder if we’ll see more of them around? I hope so!”
Area 2: Acorn Trail

Node Overview
Node name & number: Area 2, Acorn Trail
Shooting location: Blanchard Park
Background sounds: N2BG01, N2BR01…
Exits to other Nodes: Face 1: Transition to Node 1
Face 2: Transition to Node 4
Face 3: Transition to Node 3

Concepts that are introduced by this section are:
- Food, who eats what
- Animal homes
- Insect homes and places

Media
QuickTime VR still: Shady area with trails, a log with insects under it, flowers, an eggshell, and a squirrel
Flash mini-game: squirrel gathering food
Transitions: video to Area 1- Muddy Pond, to 3-Grassy Clearing, and 4- Cypress Creek

Vocabulary in this Area
A list of vocabulary words have been chosen to be represented in this environment. The vocabulary words were compiled by using Florida’s FCAT standards and several grade level education books.
### Node Diagram

<table>
<thead>
<tr>
<th>Acorns</th>
<th>Ants</th>
<th>Bees</th>
<th>Beetles</th>
<th>Busy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dragonflies</td>
<td>Egg</td>
<td>Hibernate</td>
<td>Important</td>
<td>Insects</td>
</tr>
<tr>
<td>Logs</td>
<td>Nuts</td>
<td>Pollinate</td>
<td>Project</td>
<td>Shell</td>
</tr>
<tr>
<td>Space</td>
<td>Squirrels</td>
<td>Stingers</td>
<td>Termites</td>
<td>Year</td>
</tr>
</tbody>
</table>

### Hotspot Descriptions

**1. Squirrels**

**Vocabulary:** squirrel, acorn, task, hibernate, later, year, nuts

**Description**

There is a squirrel on the ground, just sitting in the shade.

**Graphic:** N2HS01

**Cursor:** game-controller

**Sound:** N2FX01
Action
Play Sound: N2VS01
<FRIEND> Wow, these squirrels are in a hurry to gather as many acorns as they can!
<RANGER> After they finish their task, they hibernate all through the winter and don’t wake up until much later. They can sleep a long time, until next year!
<FRIEND> But now those squirrels need to find those nuts, and fast!

Play Game: Flash Squirrel Game, gather the acorns
This provides a competitive game with scoring in a short interactive lesson about hibernation and squirrels.

This game opens with two squirrels in a sort of race to gather acorns before the winter. The user clicks on the acorns and their squirrel hops over and gathers that acorn, then the user clicks a hole in their tree and the squirrel stores the acorn away. There is a second squirrel that also gathers acorns. This goes on until all the nuts are gone, then both squirrels go into their holes. A short animation of the leaves falling and snow happens, while the squirrels sleep, and then they each come out of their holes, either skinny and a little sad or healthy and happy, depending on how many nuts they gathered before the winter.

2. Buzzing Bees, Flower with Bees
Vocabulary: bees, stingers, protect, pollinate, busy, insects

Description
When the student passes by a flower patch, a sound of bees buzzing is triggered.

Graphic: N2HS02
Cursor: walkie-talkie
Sound: N2FX02
Action
Play Sound: N2VS02
When the student clicks on the flowers, the friend’s voice warns the student...
Play Movie
<FRIEND> Careful! I hear bees in there! Bees don’t like to eat wood, they like to eat the nectar in flowers. But when you make bees frightened or mad, they’ll come and prick you with their stingers! It really hurts! I got stung by a bee once.
<RANGER> You’re right, bees have stingers to protect themselves. They aren’t very big, so they have to have something to keep them safe from bigger animals!
<FRIEND> We should squash them! Bees scare me!
<RANGER> Don’t hurt the bees—bees make honey for your sandwiches and toast and dessert! If you leave them alone to find their food in the flowers, the bees will help us to pollinate our orange trees and other good things.
<FRIEND> What’s “pollinate”?
<RANGER> Well... I think that’s easier to explain when you find some flowers without busy bees! Find some flowers without bees and I will tell you about how flowers work with bees and other insects!

<FRIEND> Let’s find some bee-free flowers!

3. Log, Learning where insects live

Vocabulary: logs, insects, ants, termites, beetles, dragonflies, important, space

Description
An old log is seen on the ground.

Graphic: N2HS01
Cursor: walkie-talkie
Sound: N2FX01

Action
Play Sound: N2VS01
When the student clicks on an old log in the area, they can hear bugs crawling around.

<FRIEND> Whoa! Bugs all over the place!

<RANGER> Old logs are just one of the places where a lot of insects make their homes and find their food.

<FRIEND> Food? Where’s the bug food? I don’t see any food!

<RANGER> Bugs eat different foods than humans do. Ants and termites and beetles eat plants and logs. Other bugs, like bees, drink from flowers, and dragonflies eat mosquitoes and other bugs!

<FRIEND> They eat bugs?! Gross!

<RANGER> You may think it’s gross, but some animals really like to eat bugs, just like bugs like to eat leaves and wood and other bugs! It’s important to have some bugs around for things like birds and snakes to eat. You wouldn’t want them to be hungry, would you?

<FRIEND> How can they live under a log?

<RANGER> Most bugs can fit in a small space. The log helps keep them warm there. Of course, not all bugs live under logs! Dragonflies live around water, and some insects live in flowers or holes in the mud!

4. Eggshell, broken and sitting on the ground

Vocabulary: egg, shell

Description
An egg shell is sitting on the ground, broken open. It is empty.

Graphic: N2HS04_eggshell.png
Cursor: walkie-talkie
Sound: N2FX04

Action
Play Sound: N2VS04
<FRIEND> Look! Is that an empty egg shell? The baby bird that grew in it must have already hatched, and the shell fell onto the ground! I wonder where the baby bird is now?
<RANGER> Maybe she grew up and flew away!
Area 3: Grassy Clearing

Node Overview
Node name & number: Area 3, Grassy Clearing
Shooting location: Blanchard Park
Background sounds: N3BG01, N3BR01…
Exits to other Nodes: 4: Transition to Node 2

Concepts that are introduced by this section are:
- Animal food
- Insects as part of the forest
- Camping

Media in Node
QuickTime VR still: Grassy clearing with a trail, a few logs around, birds, a nest, and a tent
Flash mini-game: squirrel gathering food
Transitions: video to Area 2- Acorn Trail

Vocabulary
A list of vocabulary words have been chosen to be represented in this environment. The vocabulary words were compiled by using Florida’s FCAT standards and several grade level education books.

<table>
<thead>
<tr>
<th>Acorns</th>
<th>Active</th>
<th>Beautiful</th>
<th>Bees</th>
<th>Beetles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berries</td>
<td>Birds</td>
<td>Blueberries</td>
<td>Brood</td>
<td>Bustle</td>
</tr>
<tr>
<td>Dangles</td>
<td>Dragonflies</td>
<td>Habitat</td>
<td>Lantern</td>
<td>Messy</td>
</tr>
<tr>
<td>Moss</td>
<td>Mother</td>
<td>Nest</td>
<td>Oak</td>
<td>Seeds</td>
</tr>
<tr>
<td>Snore</td>
<td>Squirrel</td>
<td>Tent</td>
<td>Termites</td>
<td>These</td>
</tr>
<tr>
<td>Those</td>
<td>Trees</td>
<td>Photographer</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Hotspot Descriptions

1. Log with Bugs

Vocabulary: active, bustling

Description
An old skinny pine log laying on the ground, bark is falling off and there are holes in it.

Graphic: N3HS01
Cursor: game-curser
Sound: N3FX01
Action
Play Sound: N3VS01

<RANGER> Under the log, bugs are always active eating and bustling around.
<FRIEND> Run away, little bugs!

Play Game: Flash Game, Bugs as Lizard food
Students that dislike competitive or timed games might like this game.

A close up of the log with a bunch of holes is shown with bugs all over it and a lizard. Insects are crawling around going in and out of the holes. Chasing an insect with the lizard causes it make a little noise and move to a different part of the log. If you catch the bug, then the lizard eats it with a little slurp. This is a sort of score-free game meant to be more of an interactive activity.

2. Acorns, Finding Animal Food
Vocabulary: these, acorns, squirrel, oak, seeds
Description
A few acorns can be seen on the ground, some bounce as they fall down there.
Graphic: N3HS02
Cursor: walkie-talkie
Sound: N3FX02
Action
Play Sound: N3VS02
When the student clicks a spot on the ground with some acorns, their friend notes what they’ve found.

<FRIEND> Aren’t these acorns squirrel food? I think the ranger said squirrels eat seeds... They don’t eat people food!
<RANGER> And acorns are oak tree seeds! I bet we can see some young oak trees that came from acorns that the squirrels forgot.

3. Finding a simple Nest
Vocabulary: nest, messier, dangles, those, moss
Description
A nest is visible up in a tree, leaves occasionally fall down around it.
Graphic: N3HS03
Cursor: walkie-talkie
Sound: N3FX03
Action
Play Sound: N3VS03
In one of the trees in the area, a nest is found. The tree also has moss clumps in it, which may look similar to the nest.

<FRIEND> Look! A nest.
<RANGER> Did you find a nest? If there are more twigs than leaves, and it looks woven together, it is probably a bird nest. Squirrels’ nests are messier, they just pile the leaves deep in the meeting of branches!
<FRIEND> What are all those other clumps in the trees? That one hangs down and dangles really far! Is it a nest?
<RANGER> Hmm, no, that is probably just moss, which is a type of plant that grows on things like trees and stones.

4. Bird in a Tree

Finding a Bird in a Tree

Vocabulary: berries, blueberries, brood, mother, bird, father

Description
When the student looks up at a tree, they can hear a bird noises and see birds on a branch.

Graphic: N3HS04
Cursor: walkie-talkie
Sound: N3FX04
Action
Play Sound: N3VS04

<RANGER> Oh! That’s a bird! It’s probably eating some of the bugs and seeds in the area. Or maybe some berries… blueberries are very tasty for birds! It could be a father bird searching for lots of food so he and a mother bird can feed their brood of baby birds.

5. Tent, Sleeping Camper

Vocabulary: snore, tent, lantern, trees, beautiful, photographers

Description
A tent is sitting in the clearing, snores are emanating from within. A camera tripod and a camping lantern are visible beside the tent.

Graphic: N3HS05
Cursor: walkie-talkie
Sound: N3FX05
Action
Play Sound: N3VS05

The tent here has a few accessories outside it: a lantern and a backpack. If the student looks at the tent, a loud snore and a groan will come out of the tent.

<FRIEND> What is that sound?
<RANGER> It sounds like a snore from a sleeping person.
<FRIEND> I think it is coming from that tent!
<RANGER> It may be one of our many park guests that like to go camping, maybe one of those photographers! They live in our parks in those tents while they take pictures of the beautiful natural environment. They camp for weeks sometimes. I bet she is taking a nap before doing more work.

<FRIEND> But what about the lamp? I don’t see a place for batteries or anything!
<RANGER> Be careful! That lantern there may be very hot because it uses fire instead of electricity.

<FRIEND> That’s silly! Why don’t they plug it in?
<RANGER> There are no plugs or electricity out here.

<FRIEND> Ha! I guess trees don’t need electricity!

6. Log Bug Matching Game
Vocabulary: bees, dragon flies, beetles, termites, habitat

Description
A log is laying on the ground.

Graphic: N3HS06
Cursor: walkie-talkie
Sound: N3FX06

Action
Play Sound: N3VS06
  <FRIEND> Wow, look at all the kinds of bugs!
  <RANGER> Bees, dragonflies, beetles and termites all eat different things in their habitat.
          And they sure are different when you see them up close!

Play Game Flash mini-game: Matching Insects
This is a matching game to improve student identification skills so that the insects become more
than general “bugs.” Included are ants, bees, butterfly, and dragon flies. The game should be
found on an old log.
The game opens with a close-up of a tree. The insect names are placed on a tree spaced around.
Insects, (Bee, dragonfly, ant, lovebug, butterfly) are on the right. The student is instructed to drag
the insect to its name. They receive encouragement upon unsuccessful attempts and positive
feedback on successful attempts. The insect remains on the tree after they are matched, and their
name is spoken aloud and the written word is flashed.
Area 4: Cypress Creek

Node Overview
Node name & number: Area 4, Cypress Creek
Shooting location: Blanchard Park
Background sounds: N4BG01, N4BR01…
Exits to other Nodes: Face 3: Transition to Node 2

Concepts that are introduced by this section are:
- Stages of life and growth in plants
- Methods of seed transport
- Pollination
- Animal Movement

Media
QuickTime VR still: Area next to a creek, cypress tree and bushes nearby
Flash mini-game: squirrel gathering food
Transitions: video to Area 2- Acorn Trail
Node Diagram
**Vocabulary**

A list of vocabulary words have been chosen to be represented in this environment. The vocabulary words were compiled by using Florida’s FCAT standards and several grade level education books.

<table>
<thead>
<tr>
<th>Clearing</th>
<th>Frog</th>
<th>Grass</th>
<th>Later</th>
<th>Pollen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scent</td>
<td>Stamped</td>
<td>Streams</td>
<td>Wind</td>
<td></td>
</tr>
</tbody>
</table>

**Hotspot Descriptions**

1. **Stream**
Description:
Moving water can be seen behind the cypress tree.

Graphic: N4HS01
Cursor: magnifying glass
Sound: N4FX01
Action
Play Sound: N4VS01
Play Movie:
A close up of the water in the stream is shown. You can see it trickling over the cypress roots and knees.

2. Finding Bee-free Flowers

Vocabulary: bees, pollen, flowers, wind, birds, rivers

Description
A patch of flowers blowing in the wind can be seen next to the pathway.

Graphic: N4HS02
Cursor: walkie-talkie
Sound: N4FX02

Action
Play Video: N4VS02
A video event will be triggered. The video will show a plant in bloom and a plant in seed, and explain about the different life stages that happen for plants, as well as the transport methods that plants use to get their seeds from place to place.

<FRIEND> Here’s some flowers without bees. Maybe the ranger can tell us about that “pollegrate” or whatever word it was.
<RANGER> That’s “pollinate”! Pollination means to take the pollen from one flower and bring it to another, fertilizing the flowers so it will make seeds! Seeds come from flowers.

<FRIEND> What’s pollen then?
<RANGER> Pollen is that yellow dusty stuff you find in spots inside the flower. It’s on one of the flower’s parts.

<RANGER> The bees actually go into the flower to sip its nectar, a tasty sweet liquid like pancake syrup. Then pollen gets stuck to their furry little legs, and carried to other flowers... plants can’t walk around, right? So they also need animals and wind and rivers to carry their pollen and seeds for them.

<FRIEND> Wind carries seeds... Do bees carry seeds?
<RANGER> No, bees carry pollen... But squirrels and birds carry seeds! I bet you can find a squirrel’s stash of acorns nearby... Acorns are oak tree seeds, carried and buried by squirrels!

3. Smelling Wet Plant Matter

Vocabulary: scent

Description:
Wet and decaying plants have a very distinct smell. The humidity of the air isn’t really smelled, but contributes to the heaviness of the smell. Decaying plant matter also smells different from human garbage or animals. A wet plant can be seen by the creak.

Graphic: N4HS03
Cursor: walkie-talkie
Sound: N4FX03
Action
Play Sound: N4VS03

<RANGER> There must be a stream or a pond nearby because it smells like wet plants. Water makes plants smell more strongly, especially messy dead leaves. The scent is earthy and a little sweet, like a forest after a rain. It’s one of my favorite scents!

4. A Small Path

Vocabulary: path, hike, grass, stamped

Description
A trail that is not well marked and very small, an animal trail.

Graphic: N4HS04
Cursor: walkie-talkie
Sound: N4FX04

Action
Play Sound: N4VS04

<FRIEND> Hmm...
<FRIEND> Is that the way back?
<RANGER> Is there a spot that looks like a little path? It could be a trail that animals use.
<FRIEND> Animals have trails? Like the ones we took to get here?
<RANGER> Yes, people hike in the woods along trails where it is easier to walk and so they don’t get lost. Animals also like to walk where it is easier, so they will walk where other animals have already gone. This means that the grass and plants get stamped down, and so forms a path.

5. Frog Encounter

Vocabulary: frog, clearing

Description
In a clearing a frog is visible expanding his throat pocket, making a frog croaking call. When you ask the ranger about the frog:

Graphic: N4HS05
Cursor: walkie-talkie
Sound: N4FX05

Action
Play Sound: N4VS05

<FRIEND> A frog… I hear if you kiss a frog he’ll turn into a prince!
<RANGER> No, silly, this frog in a clearing would rather jump around and eat bugs than kiss you!
<FRIEND> Phew, I didn’t really want to kiss a frog anyways!
SOUND DESIGN

Why is sound important and what does it bring to the project?

Sound creates mood, evokes, emotion, sets tempo and can bring an environment to life. As a synthetic environment, the VFT has sound and sound effects embedded into it to create an enhanced sense of realism.

Why are sound effects important?

A sound effect imitates a sound. Sound effects are very important to any form of video because they give life to the video. In the VFT it is important to hear the birds, frogs, and wind in the background. If these sound effects were missing, an important sensory experience would also be missing.

How were the files saved?

Sound files were saved in uncompressed audio files. These files were saved in the following formats:

- wav (developed by windows)
- aiff (developed by apple)
SOUND EFFECTS

Sound Overview

Ambient Sounds: Background sounds used to add enhanced reality.  
Dialog: A conversation between two or more people.  
Designed Sounds: Sounds that do not exist within the range of human hearing. Examples are movements of tiny bugs.  
Foleyed Sound Design: Sounds that can’t be easily recorded or bought from a sound library that need to be created by using ordinary object to create similar sounds.  
Hard Sound Effects: A sound that is included because it is expected given the accompanying media. An example would be seeing a tree fall, and hearing it fall simultaneously.  
Music: An artistic form of auditory communication incorporating instrumental or vocal tones in a structured and continuous manner.  
Sound Effect: Effect that imitates a sound.

Sounds

Area 1 Muddy Pond

1.1 Looking back at the trail where you came from (tracks on ground)  
N1BG01_ambience  
N1BG01_birds  
N1FX01_squish.wav  
N1VS01_camefrom.wav  
2.1 Finding mussels a raccoon has been eating (mussels and tracks on ground)  
N1FX02_musselcrack.wav  
N1VS02_mussel.wav  
3.1 Turtle Slips into Edge of Water (turtle sunning on stone)  
N1FX03_turtle.wav  
N1VS03_turtlesunning.wav  
4.1 Wading near the Bank (looking out across the water)  
N1FX04_water.wav  
N1VS04_wading.wav

5.1 Mud with Tracks (tracks on ground)  
N1FX01_squish.wav

Area 2 Acorn Trail

N2BG01_  
N2BR01_  
1.2 Hot Squirrel Action (game, that is)  
N2FX01_  
N2VS01_  
2.2 Flowers with Bees
3.2 Log with Bugs (turning over a log)

4.2 Eggshell on the Ground

Area 3 Grassy Clearing

1.3 Log with Bugs (scaring bugs game)

2.3 Finding Animal Food (acorns)

3.3 Finding a Simple Nest

4.3 Finding a Bird in a Tree

4.3 Sleeping Camper in a Tent

5.3 Log Bug Matching Game

Area 4 Cypress Creak

1.4 Stream

2.4 Finding Bee-free Flowers

3.4 Smelling Wet Plant Matter

4.4 Find Path (smaller, not for humans)
5.4 Frog Encounter
COMMONLY ASKED QUESTIONS

What is the Virtual Field Trip?

The Virtual Field Trip captures a real world environment combining it with technology to creating a virtual world. The world will be a 360 degree view allowing the user to view the up, down, side to side, front and back. The world is combined of pictures and video from the real world. Then from a technological stand point take the real world images place them into various computer programs to create a virtual world.

Why create a Virtual Field Trip?

The Virtual Field Trip was created to help students who will never get the change to experience these sorts of environments due to funding cut backs. In the past few years school funding has been cut dramatically. As a result of this funding for school field trips are no longer available. Since The University of Central Florida is one top school’s for technology our main goal is to utilize advanced, interactive dynamic media approaches in classroom-based settings to produce a technology-enhanced classroom environment that is more effective in teaching targeted material and also more motivating to students.

Where does the Virtual Field Trip take place?

The Virtual Filed Trip takes place in a local Florida park. There are four main sections the student will be allowed to explore. The four main sections consist of a pond, trail, clearing, and a creek. Each of the sections consist educational information such as animal tracks, animal/insect hibernation, animal food, and plants.

What do I control?

The Virtual Field Trip allows the viewer to control a few areas of the environment. The viewer will be allowed to move around the environment controlling what view they are seeing at the moment. The view will also be able to control what section of the VFT they are located at. Examples are if the view is near the pond and looks down, foot prints will be found. Once the viewer is done learning in that particular area he/she will be able to control what environment they would like to learn about next by clicking in the hotspot to the next environment.
What is the main focus of the Virtual Field Trip?

The Virtual Field Trip project was established upon the firm belief that digital media can be an important tool to reduce the amount of time teachers spend trying to introduce students to real-world concepts. As students' family life and environments continue to change, many of them are now lacking in the real-world experiences that normally would be supplied by travel and tutelage from older family members. The establishment of standardized testing within lower-level schools has revealed that much of the missing experiences is translating into poor scores in reading comprehension. Virtual reality simulation technologies can go a long way to fill the missing experience opportunities of these students.

Virtual Field Trips should reduce the time spent developing reading comprehension by populating general knowledge of a child's world. With those goals in mind, we can look for certain measures of success -- guidelines that will tell us if we are meeting our project goals.

The Virtual Field Trip has the potential to become a great learning experience. There are many other virtual reality game based projects out there at the moment. The VFT is looking to surpass those games by introducing several new aspects. The projected aspects will affect the way a student takes away from the VFT also affecting the way the teacher teaches.

- Reduce the time a teacher spends on comprehension issues.
- Provide sufficient proof that a teacher or administrator can justify this technology purchase by documenting learning gains.
- Meet or exceed the caliber of quality that is standard for the industry of educational games.
- Increase educational value above a traditional field trip, showing times and locations that normally would not be able to be shown together.
- Engage the child to make them more investigative, spawning extracurricular learning.
- Provide a fully immersive environment around vocabulary items by providing proper social, intellectual and physical context in the environment important to the development of connotative knowledge.
August 24, 2006

Dear Parent/Guardian:

Your child’s classroom has been selected to participate in a study being conducted by the University of Central Florida! The research project seeks to determine the effectiveness of the Virtual Field Trip, an educational simulation based vocabulary enhancer loaded with fun characters, games, and discovery learning. The Virtual Field Trip is about a field trip to the woods, and was designed to increase a student’s ability to learn words related to nature by providing experiences.

With your consent, your child will be assigned to one of two groups. One group will use the computer simulation, while the other will listen to Field Trip Stories, which include all of the Virtual Field Trip’s characters and discoveries. The researcher will compare the results of 3 vocabulary tests and two writing assignment to see if either group has learned the vocabulary better. Participation in this experiment will take approximately 2 hours of class time, and the results of the tests will in no way impact your child’s grade. If you do not authorize your child to participate in this study, data regarding your child will not be included in the study’s results.

In order to best describe the group of children participating in this study, we also ask that you complete the short survey attached. If you would like to participate in this study and also consent to your child’s participation in this study, please complete and sign both of the attached Informed Consent forms where indicated and the short survey and return them to school with your child in the enclosed envelope. Your completion of the survey does not impact your child’s ability to participate in the Virtual Field Trip study.

Thanks for being a part of this important research!

Sincerely,

Alicia Sanchez

Your and your child’s name, the names of his/her teachers, and the name of your child’s school will be kept confidential and will not be used in any report, analysis, or publication. You and your child will be allowed the right to refuse to answer any questions that make you and/or him/her uncomfortable, and you and/or he/she may stop participating in this research at any time. No compensation of any type will be awarded to participants in this study. You may contact the researcher, Alicia Sanchez, at 407-592-8905 or email at sanchez@mail.ucf.edu.
Informed Consent Form 1 – Adult Participants

Introduction to Study:
This research, “Increasing Vocabulary Through Synthetic Learning Experiences: Implementing Virtual Field Trips Into Classrooms,” is being conducted by principal investigators, Alicia D. Sanchez from the University of Central Florida. The objective of this project is to apply advanced computer-based instructional programs to promote elementary school students’ vocabulary by providing them with a meaningful context with which to understand the concepts presented in their curriculum. We hypothesize that Virtual Field Trips (VFTs) designed to specifically enhance elementary school students’ real world knowledge of different environments and experiences will better enable them to build their vocabulary and facilitate their understanding of grade-level reading material.

In this research, your child may be asked to proceed through computer-based instruction using the VFT computer program created for this study. This program involves using the computer’s mouse to navigate through a “virtual field trip” based on stories from his/her reading text. Your child’s teacher will regulate the specific time spent on the computer, which will be, on average, up to 20 minutes per day. Additionally, a researcher will observe your child while he/she is interacting with the VFT computer program. You will be asked to complete a demographic information survey. Your child will be asked to complete 3 vocabulary tests throughout the testing period and to write a paragraph about a hypothetical field trip to the woods. Your child will be asked to complete a questionnaire that asks how he/she liked using the VFT computer program and if he/she learned from the program as well as how program made him/her feel. You will also be asked to complete a questionnaire soliciting your input as to your child’s reaction to the VFT computer program. The time commitment for your involvement in filling out all relevant forms will be approximately 3 hours for your child, and 20 minutes for your completion.

Potential Benefits and Anticipated Risks:
Potential benefits from participation in this study may include the increased vocabulary acquisition, depth of processing of vocabulary, and mastery of vocabulary either through use of computer based technology, or additional exposure to reading materials for students. No compensation of any type will be awarded to participants in this study. Participation in the current study does not involve any risks other than those commonly associated with the use of computer display terminals. No other physical, psychological, or economic harm is anticipated.

If you believe you or your child has been injured during participation in this research project, you may file a claim with UCF Environmental Health & Safety, Risk and Insurance Office, P.O. Box 163500, Orlando, FL 32816-3500 (407) 823-6300. The University of Central Florida is an agency of the State of Florida for purposes of sovereign immunity and the University’s and the State’s liability for personal injury or property damage is extremely limited under Florida law. Accordingly, the University’s and the State’s ability to compensate you for any personal injury or property damage suffered during this research project is very limited.

Information regarding your rights as a research volunteer may be obtained from:
Institutional Review Board (IRB), University of Central Florida (UCF)
12201 Research Pkwy, Suite 501, Orlando, FL 32826-3246
Telephone: (407) 823-2901 OR (407)882-2276

Confidentiality of Personal Data:
All data you contribute to this study will be held in strict confidentiality by the researchers and will be kept under lock and key; that is, your individual data will not be revealed to anyone other than the researchers and their immediate assistants.
To insure confidentiality, the following steps will be taken: (a) Only researchers will have access to the data in paper or electronic form. Data will be stored in locked cabinets; (b) Actual data will not contain names or other personal
information. Instead, the data on the forms will be matched to each participant by a number assigned by and only known to the researchers; (c) Only group means scores and standard deviations, but not individual scores, will be published or reported; (d) No information will be shared with local agencies or schools unless specifically requested in writing.

YOUR PARTICIPATION AS WELL AS YOUR CHILD’S PARTICIPATION IN THIS RESEARCH IS COMPLETELY VOLUNTARY. YOU MAY WITHDRAW FROM PARTICIPATION AT ANY TIME WITHOUT PENALTY. THIS INCLUDES REMOVAL/DELETION OF ANY DATA YOU MAY HAVE CONTRIBUTED.

If you have any questions regarding the study being conducted, or the information provided on this form, please contact:

Jan Cannon-Bowers, Ph.D., Associate Professor - Film & Digital Media Program, Institute for Simulation and Training, University of Central Florida, 3280 Progress Drive, Orlando, FL 32826; Voice: 407-882-1300 or 407-882-1483; Email: janch@dm.ucf.edu.

If you agree to participate, please sign the next page. You may tear off and keep this first page for your own information about the study and return the signed sheet in the envelope provided.
I voluntarily agree to participate in the study, “Increasing Vocabulary Through Synthetic Learning Experiences: Implementing Virtual Field Trips Into Classrooms,” conducted by principal investigator, Alicia D. Sanchez from the University of Central Florida. I understand all of the above information and I understand that I may withdraw myself or my child from the study at any time without penalty. I have read the procedure described above and have received a copy of this form. I will be given the opportunity to ask the researchers any questions I may have about the study.

____________________________________  ______________________
Signature                                    Date

____________________________________  ______________________
Print Name                                    Date

Relationship to Student

____________________________________
Student’s Name (Printed)

____________________________________
Age of Student

Clarcona Elementary

School Name

____________________________________
Principal Investigator, Alicia Sanchez    Date
Informed Consent Form – Parental Consent

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This research, “Increasing Vocabulary Through Synthetic Learning Experiences: Implementing Virtual Field Trips Into Classrooms,” is being conducted by principal investigators, Alicia D. Sanchez from the University of Central Florida. The objective of this project is to apply advanced computer-based instructional programs to promote elementary school students’ vocabulary by providing them with a meaningful context with which to understand the concepts presented in their curriculum. We hypothesize that Virtual Field Trips (VFTs) designed to specifically enhance elementary school students’ real world knowledge of different environments and experiences will better enable them to build their vocabulary and facilitate their understanding of grade-level reading material.

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information. Instead, the data on the forms will be matched to each participant by a number assigned by and only known to the researchers; (c) Only group means scores and standard deviations, but not individual scores, will be published or reported; (d) No information will be shared with local agencies or schools unless specifically requested in writing.

YOUR CHILD’S PARTICIPATION IN THIS RESEARCH IS COMPLETELY VOLUNTARY. YOUR CHILD MAY WITHDRAW FROM PARTICIPATION AT ANY TIME WITHOUT PENALTY. THIS INCLUDES REMOVAL/DELETION OF ANY DATA YOUR CHILD MAY HAVE CONTRIBUTED.

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Jan Cannon-Bowers, Ph.D., Associate Professor - Film & Digital Media Program, Institute for Simulation and Training, University of Central Florida, 3280 Progress Drive, Orlando, FL 32826; Voice: 407-882-1300 or 407-882-1483; Email: jancb@dm.ucf.edu.

If you agree to participate, please sign the next page. You may tear off and keep this first page for your own information about the study and return the signed sheet in the envelope provided.
Informed Consent Form -- Parent

I voluntarily agree to participate in the study, “Increasing Vocabulary Through Synthetic Learning Experiences: Implementing Virtual Field Trips Into Classrooms,” conducted by principal investigator, Alicia D. Sanchez from the University of Central Florida. I understand all of the above information and I understand that I may withdraw myself or my child from the study at any time without penalty. I have read the procedure described above and have received a copy of this form. I have been given the opportunity to ask the researchers any questions I may have about the study.

____________________________________  ______________________________
Signature Date

____________________________________
Print Name

____________________________________
Relationship to Student

____________________________________  ______________________________
Student’s Name (Printed) Age of Student

Clarcona Elementary
School Name

____________________________________  ______________________________
Principal Investigator, Alicia Sanchez Date
Demographic Information Survey

Student’s Name: _________________________________________

Please complete the following biographical data form by checking the appropriate response for each question. Any information you provide is voluntary and will be kept strictly confidential and used only for the purpose of this study. You do not have to answer ALL the questions.

1a Child’s race/ethnicity:
   _____________Caucasian
   _____________African-American
   _____________Asian-American
   _____________Hispanic
   _____________Other: Please specify__________________________

1b Parents/guardians race/ethnicity:
   _____________Caucasian
   _____________African-American
   _____________Asian-American
   _____________Hispanic
   _____________Other: Please specify__________________________

2. Number of children in household: ______

3. Child is qualified for:
   _____________Free Lunch
   _____________Reduced Cost Lunch
   _____________Regular Lunch

4a. Parents/guardians’ primary language:
    _____________English
    _____________Spanish
    _____________French
    _____________Sign Language
    _____________Other: Please specify__________________________

4b. Primary language the child uses at home:
    _____________English
    _____________Spanish
    _____________French
    _____________Sign Language
    _____________Other: Please specify__________________________

5. How often does your child read for pleasure (not related to homework)?
   _____________Not at all
   _____________Very little (less than once a week)
   _____________Often (about 3 to 4 times a week)
   _____________Very often (almost every day)

6. Child’s level of experience with computer and/or video games:
   _____________No experience
   _____________Very little experience (may have played computer and/or video games on occasion)
   _____________Average experience (computer and/or video game system at home or at friends’ houses)
   _____________Very experienced (daily use of computer and/or video game system at home)

7. How often does your child take trips to the park for purposes other than playground use?
   _____________Not at all
   _____________Very little (less than once a week)
   _____________Often (about 3 to 4 times a week)
   _____________Very often (almost every day)
NAME OF STUDENT: ________________________________  Participant Number: _______

You will be asked to answer some questions about the Virtual Field Trip you will be taking in class, such as how did you like using the program, what did you learn from it, and how did it make you feel.

The Virtual Field Trip and these questions are from Alicia Sanchez at the University of Central Florida.

If you would like to answer these questions, please sign your name below. You may stop at any time if you do not want to finish answering these questions.

Sign your name in cursive here: ________________________________

Print your name here: _______________________________________

How old are you? ________
Writing Sample Pre

Ranger Randall wants to know what you would do if your class took a field trip to the woods. Write a paragraph in the space below with 5 sentences about things you might do and see on a field trip to the woods!
Vocabulary Test 1

1. Acorn
2. Berries
3. Beetle
4. Nest
5. Tent
6. Pebbles
7. Photographer
8. Termite
9. Turtle
10. Pond
11. Tracks
12. Trail
13. Blueberries
14. Lantern
15. Stone
16. Bird
17. Bee
18. Fox
19. Bank
20. Mussel
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Self-Efficacy Pretest

Please circle the number that best describes the way you feel about this question.

1) How do you think you did on that vocabulary test?

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2) If you had to guess how many of the questions you got right out of 20, how many would you guess?

_______________________

Write number here
## Motivation

Please circle the number that best describes the way you feel about that question.

1) How hard do you try to learn vocabulary words?

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<td>A LITTLE HARD</td>
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2) How much do you want to read to learn vocabulary words?

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<td>REALLY WANT TO</td>
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3) How much do you want to listen to a story on a video to learn vocabulary words?

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4) How much do you want to use a virtual world on the computer to learn vocabulary words?

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5) Which one of these would you rather use for any reason? (Circle One)  
- Book  - Video  - Computer

6) Which one of these do you think would teach you the most vocabulary? (Circle One)  
- Book  - Video  - Computer

7) Which one of these would make it easiest to learn vocabulary words? (Circle One)  
- Book  - Video  - Computer

8) Which one of these would make it the hardest to learn vocabulary words? (Circle One)  
- Book  - Video  - Computer

9) Which one of these would make it fun to learn vocabulary words? (Circle One)  
- Book  - Video  - Computer
Vocabulary Test 2

1. Photographer
2. Termite
3. Dragonfly
4. Squirrel
5. Turtle
6. Berries
7. Tracks
8. Pond
9. Beetle
10. Moss
11. Trail
12. Acorn
13. Mussel
14. Seeds
15. Fox
16. Bird
17. Trees
18. Stone
19. Bank
20. Raccoon
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Self-Efficacy Posttest

Please circle the number that best describes the way you feel about this question.

1) How do you think you did on that vocabulary test?

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2) If you had to guess how many of the questions you got right out of 20, how many would you guess?

________________________________________

Write number here
Motivation Reflection

Please circle the number that best describes the way you feel about that question.

1) How much **fun** did you have using the Virtual Field Trip computer program?

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2) How **helpful** do you think the Virtual Field Trip computer program has been in helping you learn new vocabulary words?

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3) Do you think you learned a few or a lot of new vocabulary words?

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4) How **easy or hard** is it to learn vocabulary words using the Virtual Field Trip computer program?

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5) If you could use Virtual Fields Trip to learn other things, how much would you like that?

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Writing Sample Post

Ranger Randall wants to know what you would do if your class took a field trip to the woods.

Write a paragraph in the space below with 5 sentences about things you might do and see on a field trip to the woods!
Vocabulary Test 3

1. Fox  
2. Pebbles  
3. Bank  
4. Beetle  
5. Blueberries  
6. Nest  
7. Seeds  
8. Bee  
9. Tracks  
10. Turtle  
11. Acorn  
12. Dragonfly  
13. Berries  
14. Lantern  
15. Tent  
16. Pond  
17. Racoon  
18. Trees  
19. Squirrel  
20. Mussel
Self-Efficacy Posttest (3)

Please circle the number that best describes the way you feel about this question.

1) How do you think you did on that vocabulary test?

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2) If you had to guess how many of the questions you got right out of 20, how many would you guess?

_________________________

Write number here
APPENDIX D
VIRTUAL FIELD TRIP STORIES
Virtual Field Trip

Story 1

Muddy Pond

A school bus full of children arrives at the park. Full of excitement, the children talk about what they would like to see in their first field trip.

“Quiet please,” says the teacher as she stands up to explain the children what tools they will use to help them explore the park. “I just want to show you some cool things you can use on your field trip. Everybody needs to know how to use them. Okay?”

The teacher shows the children a walkie-talkie, a two way phone people use to talk to each other. “You will each get a walkie-talkie before you enter the park. If you ever want to ask our guide about one of the things you found, just push this button here and you can chat with him.”

Next, she pulls a magnifying glass out of her bag and explains, “You’ll also get this magnifying glass for small things like itty bitty bugs and tiny flowers. Okay, are you to explore and have fun?”

“Yeah!” the children yell with excitement.

“Okay, let’s go,” the teacher says.

The teacher and the children leave the school bus and meet Ranger Randall who waits for them by the park’s entrance. Ranger Randall is the park’s ranger and he is the field trip guide to help the children learn about what they see in the park.

“Hi, I’m Ranger Randall,” he says. “Are you ready for some fun today?”
“Yeah!” the children yell.

“All right, the government saves places like this park for everyone to enjoy and relax. However, there are some rules you must follow before you enter the park for your own safety,” Ranger Randy says as he sees each child become more excited.

“Make sure you throw your trash into the garbage cans to keep the clean and enjoyable for everyone else,” Ranger Randall continues. “Also, don’t take anything out of the park that does not belong to you like rocks and leaves because they are very important parts of the park. Look all you want but don’t touch. There are some plants that can hurt you, like poison ivy, that can give you a red rash and make you itch.”

“Don’t pet the animals in the park either because they may attack you. They’re not trying to be mean, they’re trying to protect themselves from humans they feel may harm them. Finally, don’t make any loud noises to scare the animals away. I want you to be able to see the animals and how they behave, okay?”

The children nod as Ranger Randall pulls out his walkie-talkie. The walkie-talkie jumps off Ranger Randall’s hand and comes to life, “Hello, my name is Scooter and I’m here to help you on your tour through the park.”

“Wow,” the children say as they gather around Scooter.

Ranger Randall kneels besides Scooter and says, “I have to go take care of some other visitors, but this is Scooter. He’ll help you learn about the park as you see the plants and animals inside. Any time you have a question just ask Scooter to call me. Any questions?”

The children shake their head as Ranger Randall looks at each child.
Scooter points to the pond across from the park’s entrance and says, “Come on. Let’s check out that pond over there. We should find some cool stuff!”

“What’s over at the pond?” one of the children asks.

“Why don’t you walk over and see for yourself,” Ranger Randall says. “Just remember Scooter can reach me if you have any questions about what you see.”

Scooter hops up and down pointing at the pond. The teacher laughs as she walks to the pond with the children, “It’s okay children. Let’s follow Scooter and see what he wants to show us.”

They all wave goodbye to Ranger Randall as they make their way to the pond using the trail used by other visitors and animals. As they reach the pond the children hear birds chirping from their nest in the trees. One of the children looks down and notices his footprints in the mud on the trail.

“Hey Scooter?” the child says.

“Yes,” Scooter responds.

“Why are our footprints in the squishy mud?”

“Let’s ask, Ranger Randall!” Scooter says.

“I hear you have a question already…,” Ranger Randall says. “A good question, too. As you get closer to the muddy pond, the ground you walk on gets wet. When the ground is wet, you leave footprints, or tracks in the mud, that everyone can see. Everybody leaves tracks on a muddy trail. Even animals, like foxes and raccoons, leave tracks.”

They get to the edge of the pond and see lots of small rocks called pebbles, and some empty shells.
“Scooter, what are those shells by the pond?” a little girl asks pointing at the shells.

Scooter squints his eyes before he answers, “I know. Those are mussel shells.”

“That’s right Scooter, great job.” Ranger Randall says. “Raccoons eat mussels, they must have used those stones near the pond to break open the mussel shells to eat them. They find the mussels in the banks or edges of the pond, which is the most shallow part of the pond.”

“But don’t the raccoons have to swim in the banks of the pond to get to the mussels?” Scooter asks.

“No, Scooter,” Ranger Randall answers. “You see, raccoons can put their paws in the banks of the pond because it’s shallow. If they were to go past the bank, then the pond would be too deep for them. When the raccoons go into the deeper part of the pond, they have to swim since their paws can’t reach the bottom anymore.”

“This pond is also a home to turtles. Turtles don’t have to stay near the bank, they like to wade and swim. They can climb onto big rocks and slip into the water whenever they feel like it!” Ranger Randall explains.

The class all walk around the lake looking for turtles on big rocks or in the water.

The teacher points to the fisherman in his boat in the center of the pond and says, “Look children, there’s a fisherman in the center of the pond.” They wave at the fisherman and he waves back.

“I bet if he slipped from his boat that he would have to swim, because that water is really deep! Right Ranger Randall?,” Scooter says.

“That’s right Scooter, let’s hope he doesn’t,” Ranger Randall answers. “Scooter, do any of the children have any more questions about the pond or the area around it?”
The children shake their head as Scooter checks.

“No,” Scooter replies. “What should I do now?”

“Why don’t you take them over to Grassy Clearing and show them some cool stuff there?” Ranger Randall suggests.

“Okay,” Scooter says as he points at the trail leading to Grassy Clearing. “Come on guys, let’s go to grassy clearing.”

They take one last look at the pond and the neat things around it before they continue their field trip into the Grassy Clearing.
They all walk down the trail, and soon they find a sign that says grassy clearing. Here, they see trees like a big oak tree with moss dangling from its branches. As the group walks further into the Grassy Clearing, they see a tree with nest on one of its branches. One of the children points at the nest and says, “Scooter, look up there! It’s a nest.”

“Wow,” Scooter says, “I wonder where the birds are, let’s ask Ranger Randall!”

“Well Scooter, do you see or hear a brood of baby birds in the nest?” Ranger Randall asks.

“It’s too high to see anything, but I do hear some chirping,” Scooter answers.

“What’s a brood of baby birds,” one of the children asks.

Scooter points at the nest and answers, “A brood is like a group of young animals, like the group of baby birds up in the nest.”

“That’s right, Scooter,” Ranger Randall says. “Can anyone guess where the mother and father bird went?”

“Ooh, I know,” Scooter says. “They must have gone to the bushes to get some berries for their babies. Their babies eat all kinds of berries.”

“Sounds yummy, do you think they're eating the Blueberries that grow here? I saw a blueberry busy on the way here. I love blueberries!,” one of the children says.
“Oh, yes. Berries and especially blueberries are good for baby birds and for kids like you!” Ranger Randall says.

“The nest looks messy up there,” another child says.

“The nest may look messy because birds like to use twigs, mosses, and other small things to make their nest,” Ranger Randall explains.

Next they see a pair of squirrels gathering acorns around the oak tree. Scooter scratches his head and asks, “Ranger Randall, why are the squirrels collecting acorns and putting them in the same tree where the birds have their nest?”

“That’s because they must share the tree as their habitat,” Ranger Randall answers.

“Habitat?” Scooter asks.

“Yes, habitat,” Ranger Randall answers, “a habitat is place where animals live. For example, the birds, squirrels, and even termites, may live in the same tree. Even though termites are a kind of bug that usually eats the wood in the trees. These creatures share the same habitat.”

As the group watches the squirrels bustle and rush around the tree to collect acorns, Ranger Randall asks, “Does anybody know what acorns are?

“A seed,” the children yell together.

“That’s right, acorns are actually a type of seed! Great job,” Ranger Randall says.

“Oh,” Scooter says. “Look, one of the birds came back but it looks like it has a beetle in its beak!”

“That’s because birds like to eat insects, too,” Ranger Randall says.

“Scooter, I hear a strange noise,” the teacher says. “Children, do you hear that, too?”
“Yes”, the children say.

One of the children says, “It sounds like someone’s snoring!”.

The children listen closely as they look around the Grassy Clearing to find where the snore is coming from. Finally, one of the children points at a tent on the edge of the clearing.

“There it is,” the child says, “that’s where the snore is coming from.”

Scooter asks, “Ranger Randall, what’s a tent doing out here in the Grassy Clearing?”

“Oh, that must be our photographer camping in this part of the park,” Ranger Randall answers. “See the lantern he uses for light once the sun goes down? I’ll bet he’s here to take pictures of our beautiful park and active animals. Our animals are always busy here”

The group walks quietly past the tent so they don’t wake up the photographer. Once they get past the tent, Scooter points to a group of bees and dragonflies flying around a small field of flowers.

“Look,” Scooter says. “The bees are pol… poli… oh what’s that word?”

“I believe you’re trying to say pollinate,” Ranger Randall says.

“That’s right, pollinate,” Scooter says. “That’s what bees do when they visit one flower to another to help spread the seeds to allow more flowers to grow.”

“Great job, Scooter! I’ll bet that dragonfly is just enjoying the pretty flowers, dragonflies don’t help spread seeds, but they sure are neat to look at. They have two sets of wings!,’” Ranger Randall says. “Wow, time has gone by really fast! You guys better head back to the bus before it gets dark, you don’t have a lantern of your own!”
Later, the group arrives back at the pond. The group hears many frogs croaking but don’t see any around the streams. However, the children do notice that their footprints stamped into the wet sand. Scooter notices the footprints and says, “Look, it’s our footprints again!”


“Tracks,” a child says.

“That’s right, great job,” Ranger Randall says. “Did everyone have fun today?”

“Yeah!” the children screamed.

“Did anybody learn anything cool today?” Ranger Randall asks.

One child says, “I learned that bees pollinate when they go from one flower to another. That’s how flowers grow in other areas.”

Another child says, “Well, I learned that photographers snore really loud in the park.”

The group and Ranger Randall laugh.

“Well, I don’t think all photographers do that,” the teacher says.

“That’s right,” Ranger Randall says. “Well, I hope you all enjoyed the tour of the park and hope you come back to enjoy it again.”

“We do, too,” the teacher says, “Right kids?”

“Yeah,” the children scream with excitement.

“I had fun, too,” Scooter says.

“Let’s thank Scooter for being a wonderful guide,” the teacher says.

“Thank you,” the children say, as they clap their hands.

Scooter bows, and then says, “You’re welcome. Please visit us again.”
Later, the children and the teacher return to the school bus and wave Ranger Randall and Scooter good-bye.

As the big yellow bus leave the park, the children share their favorite part about the park. Ranger Randall and Scooter return to the park to continue giving tours to the other visitors to help them enjoy the park.


In J. Flood, J. J. D. Lapp, & J. U. R. Squire (Eds.), *Handbook of Research on Teaching the English Language Arts* (pp. 604-632). New York: MacMillan.


