AN IDENTIFICATION OF STUDENT SUMMER ACTIVITIES AND THEIR RELATIONSHIP TO MATHEMATICS TESTING PERFORMANCE MEASURED FROM SPRING TO FALL

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ABSTRACT

The purpose of the study was to identify student summer activities and determine whether a relationship exists between the activities and mathematics testing change scores measured from spring to fall. This current effort built upon research conducted by Heyns (1978), Burkam et al. (2004), Downey et al. (2004), and Alexander et al. (2007). The commonality in findings that existed among all of these efforts was that learning loss occurred in the absence of instruction such as that experienced during the normal school term. A quantitative, correlational study was conducted using a survey method which requested that parents answer questions concerning the nature of activities and daily structure experienced by their children during the summer break.

The Group Mathematics Assessment and Diagnostic Evaluation (GMADE) testing platform was used to generate quantitative measurements of mathematics skills for exiting second graders in the spring of 2010 and for these same students as entering third graders in the fall of 2010. A voluntary sample of 57 students from elementary schools in a suburban school district in Southwestern Virginia participated in the testing process. At the conclusion of all testing and at the point at which all surveys were completed, student scoring differentials from spring to fall were compared to the activity and daily structure components reported in the survey for potential correlations between that information and mean gain test results.

This study sought potential correlations between types of summer activities and documented change between mathematics spring and fall test scores. Results of data analysis from this research will assist leaders in understanding whether activities bear a relationship to mathematics score changes. Should those relationships be established, the findings would assist leaders in determining which activities should be encouraged or discouraged during the summer

break to avoid score declines. The findings indicated that though summer mathematics learning loss did occur for the participants, no correlation between activities and test score change could be established. Implications of these findings and suggestions for the future are presented in the final chapter.

DEDICATION

This dissertation is dedicated to my best friend and unwavering supporter, my husband, Steven Wright. My accomplishments are a reflection of the sacrifices that you have willingly made to help me obtain my goals. We are indeed a team that began as good friends and evolved into an enduring love story. Thank you from the bottom of my heart.

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CHAPTER I
INTRODUCTION

Background

For over 100 years, educators have been examining the academic payback on time spent in school. One would expect students to progress while they are in school, but speculation still surrounds the idea that students suffer achievement losses when instruction is interrupted. Early in the twentieth century, one researcher found that loss of achievement seemed to occur over the summer months (White, 1906). In the years that followed, other researchers have connected a loss of achievement to the absence of instruction over the summer (Alexander, Entwisle & Olson, 2001; Cooper, Nye, Charlton, Lindsay, & Greathouse, 1996; Heyns, 1978). Yet, over the years following White's study, some researchers have moved in the opposite direction, finding that the summer period was not related to the extent of learning loss found by others (Soar & Soar, 1969; Wintre, 1986).

One of the most widely recognized studies of time spent on learning was conducted by The National Education Commission on Time and Learning (NECTL), which was created in 1994. The commission identified the same concerns that educators had previously voiced in the person of U. S. Commissioner of Education William T. Harris who, in 1894, wrote:

> [T] he constant tendency [has been] toward a reduction of time. First, the Saturday morning session was discontinued; then the summer vacations were lengthened; the morning sessions were shortened; the afternoon sessions were curtailed; new holidays were introduced; provisions were made for a single session on stormy days, and for closing the schools to allow teachers…to attend teachers' institutes….
> The boy of today must attend school 11.1 years in order to receive as much instruction, quantitatively, as the boy of fifty years ago received in 8 years… It is scarcely necessary to look further than this for the explanation for the greater amount of work accomplished … in the German and French than in the American schools. (NECTL, 1994, p.4)

Supporting the findings of Alexander et al. (2001), the commission's report stated that time spent in school advanced knowledge and proficiency and that if America is expected to prosper and

lead the world in the future, then a re-energized concern with educational excellence must be adopted (NECTL, 1994).

Confidence in the nation's schools is quite naturally predicated on the belief that learning does indeed take place in them and that the learning transfers to "real life" situations. Hence, educators employ a number of empirical testing platforms designed to ascertain that students do progress measurably from the time that they enter school in the fall to the time that they exit the classroom in the spring. The researcher would expect students to progress and evidence higher scores in the spring when they exit that years' experience than in the fall when they entered it. Indeed, were that not the case, educators would not be fulfilling society's expectations.

Statement of the Problem

Yet, for all the gains demonstrated and celebrated at the close of school, the potential for achievement loss that occurs when instruction is interrupted has caught the attention of a number of researchers. Over the course of time, researchers from White (1906) to Helf, Konrad, and Algozzine (2008) have offered evidence supporting both sides of the issue. Some researchers have found little to no significant loss (Helf et al., 2008; Soar & Soar, 1969; Wintre, 1986). Others have stated that the summer break is a definite threat to continued student progress and that this threat is magnified especially for those in disadvantaged socioeconomic positions (Alexander, Entwisle, & Olson, 2007; Allinder, Fuchs, Fuchs, & Hamlet, 1992; Heyns, 1978).

Starting with White's 1906 study, many researchers have found that the summer gap negatively influences academic progress in some measure. Though White's study represented a small population of students in a single school, his research effort demonstrated, at the very least, that a concern for summer loss existed, time-stamped early in the twentieth century. Later studies by other researchers (Alexander et al., 2001; Cooper et al., 1996; Heyns, 1978), added reinforcing data that academic achievement loss does occur over significant periods spent away from instruction.

An accumulating body of data by a growing number of researchers examining the relationship between breaks from instruction and student achievement loss engendered a meta-analysis of a number of studies (Cooper et al., 1996). From 39 studies collected and examined, Cooper et al. concluded that summer learning loss was a real and measureable phenomenon and

that the loss itself varied with respect to subject matter and socioeconomic status of the students studied.

Purpose of the Study

It is surprising that many researchers have not chosen to investigate potential relationships between academic performance changes between spring and fall and the activities in which students were involved during the summer period. Measuring performance will tell a researcher whether there has been a loss or gain in academic performance for the skill being measured and how significant that performance change may be. Collection of socioeconomic data will identify which groups suffer loss or enjoy gains in performance. But if change, either positive or negative, does occur and if educational leaders are to understand the summer academic experience, it is then logical and prudent to identify the activities in which students are engaged during summer as well.

The purpose of the study was to identify student summer activities and determine whether a relationship exists between them and mathematics testing change scores measured from spring to fall. This current effort was built upon research conducted by Heyns (1978), Burkam et al. (2004), Downey et al. (2004), and Alexander et al. (2007). All of these researchers found that some, often unnamed, outside factors indicated a relationship to summer learning loss and that these factors existed independently of those encountered during school instruction.

Research Questions

Three research questions were established to guide this study.

1. How does mathematical performance for exiting second graders in spring compare to mathematical performance for that same group of students as entering third graders in the following fall?

2. What were the activities in which these students were engaged during the summer break?

3. Is there any correlation between total test standard score change and summer activities in which participants engage?

Significance of the Study

Demographic information describing the overall makeup of the United States population from 2000 to 2008 shows an increase in minority populations, especially those incorporating Asian, Hispanic or Latino backgrounds (US Census Bureau, 2000, 2008). An increasingly diverse population of non-traditional English speaking residents of this country likewise represents a larger influx of students who require additional English Language Learner (ELL) instruction. Census data also show an increase in the number of families falling below the poverty level (US Census Bureau, 2000, 2008). The challenge of a changing population, a growing number of poorer families, and a downward-trending global economy makes the American stake in education more important than ever.

Despite all the changes experienced in the American social and educational climate in the last century and the current challenges represented by diversity, American schools still rely largely on the 180-day traditional school calendar that establishes an eight to ten week summer break . This structure, originally designed for an agrarian economy composed of a largely homogeneous racial and socioeconomic makeup of those served by education, no longer exists. An intentionally contrived break from instruction has been maintained in an era in which America -- and by extension, American students -- are competing globally against other nations in which gaps in the instructional calendar are not the norm (Rothstein, 1998).

The concern goes right to the top. Leaders are voicing concern that America is no longer leading the world educationally, and they are calling for a new look at the educational system as a whole in the realization that what has worked in the past may not now apply (NECTL, 1994). The National Education Commission on Time and Learning's report, however, did little to foment widespread change in the amount of time spent in school or to the configuration of the school calendar. Within this context of challenge to the status quo, a nonpartisan governmental effort at improving educational accountability resulted in the No Child Left Behind (NCLB) Act of 2001.

To drive increased performance, federal and state governments have mandated accountability for students and educators in an effort to increase academic performance over what has been experienced in the past (NCLB, 2002). Time spent in instruction would seem to be

critical to all efforts to increase performance. However, researchers have shown that gaps in instruction hurt some students while others seem to lose less or no academic proficiency in spite of the break (Alexander et al. 2001; Helf et al., 2008; Soar & Soar, 1969).

Throughout all of this renewed emphasis on improvement, the traditional calendar remains in place in most school districts. If eliminating or adjusting the summer break is not a viable reform measure for whatever reason, then a better understanding of what occurs during summer break for all students is essential as educators approach the problem of identified summer learning loss. Regardless of whether students lose ground over summer– and researchers have found that many do (Alexander et al., 2001; Beggs & Hieronymus, 1968; Heyns, 1978) -- they are still not receiving consistent instruction for eight to ten weeks. Still, they play in the neighborhood. They may go on vacation with family. They may attend camps. They may read independently. They are all doing *something*. If educational leaders are to gain insight into why some students experience significant learning loss over summer and some do not, it is both logical and imperative to look closely at the summer activities in which students are involved. By doing so, educational leaders may develop a better understanding of the relationships between activities and performance, and they will be better equipped to make informed decisions about summer structure for the future.

Delimitations of the Study

The intent of this study was to involve the largest number of participants from every possible area served by the school system represented. Given that socioeconomic data collection was not a direct focus for the study, the design nevertheless was to include participants from across the entire geography served. This ensured that participants from both high and low SES were included for testing purposes. In addition, an intentional effort was made to avoid artificially extending the summer break period studied so results of the research and conclusions drawn would be as focused as possible on summer learning loss.

The first delimitation for this study was that participation for their students was made available to principals at all 16 elementary schools in the Southwest Virginia division in which it was conducted. By being intentionally inclusive in the invitation to all schools, the study was designed to represent all demographic and economic strata that might exist across the geography

served. By making participation available for all schools, the intent was to provide a sample for study that would be as large as possible. The exiting second grade level for participation was chosen to concentrate on a key grade level for which standardized testing first occurs in the ensuing fall term, third grade.

The second delimitation involved the use of a testing platform designed to be used for second grade level. A and B versions of the same test were employed so that students could take alternate versions on each testing vent in spring and fall. The results were able to be age normed.

The third delimitation for the study was the intentional scheduling of completion of test events no more than three weeks prior to the end of the second grade term in the spring and no more than three weeks into the start of the third grade term in the fall. The intent was to lessen any extension of the time that comprised summer break to a minimum through testing as closely as possible to the time when students were dismissed from school in spring and when they entered in the fall.

Survey questions were constructed to be as non-invasive as possible and to gather information about a variety of activities. The approach was intended to provide for honest and complete responses by parents of participants. Survey answers were short answer or simple "yes/no" responses to eliminate the possibility of bias in interpretation of answers.

Limitations of Study

The first limitation involved the voluntary nature of the sample itself, which did not ensure that a large sample might be obtained. Opening the study to inclusion of only those students in those schools in which the principals were willing to allow participation limited the pool of participants who might have agreed to participate

In addition, policy for the school system would not allow for testing of students for independent research projects during the school day. This restriction, in effect, forced testing to be conducted after school hours, thereby limiting those who might participate to those who were willing to stay after school. This stipulation likewise provided for likely logistical difficulties centered around transportation and conflicting afternoon scheduled activities for students.

Similarly, this study was limited as to which test could be used for student assessment. Because two separate testing events were conducted for each student and because of the need for different versions of the test for each event, test choices were limited to those with more than a single version. Because not all mathematics tests available featured A and B versions and an age norming supplement, choices were limited. Ultimately, only a single test developer with a test meeting these criteria was found willing to sell the material to an independent researcher.

When a survey is used as a means of gathering data, potential exists for responses that may be returned inaccurately, dishonestly, or both. There is also the potential for no response which, in turn, limits the data available for analysis. This may be especially true of questions regarding household income or educational status, therefore, it was ultimately determined that questions of this sort would not be included in the survey due to the potential for non-completion of the survey itself or for intentional misrepresentation of the information returned. Though participants' responses are largely outside of the bounds of the researcher's control, these limitations should, nevertheless, be mentioned herein.

Terminology and Definitions

In the course of reviewing the extant research on summer learning loss, it became apparent that a number of terms commanded definition. These terms are used throughout the review, and in some cases, abbreviations for those terms will be used going forward.

Socioeconomic status (SES) refers to the societal connection that a student carries into the classroom. This term refers to whether a child lives below, at or above the poverty line. Most studies based identification of lower SES on children receiving free or reduced lunch during the school year. In some cases, this term will be encountered as *higher SES*, indicating a child or group of children living in the upper economic tier and generally in better neighborhoods. In some studies of larger urban poor school populations, a designation of *higher SES* may be relative to the group, indicating that this SES is at the upper economic tier for that population, but not necessarily the upper tier when compared to other neighborhoods or populations. Alternatively, the terms, *lower SES* and *middle SES*, may likewise be used in the same context, comparatively within the particular population being studied by a researcher at a given time.

Summer learning loss (SLL) is a term coined by Barbara Heyns (1978) in her landmark research study involving students in Atlanta schools. It refers to the quantitative measureable loss of achievement in a number of subject areas, ideally measured at the end of the previous school term, compared to a similar measurement at the beginning of the ensuing year's term. This phenomenon is synonymously referred to in this paper as *summer achievement loss*, *summer slide* or *summer drop-off*.

Summer vacation or *summer break* refers to the period of time students spend away from school after dismissal in the spring and prior to school startup in the fall. This time period may vary, but it generally comprises eight to ten weeks from mid-June through the end of August.

Year-round education (YRE) and *alternative calendar* describe approaches to education that vary in some measure from ones incorporating the traditional eight to ten-week break of instruction during the summer. These approaches may simply adjust break periods into different sizes or intervals, but do not necessarily indicate that the traditional 180-day school calendar would be exceeded. Similarly, the terms, *alternative scheduling* or *alternative schedule*, indicate an approach to the school calendar that varies from the traditional six-hour school day with the associated break periods mentioned above.

Organization of the Study

This study consists of five chapters. Chapter One comprises the introduction to the study and an overview of the significance of the problem, the statement of purpose, and the introduction of research questions. It likewise discusses the overall study design as well as the delimitations and limitations to the research. Chapter Two contains a review of empirical research and other literature related to the subject of academic loss during prolonged absence of instruction, particularly that of summer break. Chapter Three identifies the research design and the methodology used in gathering information. It contains a discussion of the attributes of the testing employed, the means by which the sample was chosen, the rationale used for survey construction, and the procedures followed for collecting testing and survey information. Chapter Four contains the analysis of the data collected and the findings from the study. Chapter Five summarizes the study and presents conclusions and leadership recommendations for the future. A reference list and appendixes follow Chapter Five.

CHAPTER II
REVIEW OF THE LITERATURE ON SUMMER LEARNING LOSS

Criteria for Inclusion of Studies in the Review

One might expect that if children learn while in school, any significant break from instruction would result in their academic progress suffering. However, upon the start of school in the fall, some students demonstrate a competency or even a mastery of skills learned during the previous term, while others must receive remedial instruction to approach the same academic levels they attained in the previous term. Just as there are two very different scenarios for students, there are also two positions that one might assume relative to the impact of summer break on learning. Either the summer break negatively impacts student progress or it does not. Educational constituents and researchers take varying stands on the issue. Summer break is a time-honored and sacred institution to many students, parents and even some educators themselves, and it is ingrained into our educational and societal structure. The economy and the desire to best prepare students to compete globally cause some to challenge the status quo. The purpose of the study was to identify student summer activities and determine whether a relationship exists between them and mathematics testing change scores measured from spring to fall. This current effort was built upon research conducted by Heyns (1978), Burkam et al. (2004), Downey et al. (2004), and Alexander et al. (2007). The commonality in findings that existed among all of these efforts was that learning loss occurred in the absence of such instruction as that experienced during the normal school term.

In order to establish whether there are grounds for examining the relationship between summer activities and academic performance and what implications this might have for leaders attempting to improve students' mathematical progress in the future, it was first necessary to review, analyze, and understand the extant research on the effect of the traditional summer break on students' academic performance change.

A number of studies by a variety of researchers have been included in this analysis. An effort was made to include work by researchers who are widely recognized in the field, such as those by Barbara Heyns (1978), Cooper et al. (1996), Alexander et al. (2001), and Borman, Benson and Overman (2005). Other noted researchers have also shown widespread concern over

summer learning loss, and their findings have been included as well. To establish that different researchers have previously found both summer losses and gains on this issue, an effort was made to include findings from researchers on both sides.

This review was designed to include research employing a quantitative focus due to the nature of the current study on summer learning loss, but it also includes reviews of other literature pertinent to the subject as well. In order that the reader might gain a perspective of the ongoing study that researchers have given summer learning loss, an overview of studies from White (1906) through Helf et al. (2008) have been reviewed. Barbara Heyns' (1978) landmark and in-depth study of the issue set the bar for subsequent research efforts on the subject, and it likewise pointed indirectly to the shallower depth of some prior efforts. The current review sought to incorporate as much information from both the pre and post Heyns periods as could be found.

Most research analyzed tested for SLL in either the area of reading or mathematics, though a small number of studies tested for both. Obviously, these subject areas involve some overlap of skills, though each contains unique academic elements as well. An effort was made to fairly represent research in both subject areas.

Research was obtained in part from electronic databases. Databases used included JSTOR, EBSCO, ERIC and Google Scholar, using the search terms, *summer learning loss, summer achievement gap, year round school, summer programs, how children spend their time, students & summer, what students do in the summer, who takes care of students in the summer, and what do children do in the summer*.

Historical Context of SLL

Though not all researchers can agree on every aspect of SLL, enough research has been conducted on the topic to establish that the summer break does, in fact, result in a drop off in academic performance for at least some students by the time that they return to school in the fall. Educators have studied the effects of summer breaks in instruction and the supposed impact on student achievement for a significant period of time with varied focus and with sometimes wide-ranging results.

White (1906) studied student performance in mathematics from a small population of students to gain insight into whether learning might have regressed during the summer months away from structured schooling. The research design involved seven second graders and 12 seventh graders in a single school. The sample may or may not have been representative of the larger population, which limits any generalization of findings, but this early effort does indicate that the summer break had caused educators concern over 100 years ago. Though other researchers (Beggs et al., 1968; Heyes & Grether, 1969; Murname, 1975; Sharkness, 1970) examined the SLL issue in between, Heyns' 1978 landmark study of student performance in reading achievement in Atlanta established the concept of SLL as it pertains to the gap in achievement between children from lower SES and those in homes of a better economic situation (Heyns, 1978). The Heyns study laid a foundation against which a great deal of later research was built and against which later studies have been measured. Cooper et al. (1996) looked at the concept of summer learning loss with a wide-ranging examination and a meta-analytic review of extant studies, synthesizing findings that echoed much of what Heyns' study had already established.

The Baltimore Beginning School Study (BBSS), begun in 1982, expanded the research timeline beyond those of most studies, tracking achievement of urban poor, middle and upper class children attending Baltimore schools from the beginning of first grade through the end of elementary school. In addition, the researchers followed the educational direction of these individuals until they were through high school and beyond (Alexander, Entwisle, & Olson, 2007). Alexander et al. discovered that the summer break disadvantaged children at an early age, especially those from lower SES. BBSS is discussed in greater depth in the ensuing sections of the current review.

Beggs and Hieronymus (1968) had earlier also looked at the disadvantages of summer break, challenging the notion that students' achievement grew at a steady rate of one-tenth of their yearly aggregate for every month spent in school. Indeed, this study concluded that a "substantial" (p. 96) loss occurred over summer, a loss that was "consistent and convincing" (p. 96).

The studies completed by Beggs & Heironymus (1968), Heyns (1978), and Alexander et al. (2007), here are representative of a much larger body of work on the SLL subject. The intent

of their inclusion at this juncture is to establish that the issue is prevalent and has caused concern over a number of years. Moving forward, more material will indicate a topic studied widely by others who have reached different conclusions on the subject.

Different Researchers, Different Findings

In a period stretching over 100 years, researchers (Alexander et al., 2007; Beggs et al., 1968; Cooper et al, 1996: Heyes & Grether, 1969; Heyns, 1978; Murname, 1975; Sharkness, 1970; White, 1906) have devoted a great deal of time, energy and concern to investigating whether students, especially those from disadvantaged backgrounds, actually do lose ground in the learning process when they are given a traditional summer break that may encompass as much as three months away from the classroom. It seems that logic alone should lead one to conclude that the summer break would be costly to student learning, given the progress that most children make during a traditional school year of consistent instruction. In the educational vacuum that may exist for most children during the summer months, the most that might be rationally expected would be that students might somehow return to school in the fall having not lost anything academically during the summer. Cooper et al. (1996) noted that the best expected outcome after the summer break was one in which students might have neither lost nor gained in academic prowess over the period and return to school in the fall in a somewhat neutral position relative to where they exited in spring.

Other researchers have drawn conclusions that either echo this notion of maintenance of the status quo or assert that students actually *gain* in skills over the break, despite the lack of instruction. Helf et al.(2008), in a recent study of reading achievement, found that little loss transpired between the end of school in spring and the startup of school in fall. Soar and Soar (1969) found that, when test scores from South Carolina fifth graders were compared in reading and mathematics for fall to spring and spring to fall achievement, students actually showed achievement gains in both areas of endeavor (Soar & Soar, 1969). Similarly, a study of middle-class students in Toronto resulted in the conclusion that actual improvement in academic skills occurred over the summer months, with the exception of mathematics computation skills (Wintre, 1986). These findings, however, are not widely mirrored in the literature.

So, if there are conflicting findings, how is any impact of summer break to be understood? How can some students gain academically during the summer, while others lose educational ground? Research indicates that summer break affects different groups of students in different ways (Cooper et al., 1996).

How Students are Affected by Summer Break

An area that has been the topic of many research studies has been the relationship that may exist between income levels and academic achievement loss suffered over the summer hiatus (Alexander et al., 2001; Burkam, Ready, Lee & LoGerfo, 2004; Heyns, 1978). Researchers have found that the SES of a family has an influence on the academic loss of students during summer breaks (Alexander et al. 2001; Cooper et al., 1996; Heyns, 1978). Alexander et al. noted that summer academic loss applied especially to younger children from lower SES, making the early years of schooling critical to the immediate and long-term success of such students.

When performance is compared for periods away from organized instruction to those periods when children are in school, economic factors do not seem to have as great an influence on the rate of learning during the school year as they do over the summer break. Heyns (1978) concluded that a parent's SES was much less of a determinant of student progress during the school year as it was over the summer break (Heyns, p. 93). Heyns found that there is an inherent educational advantage for those of higher SES because they progress at a better rate than their less-advantaged fellow students whether they are in school or not. Disadvantaged students, however, perform decidedly better when in school (Heyns). Similarly, in research conducted almost 30 years later, Burkam et al. (2004) found that students from all backgrounds progressed at an overall comparable rate during the school year, but demonstrated varied academic performances after summer vacation.

Entwisle, Alexander and Olson (2001) labeled the conclusions drawn by Burkam et al. (2004) as the "faucet theory," in which students receive a consistent flow of instruction and educational influence while in school, but once the faucet is turned off in the spring, the resources and the progress dry up. Thus, the summer break is a crucial time for students,

particularly those who are already disadvantaged within society when they are not under the steadying academic influence of a structured learning environment.

Just as Heyns' 1978 study examined an urban poor population in Atlanta, the BBSS was conducted in a city where, at the beginning of the study, two-thirds of the students qualified as low income (Alexander et al., 2007). In findings very similar to those Heyns had uncovered, Alexander et al. concluded that both socioeconomically advantaged and disadvantaged children progress while in school, but that disadvantaged students' progress suffers over the summer break. Conclusions from the results of the BBSS indicated that poorer children are, essentially, already behind their more advantaged SES counterparts even before kindergarten begins. They lag behind after elementary school, and a cumulative loss of progress by their entry into high school is real and pronounced (Alexander et al., 2007).

Subject Areas Impacted by Summer Break

So, if academic prowess slips, at the very least for a given segment of the student population, where does that slippage occur? Regardless of the growing consensus among researchers that summer learning loss is real and documented (Alexander et al., 2007; Cooper et al., 1996, Heyns, 1978), the common ground gets somewhat muddied around whether the greatest loss occurs in mathematics, reading, or spelling skills. One might naturally surmise that all of these skills would be impacted away from a structured educational environment, and some studies have reinforced this outcome. Overall, most SLL research to date has concentrated on reading. When all areas were studied, results have indicated that one set of skills was more heavily impacted by the summer break than another.

Reading, to be sure, garners its share of attention, and it factors heavily into many studies relating socio-economic status to achievement level. In her study of inner city poor sixth and seventh graders in Atlanta, Heyns (1978) strongly stated her case:

> The single summer activity that is most strongly and consistently related to summer learning is reading. Whether measured by the number of books read, by the time spent reading, or by the regularity of library usage, reading during the summer systematically increases vocabulary test scores of children. Although related to

> differences in parental status, summer reading has a substantial effect on achievement that is largely independent of family background. (p. 161)

Heyns identified reading activity as a pursuit that may not equalize disparities present between social classes, but one that nonetheless should be recognized as foundational to an initial bridging of the gap in achievement that separates them (Heyns, 1978).

McGill-Frazen and Allington (2003) likewise saw reading activity as a predictor of summer loss or gain for at-risk students. Studies conducted by other researchers report academic losses in spelling and reading over the summer break (Allinder, Fuchs, Fuchs, & Hamlett, 1992; Borman et al., 2005). One might surmise that because reading is such a basic, entry-level skill for progress in all other academic pursuits, regression at any time can be seen to somehow impact success elsewhere.

For all the attention given to reading skill regression, there is likewise a body of evidence indicating that mathematical skills suffer as well and at a somewhat consistent rate for both high and low SES groups. The BBSS examined a large at-risk urban school population in Baltimore and tested for both mathematics and reading progress across socioeconomic divides and against national norms. The BBSS found that there were differential results in verbal performance for upper and lower SES students. Advantaged students gained in both verbal and mathematics skills over the summer, whereas poorer students suffered achievement loss in quantitative skills and, at best, held their own in verbal skills (Alexander et al., 2007).

Allinder et al. (1992) found that mathematics scores regressed during the summer break for some students, while spelling skills did not. Conversely, Allinder et al. reported that some students progressed in mathematics at the expense of spelling. Students in second and third grades regressed in spelling over the break, while students in grades four and five slid backwards in mathematics.

Murname (1975) studied both mathematics and reading achievement against racial makeup in second and third graders in Connecticut and found that achievement in both subject areas increased for Anglo-American, African American and Hispanic students during the school year, but that mathematics achievement over the summer break declined at a rate equal to approximately half of the gains attained during the school year. Reading achievement declined

slightly for African American students, though it remained essentially unchanged for both Anglo Americans and Hispanics.

Though there have been many research studies of SLL, conclusions obviously vary among researchers. For the most part, when both mathematics and reading skills are studied, quantitative skills seem to be the most adversely and disproportionately affected, especially among lower SES students. In all the varied approaches at research on the subject and with the range of conclusions, study to study, there is one constant. The extended summer break from school is an impactful interruption of learning, and students' progress suffers because of it.

Longitudinal Studies of Summer Learning Loss

A number of researchers have conducted longitudinal studies of SLL, and one completed a comprehensive meta-analysis of studies conducted over a century. Several of these are salient in the literature and are worthy of a more in-depth examination. Following are analyses of research by Heyns (1978), Alexander et al. (2001, 2007), Borman et al. (2005), and Cooper et al. (1996) that utilized data collected over extended periods.

Heyns and Summer Learning Loss

Heyns (1978) constructed a study of 4800 sixth and seventh graders which was to be conducted using both socioeconomic and racial factors to study the relationship between family, schooling, summer learning trends, and the cognitive development of children. Heyns' study was begun in 1972, a time of racial tension over the desegregation of Atlanta schools. Once the study sample had been designated, reactions to the desegregation effort included large numbers of affluent White families withdrawing their children from the system and large numbers of Black families transferring their children into the previously White suburban schools. Heyns' sample population was affected by these developments, and the possibility of studying for effect within racial classifications previously sought was largely impossible afterward.

Notwithstanding, Heyns (1978) followed the original design for her research, combining the Metropolitan Achievement Tests with parental surveys to derive both empirical data related to academic progress and socioeconomic data for comparisons. Heyns chose to use the word

knowledge subtest for measurement, determining that it was the most reliable between White and Black students in terms of IQ score correlation and relationship to socioeconomic status.

Two questions were pertinent to Heyns' empirical study:

1. To what degree do the learning rates of children differ during the school year and the summer?
2. What differences exist among children from diverse backgrounds in the patterns of summer learning? (p. 44)

Heyns' results from the Metropolitan Achievement Test were telling. In comparing test results from fall of 1971 to spring of 1972, all students, White or Black, showed achievement gains. While in school, White sixth graders showed an increase of .84 points between tests, while Black students increased scores by .51 points. The SES distribution of scores ranged from an increase of .65 points to 1.00 points for those White students in the lowest SES to the highest. Over the same period, the SES distribution of scores for Black students ranged from an increase of .42 to .62 points. Though the increase varied between White and Black students, nevertheless, both White and Black students were found to make progress while in school regardless of SES.

When Heyns measured changes from spring 1972 to fall 1972, results were markedly different. White students overall, who had gained .84 points while in school during the prior term, gained only .24 points over the summer. Black students, who had experienced a .51 point gain during school, showed a -.12 decline in fall testing. Clearly, achievement suffered for both groups over the summer break, but Black students were affected disproportionately. Whereas the summer scores followed a meager linear progression for White students during the break by SES, scores for Black students registered a large loss at the lowest SES category (-.28 points) followed by an offsetting gain of .22 points for the highest SES group. The interim income level groupings for Black students recorded out-of-school scores of -.12 points, reflective of the overall loss for the group.

Heyns’ testing of seventh graders mirrored the results from the sixth-grade sample, with White students gaining .70 points while in school and Black students gaining .61 points (Heyns, 1978). Fall measurements showed that White students gained .17 points and that Black students lost .02 points, overall. Breaks along SES lines varied from the sixth grade group within each

segment, with lower SES White students losing .33 points against a .04 loss for Back students at the same level. Both upper SES White and Black students gained .37 points over the summer. Still, this gain represented less than one-half of the in-school gains for both (Heyns, 1978).

From the empirical evidence, Heyns (1978) concluded that the gap that exists between the highest SES White students and the lowest SES Black students while in school only widens when students are not in school. Heyns likewise determined that school, while important for all students, is especially crucial to the academic development of students in the lowest SES groups.

The second part of Heyns' (1978) research involved interpretation of telephone surveys conducted with parents questioning them as to what sorts of activities in which their children participated, what demographics existed in the household, what structured educational programs in which their children were involved, and what the family's proximity to libraries and parks might be. Summer, according to Heyns, presents itself as a "free market" for activities, be they formally structured programs or loosely organized neighborhood play or free time for a child. To Heyns, the summer environment presented a "natural experiment" (p. 110) to assess the demand and importance that families placed on a particular program or activity apart from anything that might be mandated by government officials.

When Heyns compiled the survey data, the research yielded some major conclusions. First, Heyns found that programs that had the greatest involvement from high income children had the greatest impact on achievement levels, but that no program could be shown to reduce the gaps in achievement levels that already existed along SES or racial lines. This conclusion served as a particular indictment of compulsory programs as well as those offered either publicly or privately as they were designed to have a focus more recreational than instructional (p. 117). In fact, subsequent to analyzing survey results, Heyns postulated that the two elements that served as the best predictors of vocabulary gains were the proximity of a child's residence to a local library and the time the child spent in reading.

Yet, Heyns research did not ignore the significance of a family's income in relationship to summer learning. As might be expected, those families at the top of the SES heap had a myriad of choices of activities, recreational or cultural, for their children’s summer experiences. And

still, Heyns recognized the simple fact that parents who earn less may decide to reallocate resources where possible in an effort to benefit a child's educational progress.

Heyns' study reinforced the concept of summer learning loss originally investigated by White in 1906. Where White's study involved a very small sample, Heyns' study was expansive and included far more data. The Heyns study is widely studied and cited by many researchers in the field. It did, nevertheless, have its limitations. By choosing to study word knowledge, Heyns did not examine the mathematics achievement loss later cited by other researchers (Cooper et al., 1996; Entwisle & Alexander, 1995). Consequently, its conclusions were limited to a reading-centered focus. Should Heyns have concentrated on another discipline, reading and proximity to a library might not have been identified as predictors of summer learning loss.

Likewise, Heyns' effort to bring research to bear that would represent diversity across both racial and SES lines was important, considering the time period and the racial unrest that existed then (Heyns, 1978). The unfortunate "White flight" from the Atlanta school system did limit the research to a less heterogeneous sample, forcing Heyns to redirect her original research effort. Interestingly, even though the sample changed, Heyns still concluded that a family's influence relative to SES and the importance placed on educational pursuits factored into SLL.

Heyns' (1978) work leads to the question of where do educators invest their efforts in the arrangement of summer time and activity to the ultimate benefit of children? Heyns' admitted to a need for additional research efforts to explain just what happens when children regress or stagnate over summer exclusive of the analysis of test scores:

> Such factors no doubt constitute a partial explanation of results. They do not, however, provide a satisfactory account of the prevalent patterns of learning. If programs did not augment achievement, yet learning occurred, it is incumbent to explain what influences were most important and through what mechanism they operated. Focusing on the narrow experimental question ignores the patterning of activities and of learning that occurred. (p. 117)

The need to look at the relationships that might exist between how children and families spend the summer break and how those activities might influence successive progress or loss during the ensuing fall term is one presupposed by the current study. Certainly, much has

changed since 1978. The racial disparity that once was the norm in segregated American schools has been replaced by multiracial and multicultural classrooms that few would have imagined early in the last century. Similarly, a global economy and the rise of quality educational standards elsewhere in the world have put the United States on the defensive on fronts in which this country has been accustomed to leading. The ready availability of electronic media and the Internet and their widespread influence on students in their free time and is something that could not have been approached by Heyns in 1978. It would be feasible to do so today.

The Baltimore Beginning School Study

The Baltimore Beginning School Study (BBSS) conducted by Alexander et al. (2007b) in Baltimore, Maryland over a 16 year period represents one of the more comprehensive longitudinal studies of SLL conducted to date. As mentioned previously, the BBSS followed the same participants from their time of entry into first grade until most of the participants were 22 years old. The researchers reported perspectives on their findings in *Schools, Achievement and Inequality: A Seasonal Perspective* (2001) and *Summer Learning and Its Implications: Insights from the Beginning School Study* (2007b).

Additionally, the BBSS researchers conducted follow-up interviews with participants as late as 2006, six years after the study was officially closed. Eighty percent of the original students responded to the last round of interviews. BBSS is remarkable within the study of SLL in its focus on the same set of participants over an extended period of time, providing insight into how achievement disparities manifested in students early on relate to later school successes or failures that may impact them well beyond their public school experience. The BBSS design incorporated a large sample population at the outset from urban public Baltimore elementary schools. Using spring and fall testing, Alexander et al. compiled data comparing school year and summer achievement gains of this group of first graders over a period of four summers until the time that they finished elementary school.

From the study's inception in fall of 1982, researchers attempted to ensure representation across social and demographic strata in their analysis by randomly selecting participants (N=790), from 20 public elementary schools. The target schools were identified for inclusion by racial composition and socioeconomic level, with first graders being the selected participants.

Six schools were predominantly comprised of African American students. Six schools were predominantly White. Eight other schools chosen for inclusion were categorized as integrated. Fourteen of the schools were included from inner city and urban areas, and six were from middle class neighborhoods. Once the students had been chosen for testing, the school division administered the California Achievement Test (CAT) battery in October and again in May. Testing, following these same CAT testing procedures, continued for the remainder of the students' elementary tenure (Alexander et al., 2001).

SES status for students involved was derived from parent-supplied information regarding educational level and occupational status. In addition, researchers pulled information from school records regarding whether individual students received reduced price lunches during the year. A composite of this information was used in the classification process. Because the sample population came largely from an urban, overwhelmingly low-income area, Alexander et al. restricted the descriptors of "low," "middle," and "upper" SES as relative to the population studied, noting that there were "few genuinely wealthy" (p. 175) families within the BSS study.

The study drew data from quantitative results on two CAT subtests, Reading Comprehension (CAT-V) and Mathematics Concepts and Applications (CAT-M). Administered through twelfth grade and implementing one less subject ceiling constraint (Alexander et al., 2001), the CAT results gave Alexander et al. nationally normed results twice annually for the four-year period and then annually for seven more years.

Conclusions drawn evidenced dramatic SLL differences between lower and upper SES students in both mathematics and reading subject areas. When considering CAT-V performance during the school year, no clear disparity in performance trend was identified between the socioeconomic groups. While in school, disadvantaged students evidenced a gain of 191.25 points cumulatively, while middle and higher SES students reported gains of 216.54 and 186.69 points, respectively. Similarly, CAT-M test results showed that low SES students cumulatively gained 183.98 points during the school year, while middle and high SES students gained 197.31 and 183.65 points, respectively (Alexander et al., 2001). Obviously, all groups benefited in achievement in reading and mathematics skills while in the structured educational environment available during the school year.

But performance comparisons at the end of summer vacations evidenced a strikingly different pattern. Children from more disadvantaged environments scored dramatically behind their more advantaged peers. By the end of the fourth summer, the higher SES students registered a total gain of 52.49 CAT-V points and 18.9 CAT-M points, reflective of minute gains each summer, while middle SES students showed gains of 7.09 CAT-V points and 1.74 CAT-M points. Over the same period, lower SES students showed cumulative scores of .26 CAT-V points and -5.82 CAT-M points.

An analysis of the results from the BBSS study leads one to some obvious conclusions. First, all students tested progressed at a much slower pace over the summer months than they did during the normal school term. This conclusion mirrors what Heyns (1978) discovered regarding reading and word recognition. Second, lower SES students suffered a loss over the summer in mathematics achievement and, at best, barely held their own with respect to reading performance. Alexander et al. determined that the achievement difference pattern begun at the elementary level becomes cumulative by the time of high school, causing students in lower SES to lag behind in CAT-R scores by 73 points relative to the higher SES group (Alexander et al., 2007b).

Students from lower SES environments who choose to stay in school during critical high school years follow a different subject path and career track (Alexander et al., 2007b). When tabulating survey results for whether students in the study had completed high school or attended college, the researchers found a 133-point differential between the ninth grade scores of those who were in the low-SES group and did not complete high school and those who were in the upper-SES group and those who pursued a four-year college degree (Alexander et al., 2007b). Of this 133-point deficit for the lower group, a 43-point advantage was established in first grade alone, with 87 points advantaging the upper group over the elementary period. The researchers noted that this establishes the elementary years as particularly crucial to overall academic development of students in the lower economic group.

The BSS was an ambitious and well-conceived project, but the analysis of research begs the question as to what was driving the summer performance losses evidenced especially by lower SES students. Alexander et al. reported that "children's lives outside school over the

preschool years and during the elementary grades account for almost all of the achievement gap that separates low- and high-SES children at the start of high school" (Alexander et al., 2007b, p. 22) and that "The family's role in summer learning also needs to be better understood…." (p. 22). Thus, the BBSS study dealt only superficially with what must be considered to be an integral aspect of a student's overall performance, factors outside of school and their affect on student performance. These statements from the researchers themselves call for additional study on the subject from a different perspective.

The Teach Baltimore Summer Activity

Borman, Benson, & Overman (2005) address the concerns mentioned in the Alexander et al. (2001, 2007a, 2007b) studies -- summer reading gains and losses of primary elementary students from high-poverty backgrounds. Borman et al. (2005) reported conclusions and research focused not only on how much students gained or lost during the summer, but also the relationship between these changes and other factors in society, especially the family influence. Given that the conclusions about summer learning loss stated by Alexander et al. called for a deeper understanding of students' time away from school in the summer, the work of Borman et al. was an effort aimed at addressing the gap.

Just as with the BBSS, participants in the Teach Baltimore Summer Activity (TBSA) study were selected from the Baltimore Public Schools, a high poverty, academically struggling, school division. Unlike the BSS research (Alexander et al., 2007a, 2007b) which reported on an educational period virtually devoid of summer school participation, TBSA took a different approach approaching summer learning from the opposite perspective. Borman et al. (2005) researched the impact that Teach Baltimore Summer Activity, (TBSA), an intensive summer instructional effort, might have on preventing the summer achievement losses in reading previously documented by other researchers (Allinder et al., 1992; Heyns, 1978; McGill-Frazen & Allington, 2003) .

Begun in the spring of 1999 and completed in the fall of 2002, TBSA engaged 686 students from high poverty schools as the sample population. Selection to the first cohort in the spring of 1999 was based on a volunteer, random selection process. All students who completed kindergarten or first grade in 10 selected schools were allowed to register for the program.

Randomly assigned to the program, 239 students were enrolled in three TBSA summer interventions. An additional 135 students were assigned to be a part of the control group, not receiving TBSA intervention. Of these, 438 were selected to participate in the TBSA program, and 248 served as the control group.

The second cohort chosen in the spring of 2000 was limited to kindergarten students only. Random assignment of 145 students to the TBSA summer intervention was made for these students with 113 students chosen for inclusion in the control group. The sampling of students reflected the overall profile of Baltimore schools, and followed the same design used by the researchers in 1999. The researchers duly noted that students in the control condition were free to pursue summer instruction and activities separately from the TBSA program.

Students receiving the TBSA interventions were educationally engaged for six hours a day in small groups of no more than eight. Activities were led by highly trained college students and included intense work in reading and writing, mathematics games, recreation, art, foreign language and drama experiences (Borman et al., 2005). Field trips, cultural events and numerous learning activities were an extensive part of this seven-week experience as well. The researchers did not report in which particular activities the students in the control group were engaged during this time. Borman et al. (2005) did state that "a sizeable portion of the control group members attended other summer school programs with less focus on academic content…" (p. 138).

To gain empirical data, the TBSA researchers intentionally employed the Comprehensive Test of Basic Skill, Fourth Edition (CTBS/4). The CTBS/4 was administered in the spring and fall of 2000 to all students involved in the study (N =686). Given within a few weeks of the ending and beginning of school so as to avoid as much as possible cross-contamination with expected learning during the school year, "graduating" kindergarten, first and second graders were tested with the appropriate level test. During fall testing, the same level test was administered to the students, using an alternate form to negate the potential for test memory and spurious research results.

To gain perspective into the family effect as it related to summer learning influences, researchers conducted telephone surveys designed to derive information about students' participation in various activities, including reading, practicing of verbal skills, and participation

in cultural and church events. This information was compiled into what the researchers termed, "the home learning resources composite" (Borman et al., 2005, p. 141). Additional survey questions focused on information from parents addressing whether they had discussed the need for success in school with the subject child. This information was collected into the "parental expectations composite" (p. 142). Additionally, researchers collected information regarding SES, race, number of parents in the household, and number of children from survey and available school data.

The researchers' empirical findings indicated that, regardless of participation in the intensive TBSA program or enrollment in other programs or no summer programs at all, students still lost about 10 achievement points when comparing fall to spring testing. Borman et al. (2005) noted that this finding mirrored the findings of the meta-analysis study conducted by Cooper et al. (1996) on summer learning loss. The study did find, however, that longer attendance in the program was the only reliable predictor of achievement gains in reading. Yet, overall, in the six-week summer program, average attendance in the TBSA was a mere 3.2 weeks, little more than half of the time available for enhanced instruction.

When researchers looked at the composite information derived from the survey, they found that students who attended more regularly were likely to come from families with a larger number of children. Higher SES families were more likely to have children attending than families of lower SES. Families with a strong church connection were more likely to participate. The overall conclusions reached by Borman et al. (2005) suggest that a combination of buy-in by parents and effective support of the community are essential elements of any potential success for summer programs.

Given that this study represented a largely disadvantaged population, it is difficult to apply findings beyond that social demographic. The conclusions arrived upon by Borman et al. must be tempered with the fact that this program was an intensive intervention effort that resulted in spotty attendance by those it proposed to assist. Conclusions drawn here cannot necessarily be applied to those who might have attended a less-focused program or no program at all during the summer break. As with Heyns' (1978) research effort, researchers recognized

parental involvement and SES as elements of student success, yet the information gathered was far less detailed than would be desired optimally.

A Meta-Analysis of SLL Studies

There have been wide-ranging efforts at identifying summer learning loss since the start of the twentieth century, and the research gathered over the years can prove intimidating if one is to come to grips with what all of it means. Since 1996, the meta-analytic anchor study for a great deal of research on the subject was conducted by Cooper, Nye, Charlton, Lindsay, and Greathouse (1996). These researchers approached the mammoth task of compiling empirical studies that had been conducted on SLL to gain insight into the extent that summer vacation seemed to affect academics. Establishing the research question, "[the]impact of summer vacation on children's retention and acquisition of academic skills and materials" (p. 292) the team of Cooper et al. also examined the impact that vacation would have on student performance in various subjects as well as on students with varying family profiles.

In determining which research to include, Cooper et al. (1996) decided to divide studies into two distinct groups. The first group consisted of 26 studies which had occurred before 1975, dating all the way back to White's study in 1906. Many of the earlier efforts did not rely on statistical data, simply "crude" analysis; however, Cooper et al. determined that the information was too important to be ignored. Therefore, a method was employed to include the results of these less than ideal study designs. The researchers synthesized data by the vote count method in which the results were statistically reviewed for significance of the impact of summer vacation on academics in both the positive and negative direction. Neutral results were considered as well. The direction that received the "most votes" was considered representative of the results for that study, was tabulated, and was included in conclusions made concerning the overall effect of summer vacation on academic loss.

Because more empirical testing was extant in the post-1975 studies, data were more naturally suited to meta-analytical review. Included in the post 1975 studies were data collected for the Sustaining Effects Study, a research effort involving "as many as 120,000 students" (Carter, 1984, p. 4). Cooper et al. (1996) treated this study separately due to its size and the controversial and disparate interpretations of data by a number of researchers. Cooper et al. noted

that though some researchers like Ginsberg, Baker, Sweet, & Rosenthal (1981) concluded that the Sustaining Effects Study data set showed very little significant correlation between economic status and summer learning loss, Klibanoff and Haggart (1981) found that an analysis of the same data did not support conclusions of any absolute SLL. Conclusions drawn by others who looked at the Sustaining Effects Study data found that less-advantaged students either progressed at a slower rate (Heyns, 1987) or that summer learning rates dropped off (Bryk & Raudenbush, 1988).

Given the large sample size, it is not surprising that researchers pulling from various subsets of data might report different findings. In fact, Cooper et al. noted that sampling was undoubtedly an issue with a significant number of studies, from White's (1906) study with seven students to Hayes and Grether's (1969) research using a population of 370,000. Cooper et al. (1996) noted that the mere size of the Sustaining Effects Study itself meant that it needed to be weighted so as not to overwhelm data collected from other efforts.

Yet, in looking at studies from different perspectives, Cooper et al. (1996) concluded that the collective Sustaining Effects Study interpretations, disparate as they might be from researcher to researcher, indicated that minority and lower socioeconomic children evidenced slower rates of gain over summer in reading and insignificant or no gains in mathematics. Additionally, Cooper et al. reported that the "best-case scenario" (p. 260) arising from a weighted look at the data would be that the summer vacation would represent a period of no achievement gain and no achievement loss.

Any meta-analysis comprising studies covering such a wide temporal period must approach shifting operational definitions used over time, study to study. Cooper et al. (1996) found that when much of the difficulty with gaining a worthwhile perspective on the summer effect arose from the number of days that individual studies incorporated as inherent in the summer vacation period. When averaging across studies, Cooper et al. found that 131 days were included as part of the summer break. Cooper et al. noted that using this same number of days would be equivalent to including "… the months of June, July, August, and September, plus the first 10 days of October" (p. 259) as a part of summer break.

When looking at the Sustaining Effects Study data, Cooper et al. (1996) reported that the summer vacation period referenced was 140 days, increasing the summer vacation period by an additional 6.9 %. This extension of the summer break effect measured into periods of actual instruction was enough to cause concern and qualifications of other researchers findings. If anything, this extension contributed heavily to other research results that were overly optimistic as to the relative amount of achievement loss over the period and called into question research findings of summer gains by researchers such as Klibanoff and Haggart (1981).

Once all 39 studies had been analyzed, Cooper et al. (1996) found that student performance was susceptible to academic loss during the summer break as documented on achievement test scores, one month (d=-.09) on grade level equivalent scores or .10 SD relative to spring test scores. The loss recorded was greater for mathematics skills than for reading. Mathematics (d=-.14), especially mathematics computation, showed a significant decline. All students, regardless of socioeconomic standing, lost in mathematics achievement over summer. Students from lower socioeconomic backgrounds also showed a loss (d = -.21) in reading performance. This research synthesis from Cooper et al. reported conclusions similar to Murname's (1975) that attributed this difference in outcomes for the two subject areas to the fact that computationally-based skills tend to suffer in the absence of practice.

Cooper et al. (1996) also found that skill loss over summer seemed to be more pronounced in grades four and beyond, while first and second graders evidenced "insignificant" (p. 263) gains over the period. This finding was qualified by an explanation of "floor effect" (p. 263) and the fact that at lower grade levels, normed skills can only register a loss of a minimal value due to the lack of time spent in school to that point. The researchers suggested that, once this factor is considered, one should expect that the first years of schooling experience are nonetheless impactful on later progress.

Looking forward, Cooper et al. (1996) suggested that policymakers should address calendar change to cope with the SLL issue, though Cooper et al. qualified this suggestion to reflect the state of affairs at the time of the study – that no alternative calendar approach had proved to be effective. Likewise, Cooper et al. suggested a new look at summer programs,

especially as a targeted effort at mathematics losses and at lessening the socioeconomic implications of summer reading losses.

Importantly, Cooper et al. (1996) suggested that more research needed to be conducted at earlier grade levels and that it should be of interest to researchers to capture what activities and experiences, apart from schooling, comprises summer vacation periods for students. Cooper et al. also strongly suggested that a "pure" (p. 264) approach – one that that does not skew the time period covered – be used to accurately measure for the summer vacation period in future research.

Alternatives to the Current School Calendar

Over the years, the concern with SLL has caused leaders to reassess the traditional school calendar design, ostensibly to shorten or even eliminate the summer break altogether. Alternatives to breaks range from the simple summer school alternative, where students are given additional instruction during the traditional summer break period, to a more involved redesign of school calendars into those of year-round education. There are proponents various alternatives, but there is no widespread agreement about which plan is best.

The Summer School Alternative

Given that summer learning loss causes researchers (Cooper et al., 1996: Heyns, 1978; Murname, 1975) a great deal of concern, the logical response, especially from those outside education, might well be that summer school should be the answer and an effective means of stemming the outgoing tide of student performance. After all, one might reason, summer programs are already a part of the American educational culture, and any necessary tweaking of the system might more readily be accomplished by using established methods. Researchers (Alexander et al., 2001; Borman et al., 2005; Carter, 1984) have already gone that route and examined summer programs' effect on summer learning loss. Their findings indicate that summer school is not an effective means of addressing the SLL issue.

> For years, summer school has been seen as a means of continuing academic influence after the traditional school term ends, whether the efforts were for remediation for slower performers during the school year, compulsory attendance for Title I students, or

> enrichment activities for anyone willing to sign up. But almost to a researcher, summer programs have been found woefully lacking in keeping the educational faucet flowing (Alexander et al., 2001).

Borman et al. (2005) studied a summer program intentionally designed to support at-risk lower SES students and found the program wanting in the face of social pressures and lack of parental support. TBSA was anything but recreational or conventional in design. Despite the intense educational focus of TBSA, lower class size and well-planned intervention did not stem the tide of academic loss.

Title I programs have been under the microscope for some time now. Carter (1984) reported on a major evaluation of Title I programs and compensatory education that involved a national focus on more than 300 elementary schools and as many as 120,000 students over a period of three consecutive school terms. Though for certain populations the study found slight gains in reading and almost no gains in mathematics achievement, conclusions were that Title I programs were largely ineffective in reducing SLL. Carter found that students already performing near the "normal" level were the individuals seen to gain from compensatory instruction and those performing at a much lower tier evidenced a gain (or lack thereof) proportional to their performance during school. This research effort indicated that when the fall scores of students attending summer school were compared to those who did not attend, summer compensatory programs were largely ineffective overall. Ultimately, Carter attributed this lack of effectiveness to poor instruction and little time for it (Carter, 1984). David and Pelavin (1978) and Kuntz and Lyczak (1983) likewise determined that Title I summer compensatory programs were, at best, only moderately effective for lower SES students and that disadvantaged students were more likely than not to show a loss in achievement when fall to spring and spring to fall test results were compared.

Ballinger (1988) builds on Carter's (1984) findings, addressing summer compensatory programs in general as lacking in focus to meet students' needs and likewise lacking in the same intensity of program that characterizes instruction during the regular school term. Heyns (1978) had made the same point in her study, finding that summer school was for the most part "recreational" and dealing with non-traditional subject matter. Ballinger goes on to make a cogent, but perhaps largely overlooked point – summer schools are not attended by most students

anyway. In much the way that a clinic built on a deserted island cannot improve the health of an invisible populace, summer school cannot possibly attend to the needs of those who do not attend.

Even when there are gains in summer school, it appears that the gains are reserved, in large measure, for middle class students -- not the disadvantaged. Alexander et al. (2001) found that summer school can have the opposite effect on disadvantaged students than that for which it is intended. Alexander et al. found that summer school attendance actually allowed middle class students to outpace the progress of their disadvantaged peers, in effect, *widening* the achievement gap rather than shrinking it.

Entwisle and Alexander (1995) identified not only a gap in learning, but one in resources available to advantaged students that simply did not exist for the disadvantaged. Thus, access to established summer programs and enrichment is already greater for those who are already better off. Further, Entwisle and Alexander found that a parent's "economic shadow" (p. 399) continues to color the performance of the disadvantaged child even with the intervention of summer school, because summer school does not address the societal factors – unwed or absent mothers, absent fathers, and one or both parents who are under or largely uneducated– that are a part of their lives whether in school or out and tend to hold them back.

The Year-Round Education (YRE) Alternative

If summer school programs are poorly designed or ill-equipped to deal with academic loss, their one advantage is that they are at least in sync with the traditional school calendar and summer break. But the current traditional system now does not appear to be working to advantage students academically. Perhaps the answer to the ineffectiveness of summer programs, then, might be a reworking of the school calendar itself, an approach commonly referred to as year-round education (YRE). The concept is not new, and has been shown by some research efforts to be tough to implement and awash in spurious results (Cooper et al., 2003; Evans & Bechtel, 1997; Trewartha, 2007; Virginia Department of Education, 1992).

Implementing YRE would directly alter the school calendar, moving it away from the traditional eight to ten week instructional gap. Alexander et al. (2007b) identified the "summer slide" (pg. 19) that especially exists with disadvantaged students and stated that there was a

pronounced need for supplementary help if the negatives of lower SES and family and community obstacles to learning were to be overcome, noting that, "if some schooling is good, more school should be better" (p. 24).

More schooling can take on different guises. Obviously, more schooling might mean a longer school year, adding days on top of the traditional 180. More schooling might also involve some variation on the 180-day calendar theme, increasing the hours per day, but not necessarily the days per year. More schooling more likely might be realized in more schooling on a more consistent basis, a concept that may not necessarily involve lengthening the traditional calendar or length of the school day. Instead, more schooling might more realistically involve spacing out the breaks within the school year to lessen the length of time students spend in the instructional vacuum. One might conjecture that a shorter summer break might translate into a smaller SLL.

This last idea of shortening the summer break and spacing breaks into shorter but more evenly scheduled breaks throughout the year most closely approaches many educators' idea of what year-round education (YRE) should look like, and it seems to have the most traction. In fact, Cooper, Valentine, Charlton and Melson (2003) reported that as of the 2000-2001 school year, over 2.16 million students at 3000 schools in 45 states were already attending alternative calendar programs.

Ballinger (1995) addressed the idea that consistency of education is at the core of YRE efforts, endorsing a non-traditional calendar as one that is more capable of timely and immediate remediation for students who are in need. Ballinger (1988) anticipated an impact that is currently being realized in an ever-increasing population of English as Second Language (ESL) students, identifying a continuity gap that occurs with the interruption of English instruction over longer periods away from school. From this perspective and research attributing loss to disadvantaged students (Alexander et al., 2007b; Borman et al., 2005; Heyns, 1978), those who fall into the categories of being both lower SES and ESL students seem to have two strikes against them moving into the summer break. Moreover, Ballinger maintains that potential problems on a number of fronts may occur for all students--and, indeed, for society itself--when children have too much time on their hands and too little direction once school adjourns in the spring.

The idea of the need for calendar adjustment has been advanced by Cooper (2004). Cooper recounts how, in the examination of 39 studies of summer learning loss, the detriment to learning discovered equaled about one month of instruction during the school year. As a means of combating the problem, he suggested a more continuous schedule of remediation and enrichment.

Sharknas (1970) estimated the learning loss due to instructional gaps at eight weeks for the average child and at an even greater number for the disadvantaged. Moreover, she maintained that it is virtually impossible to make this ground up in the ensuing school year(s). The most sensible means of stemming the loss without compromising instruction, according to Sharknas, is to work two-week "mini-vacations" into the school calendar at regular intervals throughout the year, in effect, providing for more continuous reinforcement of learning and eliminating the long summer break and the attendant loss of achievement in the process.

Though one might expect that this radical change in calendar might not go over well with those scheduled away from summer vacation, the results are somewhat surprising. In schools where modified calendars have been instituted, feedback has been identified as generally positive from those involved. Cooper et al. (2003) researched attitude surveys from participants in modified calendar environments in 55 school districts, recording that over 80% of respondents were more positive than negative about the adjustment.

Interest in the potential impact of YRE goes beyond American borders as well. Parallelling the discussion of YRE in the United States, Davies and Kerry (1999) discussed the application of YRE concepts developed in the U. S. to modified calendar project schools in the United Kingdom. Survey results for those involved were positive and supportive of calendar change that would mimic the type of change being implemented in America. The loudest discordant view, apparently, had arisen from British educators themselves. Hastings (2003) reported that for all of the supposed good that adjusted calendars might bring to British student progress, an apparent significant groundswell of opposition had arisen from teacher unions in the United Kingdom. The unions were strongly resisting what they considered to be the last remaining privilege afforded teachers in their positions.

As might be expected, there is also potential for resistance to school calendar change in the U.S. on a number of fronts. Certainly, that most immediate and obvious pushback would be from students and probably some educators as well who do not relish giving up summer break. And for some researchers who have looked into the results where modified calendars have been put in place, these expectations of mediocre return on investment in change have been confirmed, to some degree (Cooper et al., 2003; Evans & Bechtel, 1997; Trewartha, 2007; Virginia Department of Education, 1992).

Trewartha (2007) detailed responses to a questionnaire to parents, community leaders and educators, soliciting feedback on their view of a change to a year-round calendar, and reported a variety of results. Overall, respondents expressed some interest in YRE and a willing attitude toward it, but most were unconvinced that it would work. Some cited an elsewhere oft-stated fear of impact to tourism if the traditional summer student workforce went away. Others cited scheduling conflicts with local colleges and universities and the disruption of family vacation cycles. Disruption of the traditional vacation season, it appears, will not be accomplished easily.

This negativity on YRE can reach far above the local level. The Virginia Department of Education (1992) produced a research study that was, in essence, a state meta-analysis of research addressing change to traditional patterns of instruction. In comparing American educational programs and processes to those around the world, the Virginia Department of Education concluded that adjusted calendars did not advantage students in a manner that would predicate an urgent effort for large-scale change.

The Cooper et al. (2003) study expanded the look at change beyond the focus of a single state, incorporating 58 school districts in three states. Though the respondents, as mentioned previously, were overwhelmingly positive about their experience, the study's meta-analysis indicated results that were less than positive for YRE. In looking at the research conducted to that point that was supportive of the concept, Cooper et al. identified inherent problems with research studies that may have skewed results, coming to the ultimate conclusion that there was not much better than a 50% chance that students attending schools with modified calendars might outperform those attending traditional calendar schools.

Obviously, the modified calendar approach has both supporters and detractors, and there is a body of research and opinion that seemingly brings more murkiness than clarity to the discussion. Perhaps in all of this, one of the most poignant perspectives comes from the research of Evans and Bechtel (1997), who concluded that little evidence exists that more time spent in school improves student performance. Evans and Bechtel found that more time in class does not necessarily equate to better test scores or higher achievement – the key to better achievement rests in quality instruction and what is done with the time allocated for instruction.

Synthesis of Studies and Perceived Gaps in the Research

A great deal of research has been conducted in an effort to identify, understand and attempt to address summer learning loss for over 100 years. And yet, there is still much to be understood. Researchers (Borman & D'Agostino, 1986; Burkam et al., 2004; David & Pelavin, 1978; Kuntz and Lyczak, 1983) have recognized that there are gaps or inherent problems in the overall examination of SLL that provide unanswered questions for future study.

David and Pelavin (1978) called into question the whole structure of Title I measurements, tying much of their concern to the testing schedules themselves. The researchers took issue with traditional spring testing adjusted against a fall pretest that showed improvement for students overall. David and Pelavin argued that by effectively ignoring the summer period, measurements were skewed to only the periods while students were in the regular classroom, artificially inflating the positive effects of compensatory education. When David and Pelavin took into account fall to fall testing as measurements of the effectiveness of the programs, results were significantly lower than those considered from fall to spring only. Not only did the findings of David and Pelavin reinforce that loss occurred over the summer, they found fault with the ways that compensatory programs were being measured as a whole.

Kuntz and Lyczak (1983) sought to improve upon the earlier work of David and Pelavin (1978). Kuntz and Lyczak took exception with previous research involving the use of grade level equivalents for reporting in addition to the use of identical test forms for both spring and fall testing that tended to positively enhance results. In correcting for these flaws, Kuntz and Lyczak found evidence of significant summer loss in both mathematics and reading that they posited as less accurately measured in other studies.

In a meta-analysis examining 17 federal studies about Title I, Borman and D'Agostino (1996) reinforced the findings of David and Pelavin (1978), concluding that fall to spring gains in mathematics achievement were more susceptible to SLL than reading and that the "summer effect" (p. 320) tended to contribute to lesser gains than recorded in fall to spring testing. Studies purposefully designed to measure for summer effect against learning during the regular school year, by design, inaccurately secure the results when testing schedules artificially extend the period of the summer break (Borman and D'Agostino, 1996: Hayes & Grether, 1969: Heyns, 1978).

Testing schedule design can affect the accuracy of research conducted on SLL by artificially measuring for longer periods of instruction or lack thereof. The administration of testing significantly ahead of the end of school in spring and significantly after the startup of school in the fall can effectively lengthen the summer break and add periods of instruction into it that should not be considered when looking at the impact of time *away* from instruction (Burkam et al. 2004; Cooper et al. 1996; Entwisle & Alexander 1995; Heyns, 1987).

Burkam et al. (2004) stated that longitudinal studies which administer testing in October and May, ostensibly to record student progress at the beginning and end of the school year, were problematic in this regard, inaccurately measuring the summer period between kindergarten and first grade. Burkam et al. cautioned that though it might be logistically impossible to be rigid in arranging testing schedules, it was nonetheless critical for all future researchers to consider this aspect when evaluating comparative results of in-school versus away-from-school learning.

Sample sizes and the makeup of samples provide additional reasons for which the SLL study should continue. Wintre (1986) found that students actually gained in reading and mathematics concepts over summer break, though mathematics computation skills did not show an increase. However, Wintre did admit to "limitations" qualifying her research, including the use of only one test measurement and a small sample size (182 students) that may or may not have been representative in a single, middle class school. In addition to all of the sample population being from a single SES, the fact that all students were English-speaking learners should call for qualification of the nature of the study itself. In citing other research on the subject, Wintre (1986) referenced studies that coincided with her summer gain theory conducted from 1925 through 1962, a time of racial segregation when school populations did not approach

the diversity seen in classrooms today. White (1906) likewise found some minor summer loss in his study, but White's study involved only 15 students in two grade levels in a single school. It was study conducted well before even the research cited by Wintre (1986) and probably should be discounted except as historical context.

Even when studies have involved larger samples in an attempt to be more representative in measuring for SLL variances by SES, these studies themselves have been limited by the skewed demographics or abnormally large disadvantaged populations. Heyns (1978), Borman et al. (2005), and Alexander et al. (2007) conducted research on large city populations that were singularly urban, high poverty and of largely African American composition. Title I studies (Borman & D'Agostino, 1996; David & Pelavin 1978; Kuntz & Lyczak, 1983) by their nature researched learning over largely disadvantaged populations. Even though these studies were focused on a very different group than on those studied by White (1906) and Wintre (1986), the research conducted was concentrated on populations of at-risk and achievement-challenged participants.

Not all researchers have attempted to investigate exactly what occurs during the summer when students are away from instruction. As mentioned, some have studied summer programs and found them to be marginal in effect, at best. Heyns (1978), Carter (1984), Ballinger (1988), and Alexander et al. (2001) were critical of summer school programs in effect at the times of their studies as poorly focused, lacking in intensity, and largely failing to address the needs of the students within them.

The finding that summer school programs seem to underperform, especially for disadvantaged students, has prompted some researchers to broaden the scope of study beyond the programs themselves, investigating other factors or alternative programs that might influence the summer experience for students. Borduin and Cooper (1997) reported on a summer reading program where books were mailed to students over the summer break to encourage additional reading. This program, designed to allow students to enhance skills apart from classroom instruction and specifically targeted to Title I and free lunch students, reported gains in reading scores after the program was instituted.

White and Kim (2008) reported that "scaffolding" support by teachers and parents can increase voluntary student reading in summer and reading achievement overall. Teachers were challenged to provide appropriate materials, to match books to readers, and to reinforce comprehension strategies near the end of the school year. Parents were likewise challenged to provide time and support for children to read during summer.

A few researchers (Burkam et al., 2004; Chin & Phillips, 2004; Heyns, 1978) instituted surveys as an integral element of research, attempting to pull out more specifics about activities in place over summer that might be directly or even indirectly related to student achievement or learning loss measured empirically by testing methods. Heyns (1978) surveyed parents and caregivers with a wide range of questions, soliciting data from library usage, to family vacations, to use of free time in an effort to identify what might be impacting SLL for reading scores for children in Atlanta. Her conclusions were that of all activities engaged in during summer, library usage seemed to be more influential than any other on SLL for Atlanta students.

Burkam et al. (2004) conducted an in-depth national analysis of student activities that involved a wide range of schools, attempting to see how summer activities influenced learning relative to SES. Burkam et al. reported that higher SES parents were usually more involved in educationally-based activities with their children than were those in a more disadvantaged environment. Nonetheless, Burkam et al. found that summer activities seemed only to modestly impact the achievement of children at the K-1 level. But that finding was called into question by the researchers themselves, noting that they had measured for the frequency of activities in the broader perspective, but not what those particular activities involved. Realizing that an investigation of the second point should be advantageous to future research, Burkam et al. noted the need for additional research in this regard.

Chin and Phillips (2004) surveyed both middle class and disadvantaged students to gain insight into what comprised their summer experience and found that middle class students had more access to computers and learning tools, had more opportunities for enrichment, and benefited from a more structured environment than did the economically disadvantaged. Given the resources available to those more economically advantaged, this enhanced educational enrichment might be expected. But Chin and Phillips pointed out that there was some commonality between both groups – in either group, children can accept or decline the

opportunity to improve. Significantly, the researchers concluded that, despite the differences of economic advantage or disadvantage, parents in both groups wanted their children to succeed.

Of course, parental involvement in student learning is significant whether a student is in school or not. Like Chin and Phillips (2004), Bianchi and Robinson (1997) recognized a lack of structure in the environment of lower SES students, and further stated that a preponderance of working mothers, single parents, and poverty undermined achievement for these students. Bianchi and Robinson concluded that middle class and college educated parents were much more likely to have structured expectations and reinforce reading, both of which have ramifications when the "scaffolding" referenced by White and Kim (2008) is absent.

At an early age, children are incapable of providing structure to their environment. At a later age, though they may be more capable, they may likewise be unwilling to do so. Chin and Phillips (2004) found that parents must be engaged to facilitate their children's own investment in the learning process. Given the conclusions put forward by Chin and Phillips, if we are to accept that parental involvement is important for middle class students, it is imperative for the disadvantaged if they are to have a chance at progressing.

Certainly there are parents of disadvantaged students who provide as structured an environment as is possible, given their circumstances. There are middle class parents who are less than supportive or who may not be as engaged as they might be in their children's learning. There are enrichment activities and learning experiences in summer in which both groups participate. Researchers still measure summer loss in both groups - more so for the disadvantaged to be sure – but still summer loss occurs. Policymakers have adjusted some school calendars to provide for more continuous periods of instruction. Yet, the potential benefits of year-round instruction are still being debated.

With so many variables impacting student learning and with multiple adjustments to programs and processes, the SLL phenomenon appears to persist. How is it possible for leaders to make astute observations and calculated decisions on what must be done to stop the apparent drain on student learning? Considering the multitude of influences on students' lives, both in and away from school, is it possible that other as-yet unidentified relationships might exist between the way students spend their summer days and learning that might be lost over the period?

Alexander et al. (2007) strongly stated their belief that there are other factors apart from school that are driving the gap between advantaged and disadvantaged students:

> It seems self-evident that a large summer gap in cognitive skill development over the early years of children's schooling will have long-term repercussions, yet there is no research to date explicitly focused on consequences. Studies instead have centered on the pattern itself—making sure it is well documented—and to a lesser extent on identifying summer experiences that can account for summer learning differences…. (p. 20)

Downey, von Hippel and Broh (2004) brought a wider perspective to the SLL issue. Overall, Downey et al. reasoned that students spend more time away from school than they do in it and that the SES gap between the advantaged and the disadvantaged grows at a much faster rate when students are not in school. Downey et al. found that race and SES account for only about one to eight percent of the inequality that exists in learning rates, a figure much smaller than might be logically supposed, leaving the balance of the blame for summer learning loss with an unidentified, "'unexplained' inequality" (p. 34). This unexplained inequality, present even before the student starts school, was found to be at play in the gap that arises, and summer was identified as the time in which these factors were increasingly relevant and glaringly manifested.

Summary of the Literature Review

Unfortunately, no research to date has isolated a specific set of circumstances that can be identified as singularly related to summer learning loss. There are so many factors that come to bear in the education of children today and in their lives away from school that leaders cannot presume to easily identify the problem and definitively rectify the issue by instituting a policy, maintaining a program, or studying a particular subject. Though there may be no definitive answer, at this point, as to which age group or what subject area seems to be most negatively affected by SLL, there are some findings that might be more commonly gleaned from the literature reviewed:

- Summer learning loss is evident when comparing fall to spring test scores to spring to fall test scores (Heyns, 1978).

- Timing of the administration of testing influences the amount of loss measured (Burkam et al., 2004).
- Children from disadvantaged backgrounds suffer greater loss over the summer months (Downey et al., 2004).
- Losses may be evident in reading or mathematics or in both subject areas (Murname, 1975).
- Losses in mathematics skills over summer are seen across all SES groups (Cooper et al., 1996).
- Children from both advantaged and disadvantaged backgrounds progress in academic achievement while in school (Entwisle et al., 2001).
- Other factors apart from those experienced during periods of regular classroom instruction seem to influence summer drop-offs in achievement (Downey et al., 2004).
- There may be unexplained factors in SLL that are yet to be identified (Downey et al., 2004).

The unexplained influences referenced by Downey et al. (2004) may include participation in certain activities which correlate to either positive or negative academic gain. The purpose of the current study was to identify student summer activities and determine whether a relationship exists between them and mathematics testing change scores measured from spring to fall. This attempt to discover relationships between scores and summer activities was likewise an attempt to discover unexplained influences that might exist.

CHAPTER III
RESEARCH DESIGN AND METHODOLOGY

Introduction

The purpose of the study was to identify student summer activities and determine whether a relationship exists between them and mathematics testing change scores measured from spring to fall. This current effort was built upon research conducted by Heyns (1978), Burkam et al. (2004), Downey et al. (2004), and Alexander et al. (2007). The commonality in findings that existed between all of these efforts was that learning loss occurred in the absence of such instruction as that experienced during the normal school term.

The research questions to be investigated are:

1. How does mathematical performance for exiting second graders in spring compare to mathematical performance for that same group of students as entering third graders in the following fall?

2. What were the activities in which these students were engaged during the summer break?

3. Is there any correlation between total test standard score change and summer activities in which participants engage?

Research Design and Methodology

This study was designed to include both a mathematical testing element and a participant survey to collect data to answer the research questions stated above. Obviously, in order to study relationships between summer activities and SLL, it was necessary to establish if students did, in fact, experience a score decline in mathematics performance measured from spring to fall. To that end, empirical data were derived from testing students in the spring of an ending school term and again in fall of the ensuing term to gain a total test standard score (TTSS) and determine whether score changes between the two test events were positive, negative or unchanged.

Standardized change scores were recorded both for individual subtests within the complete test platform used and for the total test as well. Total test standard score (TTSS) gain

data were entered into Statistical Package for the Social Sciences (SPSS) software to run correlations between activity data and those same scores.

All participants were tested on the same material from spring to fall to provide for uniform data collection and a common experience for each. Yet, the summer activity experience for participants, while potentially incorporating a certain number of shared experiences, also provided a potential for a wide range of experiences that may or may not have been shared among participants. In order to address the second research question involving an identification of these experiences, a summer activity survey was developed and sent to parents of participants subsequent to the fall testing event. A standard set of questions was developed with designed "yes/no" or very short answer responses. Data collected from the survey material were assigned unique binary values for entry into SPSS software so that correlations could be run between these and the change score data.

Selection of Participants

Participation in the study for their second grade students was made available to all elementary principals in a Southwest Virginia school division in spring of 2010. Principals had the option of allowing or disallowing their students to take part in the study. For those second graders whose principals had agreed to allow the study, participation in the study was voluntary. No selection criteria were employed by the researcher or any school staff to encourage or identify participants who might become involved in the study. Prior to making participation available, the researcher secured permission from the division superintendent to allow the study to proceed (see letter copy, Appendix D). Subsequent to receiving the same, the researcher discussed the study with building administrators of the 16 schools whose students might participate. Of these 16 school administrators, nine ultimately agreed to make participation available to students within their charge. The nine schools from which students volunteered were located in all quadrants of the county.

Written communications with participants, parents or interested parties were drafted and forwarded to Virginia Polytechnic and State University's Institutional Review Board (IRB) for approval prior to delivery to the intended recipient (see Appendices F, G, and H). Permission forms were drafted as age and education level appropriate for the recipients (see Appendices G,

H). Any IRB suggestions for correction were resubmitted in line with standard IRB protocols. All correspondence was approved by IRB. IRB approval and certificate of completion appear in Appendices E and C, respectively.

Five hundred ninety-two letters of invitation to participate were sent to parents in early spring, 2010. One hundred thirty-three affirmative responses were returned to the researcher. Upon receipt of the responses, 133 participation consent forms for both test events were sent to all 133 potential participants and their parents. From this potential sample of 133, 58 participants agreed to be tested in the spring. Of those 58 participants, one did not return for the fall test event. This participant's data were eliminated from the study. In the end, there were 57 participants. Twenty-five of these participants were male, and 32 participants were female

Instrumentation

GMADE

Two forms of instrumentation were used in this study: the Group Mathematics Assessment and Diagnostic Evaluation (GMADE) to assess mathematics skills and knowledge and a parent survey to assess the summer activities of the student participants. Whereas evaluation of writing prompts and certain language related criteria involve some measure of subjective evaluation, mathematics by its very nature, lends itself to empirical, quantitative study. In addition, because prior SLL research (Alexander et al., 2007; Muname, 1975) has indicated that mathematics performance is affected, to some extent, across all SES groupings, the current study concentrated on an evaluation of mathematics performance to establish whether SLL occurred in the study sample. To gain quantitative data, the GMADE was used to gather scores for students in both spring and fall tests.

GMADE was developed by Pearson Education, Inc., a nationally recognized provider of student evaluation and assessment materials. Pearson asserts that this test is based on standards set forth by the National Council of Teachers of Mathematics (NCTM), is norm referenced, and is designed to be used with grades K -12 (Williams, 2004, pp. 1-4). In addition, equal and parallel A and B versions of this test were provided so that a potential practice effect did not compromise the research effort. GMADE employs both content and process based standards. Overall GMADE content standards include Geometry, Algebra, Numbers and Operations,

Measurement, and Data Analysis and Probability. Process standards include Representation, Connections, Problem Solving, Reasoning and Proof, and Communication (Williams, 2004, pp. 1-4).

GMADE has been tested for validity and shown to be a relevant mathematical skills assessment tool. The state of Washington, in its Washington State Mathematics Assessment, reports that this platform offers "substantial evidence of technical adequacy, "reporting a median for Form A of .93 and a median of Form B of .94, along with a test/retest reliability of .78 to .91 for levels K-4 (Washington State, 2009, p.11). Pearson Education offers this capsule description of this assessment tool:

> GMADE was standardized and normed using the most up-to-date methodology. It provides raw scores from each of the subtests that can be converted to stanines. Composite and total test raw scores can be converted to stanines, standard scores, percentiles, normal curve equivalencies, and grade equivalencies. Reliability coefficients for alternate form and test-retest were in the .90 range. Concurrent and predictive validity was assessed using a variety of standardized mathematics assessments, including *TerraNova, Iowa Test of Educational Development, Texas Assessment of Knowledge and Skills*, and others. The nationwide standardization sample of more than 26,000 students was collected in the spring and fall. Selection was made to be representative by enrollment, gender, race/ethnicity, region, community type, and socioeconomic status as measured by free-lunch participation. (Pearson Education, Inc., 2009, p. 7)

Additionally, Pearson also cites standards from a number of departments of education, including the State Department of Education for Arkansas, California, Georgia, Idaho, Michigan, Minnesota, New York, North Carolina, Oregon, South Carolina, Texas, and Virginia, all of which were used in the development of its GMADE platform (Pearson Education, Inc., 2009, p. 6).

The GMADE standards were divided by Pearson, Inc. into three subtests used in assessing participants' performance in this study. Concepts and Communication tested students on questions involving the vocabulary and terminology associated with mathematics. Interestingly, this area of examination, in some measure, crossed over into the testing of reading

and language related aspects of student learning. The Operations and Computation subtest assessed participants on the basic and traditional operations used in completing problems, including addition, subtraction, division and multiplication. The final subtest, Process and Applications, involved participants in using both mathematics and reading skills to solve word problems by choosing appropriate operations based on an understanding of the problem at hand. All subtest scores were standardized and evaluated as a subtest standard score (SSS). In addition, a total test standard score (TTSS) was determined for each participant.

The *GMADE Norms Supplement* was used to age norm scores from spring to fall on all SSS and TTSS to correct for the necessity to assess participant performance outside of the boundaries of the traditional school calendar. Age based norming (as opposed to grade based norming) was chosen as a more accurate means of negating not only this potential for an inaccurate assessment of student proficiency based solely on grade level, but also any influences that might have come to bear from any participants' potential for transiency during the school year or retention in previous years of instruction.

Survey

The survey was designed to identify summer activities experienced by each participant and was constructed to be administrated in a hard copy, written format. The determination was made that responses were more likely to be returned in this format as opposed to an oral one, and, moreover, it was likewise determined that responses were more likely to be returned honestly if questions regarding the SES of the families involved were eliminated. The survey itself was modeled after the oral one used by Heyns (1978); her support for its use (see Appendix M) was received.

Survey questions were designed to be a "yes/no" or short answer format to allow for simplicity of scoring and to encourage response. A listing of questions contained in the survey follows below. The survey appears in Appendix A.

1. Did your child attend summer school?
2. Did your child read independently during the summer?
3. Did your child attend a summer camp?
4. Did your child go on vacation during the summer?

5. Did your child play video games during the summer?
6. Did your child play educational games during the summer?
7. Did your child play organized sports during the summer?
8. Where did your child stay during the day?
9. Were more than 80% of your child's activities planned by a parent or third party?
10. Was more than 50% of your child's day free or unstructured?

Questions 3, 4 and 8 each contained a subset of possible responses designed to gather additional information describing the experience relative to the larger question. For example, where respondents answered "yes" to question 3, that their child did attend a summer camp, additional choices accompanying this response allowed the respondent to check a response for "Church Camp," "Sports Camp," "Educational Camp," "Scout Camp," or "Other." Where "Other" was checked, there was an opportunity to provide a brief description of what this choice entailed. Similarly, subset responses to the other questions allowed a better picture of what type of vacation was experienced or where the child might have spent his or her summer days. Parents were able to check more than a single answer for each subset question.

Surveys and cover letters were mailed to parents of participants after the fall testing event was complete and after the survey had been field tested (see Appendices A, B, I, and J). The survey was submitted to IRB for approval before it was distributed (see Appendix E). The cover letter that accompanied the survey mailing explained that test results for participants would be forwarded to parents following receipt of the completed survey by the researcher. Follow-up phone calls soliciting returns of the surveys were made by the researcher to parents not returning the information in timely fashion. All survey copies were coded with the alpha-numeric code used to identify each participant so that responses could be accurately matched to gain scores upon return of the survey. A total of 57 surveys were distributed and returned.

Administration

GMADE

Past research has drawn into question the practice of testing participants exceptionally early in spring and exceptionally late in fall or to the opposite extreme, late in spring and early in fall, scenarios that artificially lengthen or shorten the summer break period, skewing the period

actually covered by the summer break itself (Borman & D'Agostino, 1996; David & Pelavin, 1978). The logistical constraints of the lack of a central location for testing, a single researcher conducting the study, the need to conduct testing after normal school hours, and the relatively large geographic area comprising the schools involved, travel between locations, and scheduling with individual schools, it was impossible to test each participant on the same schedule. Every effort was made to test students three weeks prior to dismissal in spring of 2010 and no more than three weeks after the start of school in fall, 2010. To accommodate the varying length of time between tests for participants, days elapsed between spring and fall testing were calculated for each participant. These days were added as a variable for later analysis.

Test dates were established at individual schools and these dates were communicated to parents and participants a minimum of one week in advance of the testing date. Participants were provided a comfortable and secure test venue at their home schools following completion of their school day on the assigned date. The researcher collected all permission forms on the day of the spring test. No participant was allowed to test without a signed form. All 57 participants provided the necessary forms on the day of the spring test at his or her individual school.

The researcher took attendance on the scheduled test date to ascertain that participants who had committed to testing were in attendance. At the end of the test event, the researcher ensured that each participant departed the test venue with the prearranged transportation agreed to as indicated on the permission form. The researcher explained the test and entertained and answered questions prior to distribution of testing booklets to participants. The test was not timed, but its duration consisted of about one hour's time. Both A and B versions of the test were available from the test developer, and roughly half of the participants at each school received the A version in spring, with the rest of the participants receiving the B version. In the fall, each participant received the opposite version of the test that he or she had completed in the spring. Upon completion of the test, test booklets were collected from participants and secured for transport to the researcher's home, where they were later marked and scored by subtest and total test for each student, using the developer's supplied standardization material. The test booklets were secured in a locked cabinet to remain there until five years after completion of research, at which time the booklets will be destroyed.

Survey

With permission, Heyns (1978) telephone survey was adapted to 10 questions covering a variety of activities, and it included questions soliciting information on income, educational status, and similar socioeconomic status (SES) data. Upon advice of the examining committee, the SES information and a number of other questions were pared from what became the final summer activity survey sent to parents of participants. It was determined that, within the context of the current culture, questions relative to SES were sensitive in nature and unlikely to generate an honest response. In addition, the committee determined that the number of questions asked on the survey should be limited to a total of 10. Advice of the committee was followed, and the survey sent to parents reflected these changes. A copy of the survey appears in Appendices A and B.

Once the questions and format of the survey were finalized, the survey itself was field-tested with parents of students of the same age/grade level in a non-participating school. A letter of explanation of the need for field-testing the survey, a copy of the survey itself, a survey evaluation form, and a self-addressed, stamped envelope for the evaluation form's return were sent home with 99 students on December 15, 2010 with a request that the evaluation be returned by December 23rd . The survey evaluation form requested feedback on whether the survey was easily understood and whether those receiving it were likely to complete it completely and honestly. The survey evaluation letter was sent under the cover of the researcher's committee chair so that the identity of the schools and school system participants would remain anonymous. Of these survey evaluations sent out, 35 were returned to the researcher. Responses indicated that the survey was appropriate and likely to be completed. The survey evaluation letter appears in Appendix L.

Subsequent to gaining a positive field test of the survey and completion of the fall test by participants, cover letters and surveys were mailed to parents of all 57 participants in the study. This mailing included a self-addressed, stamped envelope for return of the survey. Returned surveys were collected by the researcher and follow-up phone calls were made to parents of participants from whom no survey was immediately received. Ultimately all 57 surveys were completed and returned.

Data Collection

Upon receipt of survey responses, activity data for each participant were entered into SPSS software so that correlations might be run against the TTSS gain recorded for participants. Each question response was assigned a unique numerical value for "yes" or "no." For example, for question 1, regarding summer school participation, a "yes" response was assigned the value of "1," and a "no" response was assigned a value of "2." For question 2, a response of "yes" to independent reading received a value of "3" and a "no" received a value of "4." Assignment of variables progressed in this same ascending pattern until all responses were completely labeled and entered into SPSS. Subset responses to questions 3, 4 and 8 were likewise assigned unique numerical values for each potential response.

In addition, the total number of summer activities for each participant gathered from the surveys was recorded for entry into the SPSS. These data were likewise run against change scores for each participant to determine any correlation between the number of summer activities and the net change score. Results from data collection for all variables are reported in Chapter IV.

CHAPTER IV
DATA ANALYSIS AND RESULTS

Introduction

Upon completion of data collection, analyses were conducted relative to each research question. For the first question, a paired-samples t-test was conducted. A repeated measures analysis of variance was employed to address the second research question. To examine the third research question, a correlation analysis was conducted between total test standard change scores and survey response data. The results of these comparisons follow.

Testing the Research Questions

Research Question 1 – Test Change Comparisons

The Group Mathematics Assessment and Diagnostics Exam (GMADE), administered to the students in spring and fall yielded SSS and TTSS. Raw scores were age-normed using GMADE supplemental guides and scores were entered into SPSS software for analysis. Paired samples t-test analyses were conducted and the results of those analyses indicated that there were significant declines in test scores from spring to fall on the Total Test, $t(56) = 3.248$, $p = .002$, Cohen's $d = .32$, the Concepts and Communication Subtest, $t(56) = 4.574$, $p < .001$, Cohen's $d = .49$, and the Operations and Computation Subtest, $t(56) = 3.028$, $p < .004$, Cohen's $d = .38$. In each instance, Cohen's d indicates that the effect size would be judged to be medium (Cohen, 1988). The decline on the Process and Applications Subtest was not deemed to be a significant drop from spring to fall, $t(56) = 1.208$, $p = .232$. Overall, these results suggest that students' mathematics skills decline substantially during summer break. The means and standard deviation for the spring and fall administrations of the test and subtests are presented in Table 1.

Table 1

Subtest and Total Test Standard Score Mean Decline Comparison

Test Category	Spring Test N = 57	Fall Test N = 57	Change N = 57
Concepts and Communication Subtest			
Mean	112.21	105.72	-6.49
Std. Deviation	12.571	13.685	10.31
Operations and Computation Subtest			
Mean	108.84	103.42	-5.42
Std. Deviation	14.444	14.148	13.517
Process and Applications Subtest			
Mean	112.14	110.02	-2.12
Std. Deviation	14.433	16.518	13.271
Total Test			
Mean	112.28	107.49	-4.789
Std. Deviation	14.061	15.544	11.132

Research Question 2 – Activity Survey Results

The Summer Activity Survey (see Appendix A) sent to parents of participants was designed to gather information regarding the range of activities comprising the participants' summer experience. Though the range of participants' activities might have been considerable for 2010, the survey was limited to 10 questions. The first seven survey questions solicited details regarding specific activities. Responses to these questions yielded data comprising varying numbers of participants who responded positively or negatively for participation in a given activity. For five of seven activities, participation was heavily skewed, either positively or negatively. These data are reported in Table 2.

Table 2

Summer Activity Participation by Sample Size (Irrelevant Sample Size)

Summer Activity	Number, Participants	Number, Non-Participants
Summer School	3	53
Independent Reading	55	1
Summer Vacation	49	8
Video Games	42	15
Educational Games	45	12

The number of participants versus non-participants was decisively skewed for the activities of summer school (3 of 56), independent reading (55 of 56), summer vacations (49 of 57), video games (42 of 57) and educational games (45 of 57). Because of the skewed nature of the participation in these activities, analyses comparing the test scores of participants versus non-participants in these summer activities were not conducted.

Total Vacations

Because the survey question soliciting responses to participation in summer vacations allowed multiple responses for more than a single vacation experience, a repeated measures analysis of variance was conducted to assess differences in decline in test scores based on the number of summer vacation experiences (which varied from 0 to 4) reported for a student. The results of the analysis (see Table 3) indicated that there was no interaction between the number of summer vacation experiences for a student and decline in test scores from spring to fall, F (3, 53) = .233, p = .873. Furthermore, no significant difference in decline of Total Test scores was found to be dependent on the number of summer vacations a student experienced, $F(3, 53)$ = .864, p = .465. As was noted in the t-test analyses reported above, the decline in spring to fall mean Total Test scores (112.28 to 107.49) was found to be significant, $F(1, 53) = 6.090$, p = .017, $\eta_p^2 = .103$. A η_p^2 of .103 would be considered a small effect size (Cohen, 1992).

Table 3

Repeated Measures Analysis of Variance, Total Vacations

Effect	*df*	*MS*	*F*	*p*	η_p^2
Total Vacations	3	328.568	.864	.465	.047
Within	53	380.119			
Spring-Fall	1	393.486	6.090	.017	.103
Total Vacations X Spring-Fall	3	15.029	.233	.873	.013
Spring-Fall X Within	53	64.616			

A repeated measures analysis of variance was conducted to assess differences in decline in Concepts and Communications Subtest scores based on the number of summer vacation experiences for each student. The results of the analysis (see Table 4) indicated that there was no interaction between the number of summer vacation experiences and decline in Concepts and Communications Subtest from spring to fall, $F(3, 53) = .201$, $p = .895$. Furthermore, no significant difference in decline of Concepts and Communications Subtest scores was found to be dependent on the number of summer vacation experiences for each student, $F(3, 53) = .072$, $p = .97$. As was noted in the t-test analysis reported above, the decline in spring to fall Concepts and Communication scores (112.21 to 105.72) was found to be significant, $F(1, 53) = 15.246$, $p < .001$, $\eta_p^2 = .223$. A η_p^2 of .223 would be considered a medium effect size (Cohen, 1992).

Table 4

Repeated Measures Analysis of Variance, Total Vacations by Concepts and Communications Subtest

Effect	*df*	*MS*	*F*	*p*	η_p^2
Total Vacations	3	22.042	.072	.975	.004
Within	53	307.448			
Spring-Fall	1	846.520	15.246	$\leq$.001	.223
Total Vacations X Spring-Fall	3	11.141	.201	.895	.011
Spring-Fall X Within	53	55.523			

A repeated measures analysis of variance was conducted to assess differences in decline in Operations and Computation Subtest scores based on the number of summer vacation experiences for each student. The results of the analysis (see Table 5) indicated that there was no interaction between the number of summer vacation experiences and decline in Operations and Computation Subtest from spring to fall, $F(3, 53) = .403$, $p = .751$. Furthermore, no significant difference in decline of Operations and Computation subtest scores was found to be dependent on the number of summer vacation experiences for each student, $F(3, 53) = 1.132$, $p = .345$. As was noted in the t-test analysis reported above, the decline in spring to fall Operations and Computation subtest scores (108.84 to 103.42) was found to be significant, $F(1, 53) = 7.149$, $p = .010$, $\eta_p^2 = .119$. A η_p^2 of .119 would be considered a small effect size (Cohen, 1992).

Table 5

Repeated Measures Analysis of Variance, Total Vacations by Operations and Computation Subtest

Effect	*df*	*MS*	*F*	*p*	η_p^2
Total Vacations	3	356.162	1.132	.345	.060
Within	53	314.661			
Spring-Fall	1	674.670	7.149	.010	.119
Total Vacations X Spring-Fall	3	38.052	.403	.751	.022
Spring-Fall X Within	53	94.373			

A repeated measures analysis of variance was conducted to assess differences in decline in Process and Applications Subtest scores based on the number of summer vacation experiences for each student. The results of each analysis (see Table 6) indicated that there was no interaction between the number of summer vacation experiences and decline in Process and Applications Subtest from spring to fall, $F(3, 53) = .519$, $p = .671$. Furthermore, no significant difference in decline of Process and Applications subtest scores was found to be dependent on the number of summer vacation experiences for each student, $F(3, 53) = .794$, $p = .503$. As was noted in the t-test analysis reported above, the decline in spring to fall Process and Applications subtest scores (112.14 to 110.02) was not found to be significant, $F(1, 53) = .354$, $p = .554$.

Table 6

Repeated Measures Analysis of Variance, Total Vacations by Process and Applications Subtest.

Effect	*df*	*MS*	*F*	*p*	η_p^2
Total Vacations	3	315.616	.794	.503	.043
Within	53	397.471			
Spring-Fall	1	32.035	.354	.554	.007
Total Vacations X Spring-Fall	3	46.950	.519	.671	.029
Spring-Fall X Within	53	90.382			

Total Camps

As was true for the summer vacation items, the survey question soliciting responses to participation in summer camps allowed multiple responses for more than a single camp experience. Therefore, a repeated measure analysis of variance was conducted to assess differences in decline in test scores based on the number of summer camps (which varied from 0 to 3) a student experienced. The results of the analysis (see Table 7) indicated that there was no interaction between the number of summer camps a student experienced and decline in Total Test scores from spring to fall, F (2, 54) = 1.445, p = .245. Furthermore, no significant difference in decline of Total Test scores was found to be dependent on the number of summer camps a student experienced, F(2, 54) = .575, p = .566. As was noted in the t-test analyses reported above, the decline in spring to fall mean Total Test scores (112.28 to 107.49) was found to be significant, F(1, 54) = 13.409, p = .001, η_p^2 = .199. A η_p^2 of .199 would be considered a small to medium effect size (Cohen, 1992).

Table 7

Repeated Measures Analysis of Variance, Total Camps

Effect	*df*	*MS*	*F*	*p*	η_p^2
Total Camps	2	220.474	.575	.566	.021
Within	54	383.168			
Spring-Fall	1	817.786	13.409	.001	.199
Total Camps X Spring-Fall	2	88.139	1.445	.245	.051
Spring-Fall X Within	54	60.990			

A repeated measures analysis of variance was conducted to assess differences in decline in Concepts and Communications Subtest scores based on the number of summer camp experiences for each student. The results of each analysis (see Table 8) indicated that there was no interaction between the number of summer camp experiences and decline in Concepts and Communications Subtest from spring to fall, F(2, 54) = .322, p = .726. Furthermore, no significant difference in decline of Concepts and Communications Subtest scores was found to be dependent on the number of summer camp experiences for each student, F(2, 54) = .935, p = .399. As was noted in the t-test analysis reported above, the decline in spring to fall Concepts and

Communication scores (112.21 to 105.72) was found to be significant, $F(1, 54) = 16.722$, $p < .001$, $\eta_p^2 = .236$. A η_p^2 of .236 would be considered a medium effect size (Cohen, 1992).

Table 8

Repeated Measures Analysis of Variance, Total Camps by Concepts and Communications Subtest

Effect	*df*	*MS*	*F*	*p*	η_p^2
Total Camps	2	273.843	.935	.399	.033
Within	54	292.837			
Spring-Fall	1	910.727	16.722	$\leq$ .001	.236
Total Camps X Spring-Fall	2	17.558	.322	.726	.012
Spring-Fall X Within	54	54.463			

A repeated measures analysis of variance was conducted to assess differences in decline in Operations and Computation Subtest scores based on the number of summer camp experiences for each student. The results of each analysis (see Table 9) indicated that there was no interaction between the number of summer camp experiences and decline in Operations and Computation Subtest from spring to fall, $F(2, 54) = .362$, $p = .698$. Furthermore, no significant difference in decline of Operations and Computation Subtest scores was found to be dependent on the number of summer camp experiences for each student, $F(2, 54) = .177$, $p = .838$. As was noted in the t-test analysis reported above, the decline in spring to fall Concepts and Communication scores (108.84 to 103.42) was found to be significant, $F(1, 54) = 9.203$, $p = .004$, $\eta_p^2 = .146$. A η_p^2 of .146 would be considered a small effect size (Cohen, 1992).

Table 9

Repeated Measures Analysis of Variance, Total Camps by Operations and Computation Subtest

Effect	*df*	*MS*	*F*	*p*	η_p^2
Total Camps	2	57.940	.177	.838	.007
Within	54	326.75			
Spring-Fall	1	860.362	9.203	.004	.146
Total Camps X Spring-Fall	2	33.817	.362	.698	.013
Spring-Fall X Within	54	93.487			

A repeated measures analysis of variance was conducted to assess differences in decline in Process and Applications Subtest scores based on the number of summer camp experiences for each student. The results of each analysis (see Table 10) indicated that there was no interaction between the number of summer camp experiences and decline in Process and Applications Subtest from spring to fall, $F(2, 54) = .2.973$, $p = .060$. Furthermore, no significant difference in decline of Process and Applications Subtest scores was found to be dependent on the number of summer camp experiences for each student, $F(2, 54) = .467$, $p = .630$. As was noted in the t-test analysis reported above, the decline in spring to fall Process and Applications scores (112.14 to 110.02) was not found to be significant, $F(1, 54) = 3.152$, $p = .081$.

Table 10

Repeated Measures Analysis of Variance, Total Camps by Process and Applications Subtest

Effect	*df*	*MS*	*F*	*p*	η_p^2
Total Camps	2	187.016	.467	.630	.017
Within	54	400.718			
Spring-Fall	1	259.290	3.152	.081	.055
Total Camps X Spring-Fall	2	244.587	2.973	.060	.099
Spring-Fall X Within	54	82.257			

Research Question 3 – Activity Participation Correlation to TTSS Change Score

In order to determine whether a correlation existed between the summer activities described in the survey data and the TTSS change scores reported on the GMADE, a Pearson's correlation was calculated. Results are reported in Table 11.

Table 11

Intercorrelations Between Summer Activity Participation and Total Test Change Scores

Subscales	1	2	3	4	5	6	7	8
				Participants (n = 57)				
1. TTSS Change	-	.140	.048	-.020	-.129	.065	-.039	-.259
2. Video Games		-	-.082	-.393	-.226	-.036	.004	.082
3. Independent Reading			-	.033	-.142	-.063	.108	-.070
4. Summer School				-	.130	.033	-.037	-.069
5. Summer Camp					-	-.030	-.103	.190
6. Summer Vacation						-	-.172	.070
7. Organized Sports							-	-.102
8. Educational Games								-

Note. Correlation is significant at the 0.01 level (2-tailed).

No significant correlation between the activities reported and TTSS change was found. A negative correlation was found between attending summer school and playing video games. The correlation between total test score change and the days elapsed between tests for participants and the total number of activities during the summer in which students participated was calculated and is reported in Table 12. No significant relationships were found.

Table 12

Intercorrelation between Total Activities, Days between Testing, and Total Test Change Score

Subscales	1	2	3
	Participants (n = 57)		
1. TTSS Change	-	-.029	-.119
2. Total Activities		-	.085
3. Days between Testing			-

Summary of Results

Information reported in Chapter IV responded to three central research questions for this study:

1. How does mathematical performance for exiting second graders in spring compare to mathematical performance for that same group of students as entering third graders in the following fall?

Results from GMADE testing showed that participants' spring to fall test scores, normed for age equivalency, evidenced a mean decline over all subtests and for the Total Test Standard Score. This mean decline from spring to fall varied among the subtests, which included Concepts and Communications (-6.49), Operations and Computation (-5.42) and Process and Applications (-2.12). The decline was not significant for the Process and Applications subtest. Total Test Standard Score mean decline was -4.789.

2. What were the activities in which these students were engaged during the summer break?

Responses to surveys reported a wide variety of activity participation during the summer. Responses to participation versus non-participation in certain activities were heavily skewed for some activities, whereas participation in others was more evenly distributed between those who participated and those who did not. Survey responses indicated that most participants engaged in independent reading, summer vacation, video game playing, and educational game playing. The

responses also indicated that few participated in summer school. Numbers were more evenly distributed between summer camp and organized sports participation.

3. Are there any correlations between total test standard score change and summer activities in which participants engaged?

No significant correlations were found between Total Test change scores and activities in which participants engaged over the summer break. Participation in summer school and playing video games were found to be negatively correlated.

CHAPTER V
SUMMARY, DISCUSSION, CONCLUSIONS, IMPLICATIONS, RECOMMENDATIONS, SUGGESTIONS, REFLECTIONS, AND CONCLUDING STATEMENTS

This chapter opens with a summary of the findings of the study. The purpose of the study was to identify student summer activities and determine whether a relationship exists between them and mathematics testing change scores measured from spring to fall. This current effort was built upon research conducted by Heyns (1978), Burkam et al. (2004), Downey et al. (2004), and Alexander et al. (2007). The commonality in findings that existed between all of these efforts was that learning loss occurred in the absence of such instruction as that experienced during the normal school term. A discussion of conclusions from the findings, implications for practice, recommendations for future research, and reflections on the study are included, as well. A summary and concluding statements appear at the end of the chapter.

Summary

Research Question One -- How does mathematical performance for exiting second graders in spring compare to mathematical performance for that same group of students as entering third graders in the following fall?

Elemental to this study was the need to establish that summer learning loss (SLL) does, in fact, occur not solely in urban locations such as Atlanta (Heyns, 1978) or Baltimore (Alexander et al., 2007), but in a Southwest Virginia school division that serves both an urban and suburban population. Though socioeconomic status (SES) was not assessed, participants who volunteered came from nine different schools that serve families with a variety of SES backgrounds as evidenced by the school division's published report on free and reduced lunch participation. The sample included 25 male and 32 female participants.

The Group Mathematics Assessment and Diagnostics Examination (GMADE) was used to collect scores for each participant in both spring and fall of 2010. This assessment produced standardized scores for three different testing subsets, Concepts and Communication, Operations and Computation, and Process and Applications, as well as Total Test scores, which incorporated all three subtest elements. Participants in the sample were tested within three weeks of the close of school in the spring and within three weeks of the start of school in the fall in an effort to

avoid an artificial extension of the summer break or an artificial shortening of the school term. The intent was to study summer learning loss measured as close to the normal summer break period experienced by students each summer as was logistically possible.

Normed mean scores for each spring subtest and the total test were subtracted from fall mean scores on subtests and total test to arrive at a mean change score for the participant sample. This mean change score was negative for all subtests and the total test, indicating a decline in performance and a summer learning loss on mathematics skills for the sample. Though the decline in the Process and Applications subtest was not significant compared with the other subtests and total test results, the findings of this study suggest that the absence of mathematics instruction during summer affects student performance.

Research Question Two -- What were the activities in which these students were engaged during the summer break?

Information reported by parents on the summer activity survey indicated that participants spent their summers involved in a variety of activities. Some participants participated in more than a single vacation experience or summer camp, and some did not participate in these activities at all. Almost all participants read independently and most participated in video game play. Very few went to summer school.

Responses to questions related to typical daily structure and the physical locale for participants provided conflicting information in some instances. Ten respondents reported that their child had spent a typical day in an environment where more than 80% of the child's time was structured by a third party. These same respondents reported on a separate question that more than 50% of the child's day was spent in free time. In addition, four respondents reported that their child stayed at more than a single location during a typical day, and that, nevertheless, more than 80% of that day was structured by a third party. Validity of these responses was called into question – therefore, these responses were not evaluated statistically.

Responses to questions on some areas of activity participation were skewed more heavily toward those who participated or to those who did not. Skewed sample sizes surrounding the number of participants who engaged in these activities versus those who did not provided for

questionable statistical relevance for evaluation of interaction between activities and change scores. Therefore, no analysis was completed for these responses.

Two activity survey questions centered around summer vacation and summer camp did provide additional data for evaluation, due to subset questions regarding the number and type of experience for each activity. Repeated measures analyses for interaction between the number of experiences and test score change were conducted for both areas, and no interaction between the variables could be statistically determined. In all evaluations, the only significant interaction determined was between spring and fall test score change, not between any activity and the decline in scores. The findings of this study suggest that for the activities studied, there was no relationship between test score declines and summer activities for the participants.

Research Question Three -- Are there any correlations between total test standard score change and summer activities in which participants engaged?

The researcher used Pearson's correlation to determine whether any statistically verifiable relationship between change scores and summer activities existed. None was found. The only significant correlation identified was a negative one between summer school participation and video game playing.

In addition, because of the need to test participants at nine different schools, days elapsed between testing varied somewhat from school to school from spring to fall. Therefore, a Pearson's correlation was calculated to determine the relationship, if any, between days elapsed between testing and test score change. No correlation was found.

Conclusions

Summer learning loss in mathematics does occur in Southwest Virginia, much as it occurs in Atlanta (Heyns, 1978) or Baltimore (Alexander et al., 2007). The fact that students lose academic ground in the summer regardless of how the time is spent mirrors the findings of other researchers (Borman et al., 2005; Carter, 1984) in which students were found to suffer summer learning loss regardless of activity or intervention.

It is possible that other activities not reported on the survey employed in this study could have some as yet undetermined relationship to the decline in mathematics scores observed. Participants in this study were involved in a variety of activities, from multiple summer camp and vacation experiences to independent reading and video game playing. One would expect that an environment enriched through a number of activities over the summer should somehow impact learning loss. However, there was no evidence that activities mitigated loss in mathematics.

The single common variable for all participants in this study was that they spent the majority of their summer outside the classroom. For the majority of the summer months of 2010, all participants in this study were not in school. In the absence of any established relationship between activities studied and total test mean score decline observed, the results of this study suggest that the absence of formal instruction during the summer months contributes more to students' lack of mathematics progress than any activity in which students did or did not engage.

Implications

Today's educational environment is one of unique challenge for teachers, administrators and policymakers alike. At the school level, teachers and administrators are faced with budget cuts that have resulted in increased class sizes and reduced expenditures for curriculum, technology upgrades, and training. Within the context of this economic environment, public expectations and governmental mandated standards for accelerated academic progress in schools increase pressures for performance from both students and educators. In the environment of decreased resources and increased expectations, the school calendar remains largely unchanged, and summer break continues to comprise a traditional 10-12 week gap in instruction between spring and fall school terms for many school divisions. This study has established that summer learning loss does occur and that no relationship to what participants did during the period away from school had any significant relationship to score declines observed.

Because learning itself is under the scrutiny of both the public and private sector, lack of educational progress or the retrenchment of it should be unacceptable to those who are charged with bringing it about. If practitioners and policymakers are to carry out mandates for increased

performance in schools, the time has come to re-examine summer break if unacceptable loss of mathematics progress is to be addressed.

Recommendations

The fact that summer learning loss in mathematics was observed should encourage policymakers to consider planning for future mathematics instruction:

1. The traditional summer break should be re-examined within the context of summer learning loss. A school year interrupted by an artificially long time away from instruction during the summer months has little practical relevance in a society that is no longer primarily agrarian. Challenges to educational progress today warrant a new and practical look at shortening time away from instruction. At the very least, summer break needs to be shortened. Ten weeks or more away from instruction is too long, and mathematics progress declines during the gap. One or two-week mini-breaks from school, similar to the length of a normal family vacation, interspersed between periods of regular instruction in the classroom would lessen time away from instruction and allow for a continuum of learning that should contribute to maintenance of mathematics progress, at the very least.
2. School calendar adjustment should be a priority. The term, "adjustment" has been used purposely here as an indication that a realignment of the time between spring and fall term may not need to be drastic. School systems can still maintain a 180 day calendar. If a series of "mini-breaks" (see above) are to be instituted to allow for a continuum of instruction in the summer, it would make sense to adopt similar calendar change throughout the year, shortening the winter break that typically occurs in mid to late December and providing for more breaks that are shorter in duration throughout the school year. Perhaps the breaks during the year should be in one or two day increments. The suggestions here are arbitrary but logical means of shortening time away from instruction. More study will need to be conducted to determine the appropriate length of breaks, and this will be discussed in the Recommendations for Future Research section of this chapter.
3. Policymakers should work cooperatively with the community at large, including teachers, staff, parents, students, business owners, and all stakeholders as

adjustments are made so that all concerned feel a part of the process and so that all are vested in the end result. Changes to a convention deeply rooted in the culture will likely not come without some pushback. Educating parents and business leaders about summer learning loss must be a priority. Informed stakeholders make better decisions. Given the tightened budgets of recent years, leaders should use channels already available to them which are low cost and reasonable. Mass meetings, handouts to students, news stories, and web campaigns can disseminate factual information and foment discussion on the topic and a discourse that leads to change.

4. Finally, policymakers should conduct due diligence in following research addressing summer learning loss so that they may be well-versed before making decisions that will affect not only students and teachers, but the community at large, as well. By knowing the effects of summer break and understanding the need for shorter, more reasonable breaks throughout the year, policymakers should be better informed to approach calendar adjustment without necessarily lengthening the school year and without undue strain on budgets.

Practitioners, including building administrators and teaching staff, are the individuals who will be charged with implementing and maintaining policy changes in individual schools. As such, these recommendations are offered relative to their roles:

1. Teachers and principals at the building level have the most direct impact on student progress. It is important that these individuals embrace any change to scheduling and any adjustment to summer break. A lack of enthusiasm on their part is transparent to parents and children in the schools and will likely be counterproductive, especially during any transition period. It is likely that some teachers, accustomed to the extended vacation period in summer may be unenthusiastic at the prospect of working for periods in the summer that they had not previously worked. They should understand that there will also be other breaks inserted into the schedule that will allow them time away from work that they had not enjoyed previously and that change is good for education, the profession, and their students.

2. Teachers and administrators must be prepared to adjust educational plans to account for calendar change and must make sure that instruction flows smoothly with any readjustments to calendars. This change will be critical to student success. If a continuum of instruction is the goal, lesson plans and scheduling of instruction must be adapted to fit the time that students are continually in school so that material is covered completely between breaks. The benefit of completely covering material with shorter breaks in between sessions will be a lessened need for remediation after the break.
3. For teachers who have come to rely on the traditional summer break as a respite from work, a shortened break may prove to be an inconvenience and somewhat difficult to accept. For teachers who have come to rely on the summer break as a time for earning extra income, calendar change may be a financial concern. Serious dialogue and involvement with policymakers and the business community are necessary to address these concerns. All of these issues will be directly tied to the exact nature of a reworked calendar, and informed discussion cannot be initiated at this juncture. However, the nature of this concern is real, and it does point to the need for all stakeholders to be invested in the process.

Suggestions for Future Research

Though the idea that students have been losing academic ground over the summer is a longstanding one, dating to the early part of the last century (White, 1906), researchers have yet to develop a complete understanding of what is involved in the loss from a temporal standpoint. Hence, suggestions for future efforts include the following:

1. This study confirmed that mathematics score decline occurs over the summer break, but research has not yet established over what period of time learning tends to drop off. Is mathematics progress impacted after a week away from instruction? Does a decline take a month or more? No one is certain and future research efforts should expand on the time factor and other studies by exposing participants to pre and post-test events measuring for decline over varying periods of time. Policymakers cannot be expected to adjust calendars without knowing the time period at which critical declines in learning are likely to occur.

2. Researchers should use the current calendar in the approach suggested above, since shorter gaps comprised by teacher work days, winter break, spring break, or the like already exist as breaks in instruction during the year. This plan should prove to be minimally invasive and work within parameters for instruction that are already established.
3. Of equal importance to future studies attempting to identify where learning loss starts are studies that would attempt to discover where learning begins to recover. How long does it take students to regain ground relative to time away from instruction? Again, intelligent adjustments to calendars cannot be made without such information.

Reflections

This study provided the opportunity to discover and analyze data pertinent to summer learning loss and summer activities, but it also provided an opportunity to examine the study itself for aspects that might have been changed to enhance its effectiveness. Reflections on aspects that might have been changed include:

1. Meetings with building administrators should have been scheduled earlier in the process so that all involved might have a better understanding of the scope of the study, the logistics of the testing process itself, and the impact for each school involved. It is believed that a better understanding might have resulted in better cooperation from individual schools and potential participants.
2. Communication to parents and participants that testing was being conducted after school would have eliminated some confusion early on in the process and would likely have increased participation throughout the school division.
3. Better communication with building administrators regarding the logistics of testing days would have eliminated several issues with classroom availability on the days of the testing events.
4. Hiring an assistant to administer tests and/or assist in the process would have been more efficient and conducive to a smoother process on test days.

5. Because no test events were timed and students completed the work at different times, provision for activities or study in a separate area for those who had finished early would have been desirable.
6. Ideally, the survey itself should have been sent to parents as closely as possible after the summer break to ensure accuracy of the information returned.
7. In addition, a means of allowing parents to document survey activities on an ongoing basis when they were taking place may have been a better approach, again in the interest of receiving the most accurate information

Concluding Statements

The information in Chapter V contains the findings of the research study, as well as conclusions, implications for the field of study and recommendations for future research efforts for educators and researchers. This study, designed to discover relationships that may exist between summer learning loss and the activities in which students participated over the summer months, ultimately found no statistically significant relationship between any of the activities reported and summer learning loss. It did, however, establish that SLL occurred in the Southwest Virginia school division in which the study was conducted. This finding mirrors the findings of research efforts dating back to the early part of the last century (White, 1906).

Given the degree of change that has been manifested across American society and the educational experience for educators and students alike since 1906, it is impossible to escape the irony that the American educational calendar remains essentially unchanged over the last 100 years. Leaders who fail to consider societal and economic changes within the current climate do so at the risk of the future success of education. Decision makers, whether governmental, educational or parental, cannot afford to be comfortable with a status quo that continues to sap the educational progress of those who will be filling their shoes and determining the future of this country in years to come. Time is of the essence for education today.

Educators cannot rely on past practices and calendar configurations if American education is to optimize mathematical learning opportunities. If the focus is on the future, then the focus must be on the educational processes and structures that allow children to progress, not on an unchanged convention that continues to hold them back.

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APPENDIX A

Summer Activity Survey (English)

SUMMER ACTIVITY SURVEY

Please answer the following questions describing your child's 2010 summer activities.

1. Did your child attend summer school during 2010? YES ____ NO ____
2. Did your child read independently during summer 2010? YES ____NO ____
3. Did your child go to a summer camp in 2010? (Check all that apply) YES ____NO ____
    a. ____ Sports camp
    b. ____ Educational camp
    c. ____ Church camp
    d. ____ Scout camp
    e. ____ Other. If checked, please specify the activity

    _____
4. Did your child go on a vacation in summer 2010? YES ____ NO ____

    Check the activities in which your child was engaged during this vacation:

    a. ____ Recreational only
    b. ____ Museum visits
    c. ____ Visited historical sites
    d. ____ Other. If checked, please specify the activity

    _____
5. Did your child play video games during the summer 2010? YES ____NO ____
6. Did your child play educational games during the summer 2010? YES ____ NO ____

7. Did your child play organized sports during the summer 2010? YES ____NO ____

8. Where did your child stay during the day during summer 2010?
    a. ____ Home
    b. ____ Private sitter
    c. ____ Relative's home
    d. ____ Day care

9. Were more than 80% of your child's daily activities planned by you or a third party, such as a day care facility, tutor or summer school program during summer 2010?

    YES____ NO ____

10. How much of your child's day was involved in free/unstructured play in summer 2010?
    a. ____ Less than 50%
    b. ____ More than 50%

APPENDIX B

Summer Activity Survey (Spanish)

ENCUESTA DE ACTIVIDADES DE VERANO

Por favor conteste las siguientes preguntas que describan las actividades de verano de su hijo(a) en el año 2010.

1. ¿Su hijo(a) asistió a la escuela de verano durante el año 2010?
SÍ ____ NO ____

2. ¿Su niño(a) leía de manera independiente durante el verano del 2010?
SÍ ____ NO ____

3. ¿Su hijo(a) fue a un campamento de verano en el 2010?
(Marque todo lo que corresponda) SÍ ____ NO ____
a. ____ Campo de deportes
b. ____ Campo de educación
c. ____ Campo de verano en una iglesia
d. ____ Campamento de “Scout”
e. ____ Otro. Si escoge esta categoría, por favor, especifique la actividad
_____

4. ¿Su hijo(a) fue de vacaciones en el verano de 2010? SÍ ____ NO ____
Marque las actividades en las que su hijo(a) participó durante estas vacaciones:
a. ____ Recreativos
b. ____ Museos
c. ____ Sitios históricos
d. ____ Otro. Si escoge esta categoría, por favor, especifique la actividad
_____

5. ¿Su hijo(a) jugó juegos de vídeo durante el verano de 2010?
SÍ ____ NO ____

6. ¿Su hijo(a) jugó con juegos educativos durante el verano de 2010?
SÍ ____ NO ____

7. ¿Su hijo(a) jugó deportes organizados (como fútbol, baloncesto, natación, etc. en una liga) durante el verano de 2010?
SÍ ____ NO ____

8. ¿En dónde se quedó su hijo(a) durante el día en el verano de 2010?
a. ____ Casa
b. ____ Niñera privada
c. ____ Hogar de un familiar
d. ____ Guardería

9. Fueron más de 80% de las actividades diarias de su hijo(a) planificadas por usted o por un tercero, como una guardería, un tutor o un programa de escuela de verano durante el verano del 2010?
SÍ____ NO ____

10. ¿Cuánto tiempo del día su hijo(a) estuvo involucrado(a) en juego al aire libre / juego no estructurado en el verano del 2010?

a. ____ Menos del 50%

b. ____ Más del 50%

APPENDIX C

IRB Certificate of Completion

APPENDIX D

Superintendent's Permission to Test

[redacted]

OFFICE OF SUPERINTENDENT

[redacted]

Phone: [redacted] **Fax:** [redacted]

April 1, 2010

TO WHOM IT MAY CONCERN:

This is to certify that Linda Wright has permission to test second grade students in [redacted] as part of her research project for her dissertation, "Summer Vacation: A Break in Need of Repair." She must secure parent approval prior to proceeding with the testing.

[redacted] Ed. Ed.
Superintendent

dr

APPENDIX E

IRB Approval

VirginiaTech

Office of Research Compliance
Institutional Review Board
2000 Kraft Drive, Suite 2000 (0497)
Blacksburg, Virginia 24060
540/231-4606 Fax 540/231-0959
e-mail irb@vt.edu
Website: www.irb.vt.edu

MEMORANDUM

DATE: May 5, 2010

TO: Wayne Tripp, Linda Wright

FROM: Virginia Tech Institutional Review Board (FWA00000572, expires June 13, 2011)

PROTOCOL TITLE: Summer Vacation - A Break in Need of Repair

IRB NUMBER: 10-288

As of May 5, 2010, the Virginia Tech IRB Chair, Dr. David M. Moore, approved the new protocol for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at http://www.irb.vt.edu/pages/responsibilities.htm (please review before the commencement of your research).

PROTOCOL INFORMATION:
Approved as: **Expedited, under 45 CFR 46.110 category(ies) 7**
Protocol Approval Date: **5/5/2010**
Protocol Expiration Date: **5/4/2011**
Continuing Review Due Date*: **4/20/2011**
*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

FEDERALLY FUNDED RESEARCH REQUIREMENTS:
Per federally regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals / work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

Date*	OSP Number	Sponsor	Grant Comparison Conducted?

*Date this proposal number was compared, assessed as not requiring comparison, or comparison information was revised.

If this IRB protocol is to cover any other grant proposals, please contact the IRB office (irbadmin@vt.edu) immediately.

APPENDIX F

Introduction Letter to Parents

Dear Parent/Guardian:

I am a doctoral student at Virginia Tech and the principal of Penn Forest Elementary in Roanoke County. As a part of my dissertation study, I would like to examine the potential for academic learning loss of second graders in the area of reading and mathematics over the summer vacation period. To accomplish this, I will need to test second grade students at the end of the school year and again at the beginning of their third grade school year. The title of my study is, "Summer Vacation – A Break in Need of Repair: Examining the Relationship between Summer Activities and Fall Achievement." This study is being conducted under the supervision of Dr. Wayne Tripp, clinical assistant professor in the School of Education at Virginia Tech and former superintendent with Salem City Schools.

The goal of my study is to determine if indeed there is an academic loss experienced in the absence of direct instruction for the ten-week summer break as has been documented in some research to date. But the extant research has not always shown the same results. Some students have been documented as losing academically, while others have actually shown growth during the summer. With my research, I plan to investigate how students spend their summer break and what occurs when they return to school in late August. A mitigating factor in clear determination of past results has been the inability to test students as near the end of the school year as possible and as close to the subsequent year's opening as possible. Many research efforts have tested too early in the spring and too late in the fall, in effect, adding instructional time to the summer break that should not be considered in evaluating summer academic loss or gain. With my approach, I hope to answer some of these questions and reduce the research concerns raised with past efforts.

For the assessment instrument, I have chosen the Metropolitan 8, an evaluation platform designed to test for student achievement in the areas of reading and mathematics. The test will be administered by me at your child's school during the last week of school in June and again in late August subsequent to the start of school. The test should take a total of one hour administration. Tests will scored and results will be mailed to parents in October, 2010. Information obtained from these test results will **NOT** become a part of your child's official school record, but school personnel will be given the information to help them plan instruction for the fall. All tests will be coded so that no one, with the exception of you and me, will see the individual test results for your child.

A survey asking questions related to how your child spent the ten weeks of summer between the two testing periods will be mailed in early September, 2010. The survey will also ask for demographic information such as the number of family members and their education. Other this information, nothing of a personal nature will be requested. This survey is designed to take no longer than thirty minutes to complete, and a stamped return envelope will be included to simplify the return of the form.

Students from [redacted] Schools will be invited to participate with the study and participation will be limited to the first twenty-five students at each school whose parents give permission. This is strictly a voluntary program, but one that is focused on improving how and what we do to educate students.

Should you choose to allow your child to participate in this effort to improve instruction for all students, please return this permission form to your child's teacher by _____.

Please feel free to contact me if you have questions (540-314-5162). Do not contact school officials as they are not a part of the study and cannot answer your questions.

_____ I give permission for my child to be tested for the doctoral study and to be administered achievement tests.

Student Name_____ Date_____

Parent/Guardian Signature_____

School _____ Grade _____

APPENDIX G

Student Assessment Form

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
Informed Assent for Participants
in Research Projects Involving Human Subjects

Title of Project: Summer Vacation: A Break in Need of Repair
Investigator(s): Linda F. Wright

I. Purpose of this Research/Project

This study is for a school project.

Sometimes children do better in school after summer vacation. Sometimes, they do not. We do not know why. The things you do in summer might help you in school. We want to see if that is true.

I want to ask you to take two tests. One test will be in the spring. One test will be in the fall. These will be math tests. I will see how well you do on each test.

II. Procedures

The tests I give you will only be on math. You will be in a room with other children after school. The test will take less than one hour. The test will give you problems to solve. It will give you a choice of answers. You will choose the right answer.

The test in the fall will be a little different from spring. But you will have the same kind of test. I will see if you did better in the spring or fall.

III. Risks

You will only be taking a test after school. You will not have to do anything else.

IV. Benefits

If you take these two tests, you will get extra practice in math.

This testing will help me and others decide what is good to do in summer. It will help us make better choices for your school.

You will not be paid for taking the test.

Your parent or guardian can get the results if they ask later.

I do not promise that things will be better if you take the test.

V. Extent of Anonymity and Confidentiality

I will see your test results. Some other people who are helping me might see them. No one else will see them. I will not use your name when I give my results to my teachers.

I will keep these tests locked up. No one but I can get to them. I will tear up all of the tests five years after my study ends.

VI. Compensation

I am not paying anybody to take the tests.

VII. Freedom to Withdraw

You can stop being in the study if you want to. You do not have to answer questions that you do not want to.

VIII. Subject's Responsibilities

I agree to take the spring and fall math tests.

IX. Participant's Permission

I have read this form. I understand what I have to do in the study. If I sign my name on the line right after this, it means I agree:

_____ Date_____
Participant signature

_____ Date _____
Witness (Optional except for certain classes of subjects)

If I have any questions, my parent or guardian can contact:

Linda F. Wright _____ 540-772-7590/lfwright@rcs.k12.va.us
Investigator Telephone/e-mail

David M. Moore 540-231-0091/moored@vt.edu
Chair, Virginia Tech Institutional Review Board for the Protection of Human Subjects Telephone/e-mail
Office of Research Compliance
3000 Kraft Drive, Suite 2000 (0497)
Blacksburg, VA 24060

[NOTE: Subjects must be given a complete copy (or duplicate original) of the signed Informed Consent.]

APPENDIX H

Parental Consent Form

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
Informed Parental/Guardian Consent to Answer Questions in Research Projects Involving Human Subjects

Title of Project: Summer Vacation: A Break in Need of Repair
Investigator(s): Linda F. Wright

I. Purpose of this Research/Project

This study is a part of a doctoral dissertation project.

Summer vacation can be positive or negative for students in school skills. Students participate in many different activities during the summer.

Summer vacations have been studied for years, but not many studies have asked what summer activities were for the students in them.

This study will use written tests in spring and fall for second grade students. Scores in spring will be compared to scores in the next fall. A survey will be mailed to parents/guardians who have a child in the study. Parents or guardians will answer questions on the survey to identify the child's summer activities.

When all of this information is collected, the researcher will compare test scores and see if there is any relationship between scores and activities.

Students will be tested in both spring and fall for math skills. The tester will use the Group Mathematics Assessment and Diagnostic Evaluation (GMADE) Level 2, Forms A & B testing platform. One hundred students will be chosen for the study from [redacted] elementary schools. The first twenty-five students who apply at each school will be chosen for the study.

II. Procedures

You are being asked to fill out a survey that will be mailed to you. This survey will ask questions about your child's summer activities. The format will be a short answer or multiple choice response. The survey will be mailed after your child completes the fall test. This survey will also include a self-addressed, stamped envelope for return to the researcher.

Once the test scores are recorded and the surveys are returned, the researcher will compare scores to summer activities. The researcher will then record whether certain activities are related to improved scores.

III. Risks

The researcher could not find any risks for anyone involved in the study.

IV. Benefits

Students in the study will benefit from additional math practice on both testing days.

Administrators will benefit if there are relationships between certain activities and better scores on the tests. This information will help them plan programs that will be better for students in the future. This information will also help parents or guardians plan better activities for students in the summer.

The researcher does not make any guarantee of benefits to students, parents or guardians.

When the study is complete, parents or guardians can request a summary of results from the researcher.

V. Extent of Anonymity and Confidentiality

Test results and surveys will be coded so that the researcher can match the results of tests and activities. The researcher will keep all information confidential. Students' names will not be identified in any of the study results.

The researcher and those working on the project are the only ones who will have access to the information. No one will release any information without your written approval. The Institutional Review Board (IRB) may access the information for auditing. The IRB is responsible for the protection of everyone taking part.

The researcher will keep the results in a locked cabinet at home. No one else will have access to the cabinet. The researcher will destroy all files five years after the study is completed.

VI. Compensation

No pay or other favor will be given to those who participate.

VII. Freedom to Withdraw

Anyone in this study is free to stop at any time. No penalty will be given to anyone who withdraws. Anyone is also free to refuse to answer questions.

VIII. Subject's Responsibilities

I voluntarily agree to answer questions about my child's summer activities. I agree to fill out the survey form and return it in the envelope provided.

IX. Parent's/Guardian's Permission

I have read the Consent Form and conditions of this project. I have had all my questions answered. I give my consent to participate by signing below:

_____ Date_____

Parent/Guardian signature

If I have any questions about this study, I may contact:

Linda F. Wright — 540-772-7590/lfwright@rcs.k12.va.us
Investigator — Telephone/e-mail

David M. Moore — 540-231-0091/moored@vt.edu
Chair, Virginia Tech Institutional Review Board for the Protection of Human Subjects — Telephone/e-mail
Office of Research Compliance
3000 Kraft Drive, Suite 2000 (0497)
Blacksburg, VA 24060

[NOTE: Subjects must be given a complete copy (or duplicate original) of the signed Informed Consent.]

APPENDIX I

Survey Letter (English)

December 29, 2010

Thank you for allowing your child to participate in my study comparing mathematics performance before and after summer break. Your cooperation and your child's cooperation in both the spring and fall after-school testing sessions have been extremely beneficial to my research.

A key element of my study is to determine whether summer activities may have a relationship to performance on the tested material. In order to gather this information, it is necessary for me to collect information from each family involved about the activities in which your child was engaged over the 2010 summer break.

Enclosed with this letter is a brief survey that I am asking you to fill out and return to me at your earliest convenience. Once I have all surveys returned for all participants, I will be able to finish my research and return test results to all participants.

There is a self-addressed, stamped envelope enclosed which I ask that you please use to return the completed survey to me by **January 10, 2010**. Rest assured that all testing and survey results are strictly confidential and will not be used for any purpose other than the research itself.

Please note that participation in the survey serves as implied consent to do so. Participation is voluntary, and any participant may withdraw at any time.

Thank you, once again, for allowing your child to participate in this research.

Sincerely,

Linda F. Wright

APPENDIX J

Survey Letter (Spanish)

Diciembre 29 del 2010

Estimado Señor/Señora _____:

Gracias por permitir que su hijo(a) participe en mi estudio que está diseñado para comparar el rendimiento en matemáticas antes y después de las vacaciones de verano. Su cooperación y la cooperación de su hijo(a), tanto en la primavera como en el otoño, en las sesiones de pruebas han sido extremadamente beneficiosas para mi investigación.

Un elemento clave de mi estudio es determinar si las actividades de verano pueden tener una relación con el rendimiento en el material evaluado. Con el fin de recopilar esta información, me gustaría recoger información de cada familia que ha participado acerca de las actividades en que se ocupó su hijo(a) durante las vacaciones de verano de 2010.

Adjunto con esta carta está una breve encuesta. Por favor complete la encuesta y devuélvamela lo más pronto posible. Una vez las encuestas hayan sido devueltas por los participantes, voy a poder terminar mi investigación y podré devolver los resultados de rendimiento de pruebas a los participantes.

Anexo encontrará un sobre con estampilla que le pido el favor utilice para devolver la encuesta completa antes del _____. Tenga la seguridad de que todos los resultados de las pruebas y la encuesta son estrictamente confidenciales y no serán utilizados para ningún otro propósito que la propia investigación.

La participación en este estudio es voluntaria, y los sujetos pueden retirarse en cualquier momento.

Gracias, una vez más, por permitir que su hijo(a) participe en esta investigación.

Atentamente,

Linda F. Wright

APPENDIX K

Survey Consent Form

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
Informed Parental/Guardian Consent to Answer Questions in Research Projects Involving Human Subjects

Title of Project: Summer Vacation: A Break in Need of Repair
Investigator(s): Linda F. Wright

I. Purpose of this Research/Project

This study is a part of a doctoral dissertation project.

Summer vacation can be positive or negative for students in school skills. Students participate in many different activities during the summer.

Summer vacations have been studied for years, but not many studies have asked what summer activities were for the students in them.

This study will use written tests in spring and fall for second grade students. Scores in spring will be compared to scores in the next fall. A survey will be mailed to parents/guardians who have a child in the study. Parents or guardians will answer questions on the survey to identify the child's summer activities.

When all of this information is collected, the researcher will compare test scores and see if there is any relationship between scores and activities.

Students will be tested in both spring and fall for math skills. The tester will use the Group Mathematics Assessment and Diagnostic Evaluation (GMADE) Level 2, Forms A & B testing platform. One hundred students will be chosen for the study from [redacted] elementary schools. A maximum of twenty-five students from each school will be chosen for the study.

II. Procedures

You are being asked to fill out a survey that will be mailed to you. This survey will ask questions about your child's summer activities. The format will be a short answer or multiple choice response. The survey will be mailed after your child completes the fall test. This survey will also include a self-addressed, stamped envelope for return to the researcher.

Once the test scores are recorded and the surveys are returned, the researcher will compare scores to summer activities. The researcher will then record whether certain activities are related to improved scores.

III. Risks

The researcher could not find any risks for anyone involved in the study.

IV. Benefits

Students in the study will benefit from additional math practice on both testing days.

Administrators will benefit if there are relationships between certain activities and better scores on the tests. This information will help them plan programs that will be better for students in the future. This information will also help parents or guardians plan better activities for students in the summer.

The researcher does not make any guarantee of benefits to students, parents or guardians.

When the study is complete, parents or guardians can request a summary of results from the researcher.

V. Extent of Anonymity and Confidentiality

Test results and surveys will be coded so that the researcher can match the results of tests and activities. The researcher will keep all information confidential. Students' names will not be identified in any of the study results.

The researcher and those working on the project are the only ones who will have access to the information. No one will release any information without your written approval. The Institutional Review Board (IRB) may access the information for auditing. The IRB is responsible for the protection of everyone taking part.

The researcher will keep the results in a locked cabinet at home. No one else will have access to the cabinet. The researcher will destroy all files five years after the study is completed.

VI. Compensation

No pay or other favor will be given to those who participate.

VII. Freedom to Withdraw

Anyone in this study is free to stop at any time. No penalty will be given to anyone who withdraws. Anyone is also free to refuse to answer questions.

VIII. Subject's Responsibilities

I voluntarily agree to answer questions about my child's summer activities. I agree to fill out th survey form and return it in the envelope provided.

IX. Parent's/Guardian's Permission

I have read the Consent Form and conditions of this project. I have had all my questions answered. I give my consent to participate by signing below:

_____ Date_____
Parent/Guardian signature

If I have any questions about this study, I may contact:

Linda F. Wright _____ 540-772-7590/lfwright@rcs.k12.va.us
Investigator Telephone/e-mail

David M. Moore 540-231-0091/moored@vt.edu
Chair, Virginia Tech Institutional Review Telephone/e-mail
Board for the Protection of Human Subjects
Office of Research Compliance
3000 Kraft Drive, Suite 2000 (0497)
Blacksburg, VA 24060

[NOTE: Subjects must be given a complete copy (or duplicate original) of the signed Informed Consent.]

APPENDIX L

Survey Field Test Evaluation Letter

VirginiaTech
College of Liberal Arts
and Human Sciences
School of Education

Educational Leadership Program
219 East Eggleston Hall (0302)
Blacksburg, Virginia 24061
540/231-5642 Fax: 540/231-7845

December 15, 2010

Parents of Third Grade Students

[redacted]

Dear Parent/Guardian:

A current Virginia Tech doctoral research study is examining summer learning loss and its relationship to activities in which students participate over the summer months. A survey that is a part of this study will collect information on summer activities from parents of the students involved.

So that the survey itself may be third-party field tested for validity, it is being sent out to parents who do not have children participating in the study. Because no [redacted] students are involved in this research, the researcher is asking you to take a few moments to evaluate the survey.

Please read through the survey information and fill out and return the enclosed Survey Evaluation form. This form asks for your feedback on several basic questions:

1. Are all of the words in the survey questions easily understood?
2. Are the questions easily interpreted?
3. Do all of the questions have an answer that can be marked by every survey recipient?
4. Is it likely that each recipient will read and answer each question?
5. Do the survey and cover letter create a generally positive impression that will make it likely that the survey will be completed?

It has been arranged for the evaluations to be returned to [redacted]. To that end, you will find enclosed a pre-addressed, stamped envelope with this letter. After completing the Survey Evaluation form, please use the envelope to return the form.

Because the research cannot proceed until the survey is field tested, please return the form to [redacted] by **December 23, 2010**. I hope that this condensed time frame for response will not present an inconvenience for you.

Please note that participation in the survey evaluation serves as implied consent to do so. Participation is voluntary, and any participant may withdraw at any time.

Thank you for your cooperation.

Best regards,

N. Wayne Tripp

N. Wayne Tripp, Ed.D.
Clinical Assistant Professor and Educational Leadership Program Area Leader
Department of Educational Leadership and Policy Studies
Virginia Tech

SURVEY EVALUATION FORM

After reading through the Summer Activity Survey, please respond to the following questions by checking the response that most closely represents your evaluation of the material.

1. Are all of the words in the survey questions easily understood?

   YES ____ NO ____

2. Are the questions easily interpreted?

   YES ____ NO ____

3. Do all of the questions have an answer that can be marked by every survey recipient?

   YES ____ NO ____

4. Is it likely that each recipient will read and answer each question?

   YES ____ NO ____

5. If your answer to question 4 (above) is "NO", which question(s) on the survey would a recipient be less likely to answer? Please list the survey question number(s) less likely to be answered below:

   _____

6. Do the survey and cover letter create a generally positive impression that will make it likely that the survey will be completed?
   a. YES ____ NO ____

Thank you for your review of this information. Please enclose this form in the self-addressed, stamped envelope provided return it by mail by December 10, 2010.

APPENDIX M

Heyns' Consent to Survey Use

From: Barbara Heyns [bh5@nyu.edu]
Sent: Monday, September 06, 2010 12:09 PM
To: Linda F. Wright
Subject: Re: Survey Information

Ms. Wright:

Survey structure and questions are in the public domain --- you are entitled to borrow questions, organization or even the survey wholesale with proper crediting to sources. I do recommend that you include the items about family background and parental income, however, since that was invariably a very significant factor in predicting summer activities (as well as learning).

As I'm sure you know, the original questionnaire is in the appendix to my book. I look forward to seeing your results.

Sincerely,
Barbara Heyns

----- Original Message -----
From: "Linda F. Wright" <lfwright@rcs.k12.va.us>
Date: Monday, September 6, 2010 9:30 am
Subject: Survey Information
To: "bh5@nyu.edu" <bh5@nyu.edu>
Cc: "wtripp@vt.edu" <wtripp@vt.edu>

> Dr. Heyns,

> I recently contacted you on facebook concerning my dissertation study on summer learning loss. My study is designed to explore summer activities, both social and educational, that may contribute to the retention or advancement of mathematics skills during summer vacation periods. I pre-tested second grade students during the last weeks of the school year, and I am in the process of post-testing them as they return from summer break. All participants were volunteered by their parents to participate. Parents assisted with the study by making arrangements for their children to stay after school for the tests and for their transportation home upon completion. The remaining component of the study is a written survey questioning parents as to how their children spent the summer. While I will not be asking economic and demographic questions as you did in the survey your team conducted in Atlanta, I will be asking for similar information as to their summer activities. Additional questions will be added to cover technological changes that have occurred in the interim between the conclusion of your study and my current effort. With that being said, would it be possible to use your overall format for my survey? Certainly, some questions included on the survey may bear a significant resemblance to those asked originally in your own work, but because of changes in an ever-evolving society, new questions will be added that attempt to address the wide range of summer opportunities available for children of today. I would be glad to send the survey to you for your review, and I will certainly credit your work in the study.
>
> Please feel free to contact me for additional information. I look forward to hearing from you
>
> Linda F. Wright

> Doctoral Candidate

> Virginia Tech