The Difference Between Multigrade and Monograde Education: A Quantitative Causal –
Comparative Study

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Comparative Study

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Abstract

Student achievement results in the multigrade classroom compared to the traditional monograde classroom is inconclusive and inconsistent providing a rationale for more research to determine if classroom organization has an effect on student performance. This quantitative study examined existing test results on a Criterion-Referenced Test (CRT) taken by sixth graders in 2009 in the province of Newfoundland and Labrador, Canada to determine if there existed a difference in student achievement between multigrade and monograde classes. The target population included all 198 multigrade students in 2009 in the 6th grade who also took the CRT in 2006 while in the 3rd grade. Data were drawn from CRT results of the sixth grade students in 2009 in multigrade and monograde classrooms in the province and their CRT results in 2006 (when these students were in 3rd grade) as baseline student achievement. The study controlled for demographic factors of location (rural/urban), parental socio-economic status, and parental education level that may influence student achievement. The independent variable was classroom organization of multigrade or monograde and the dependent variables were students’ reading, writing, and mathematics scores on the annually administered Criterion Referenced-Tests (CRTs) in English Language Arts and Mathematics in 2009. The quantitative study used MANOVA for statistical analysis of data from both multigrade and monograde classes to determine if a difference existed in students’ reading, writing, and mathematics scores. There was no statistically significant difference between multigrade and monograde classes on the combined dependent variables, $F (3, 391) = 1.74, p = .158$; Wilks’ Lambda $= .99$; partial eta squared $= .013$ using a covariate of previous learning. It is suggested that multigrade education is
viable alternative to monograde education. It is recommended that continued implementation of multigrade education can continue into the future. It is recommended that future research be conducted in others grade levels, subject disciplines, and jurisdictions.
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Chapter 1: Introduction

The rural nature of the Canadian province of Newfoundland and Labrador, comprised mainly of small communities, has experienced significant and consistent population decline since the closure of the cod fishery in 1992 (Government of Newfoundland and Labrador – [Govt. NL], 2010). A population decline involves family migration that results in a decline in school student enrollment. Therefore, in Newfoundland and Labrador, a student population decline has resulted in the closure of some schools and the implementation of many more multigrade classrooms to ensure school sustainability in small and rural communities (Govt. NL, 2009).

Multigrade classrooms are a means of maintaining teachers and schools considering declining student enrollment, or in some instances in inner city communities that results in either attending multigrade classes or no school at all (Berry & Little, 2006). The monograde classroom is the most widely recognized form of educational organization for classrooms. When offered as an alternative to the monograde classroom to ensure a sustained educational program for rural students, and often times, poor regions (Little, 2007), multigrade classrooms are beneficial because of their prudent financial advantages and maintaining classrooms in the face of declining or small student enrollments (Little, 2004). Additionally, multigrade education is a reasonable, and sometimes preferable, alternative because of the required individualized teaching through differentiated instruction (Tomlinson, 2005) and the benefits of capable peer collaboration (Fawcett & Garton, 2005).

However, research in multigrade education on student achievement has revealed mixed and inconsistent findings (Brinegar, 2010; Kappler & Roellke, 2002; Little, 2008).
Some research has found that students have better achievement in multigrade classes (Aina, 2001; Gutierrez & Slavin, 1992; Lloyd, 1999; Lloyd, 2002; McEwan, 2008; Nye, 1995; Ong, Allison, & Haladyna, 2000; Stone, 1998). Some research found no difference in student learning between multigrade and monograde classes (Cornish, 2009; Gerard, 2005; Goodlad & Anderson; 1959; Gorrell, 1998; Little, 2004; Pratt, 1986; Veenman, 1987; Veenman, 1995; Vincent, 1999). Other research found negative impacts of multigrade education on student achievement (Mason & Burns, 1996). In short, the difference between multigrade education and monograde education on student achievement remains inconclusive (Brinegar, 2010; Little, 2008) and controversial (Fosco, Schleser, & Andal, 2004).

Given the increased presence of multigrade classrooms (Mulryan-Kyne, 2007) and the controversy surrounding the suggested benefits (Fosco, Schleser, & Andal, 2004), the study was appropriate. Specifically, a study to examine the difference between multigrade and monograde education on student academic achievement was relevant. This study will contribute to a better scientific understanding of the educational organization. The next sections of the paper will provide a detailed discussion of the problem statement, purpose statement, research method, and a review of literature that will provide a context for the current study.

**Background**

Multigrade education is a pervasive educational organization that can be found throughout the world in both industrialized and developing nations (Little, 2004). Specifically, research from the United States and Canada projected the prevalence of multigrade education to increase (Chapman, 1995). Furthermore, multigrade education is
likely to increase even further into the future as a viable alternative to the monograde classroom (Mulryan-Kyne, 2007). However, given the wide variance in implementation methodology of multigrade education, research on the effects of this classroom organization on student achievement remains inconclusive (Brinegar, 2010) and in need of further research (Little, 2008).

Education is about student learning. The organization of the classroom to provide education to students may come in the form of a monograde or multigrade classroom. In many jurisdictions, multigrade education is the only opportunity for learning (Berry & Little, 2006). However, given that research on the effects of multigrade education on student achievement is inconclusive and controversial, determining if multigrade education is a viable alternative to monograde education is a subject that required further study (Brinegar, 2010; Fosco, Schleser, & Andal, 2004; Little, 2008).

Early research in the area of multigrade education found there existed no significant difference between multigrade classrooms and monograde classes (Goodlad & Anderson, 1959; Pratt, 1986; Veenman, 1995). In fact, later research has indicated that fear about multiage education as an inferior classroom organization to monograde classes is without foundation (Gerard, 2005). However, in a modern era of high-stakes testing and accountability, a significant body of research on the effects of multigrade education on student achievement suggests that the findings are controversial and inconsistent (Brinegar, 2010; Fosco, Schleser, & Andal, 2004; Kappler & Roellke, 2002).

The literature on multigrade education on student achievement does not reveal any clear direction on if it is a viable alternative to monograde education. Although it has been found that often a choice between multigrade education is a choice between
multigrade education or no education at all (Berry & Little, 2006), there remains a need for further research (Kappler & Roellke, 2002). The current study used standardized student achievement results to determine if multigrade education is a viable alternative to monograde education considering its continued implementation (Govt. NL, 2009). Multiage instruction may offer improvements to student learning in noncore subject areas, such as art, physical education, music, and dance (Broome, 2009; Heid, Estabrook, & Nostrant, 2009; Skoning, 2010). However, the effects of multigrade education in key subject areas, such as reading, writing, and mathematics (Kobelin, 2009) are not as evident. Therefore, this study examined if multigrade education is a viable alternative to monograde education in core subject areas of reading, writing, and mathematics. In sum, studies on multigrade education lack research based on student achievement (Tomlinson, 2000) and there is a projected increase in multigrade education into the future (Mulryan-Kyne, 2007). As a result, the inconsistent, and controversial, field of multigrade education on student achievement (Brinegar, 2010; Fosco, Schleser, & Andal, 2004) provided a rationale for more research.

**Problem Statement**

Since the collapse of the cod fishery and subsequent government-implemented cod moratorium, the population of Newfoundland and Labrador has witnessed a significant and profound decline largely due to high levels of outward migration that has resulted in a formidable challenge to the education system of maintaining schools with significant losses in student enrollment (Govt. NL, 2010). Student enrollment decline has negative impacts on the local education system. Student enrollment decline results in small school closures and higher transportation costs of bussing students to larger centers.
(Little, 2004). Maintaining smaller schools may result in challenges to school programming, increased cost of teacher-student ratio, maintaining support staff, and school maintenance (Little, 2004).

In an effort to maintain schools in shrinking communities for small and rural areas, multigrade education is an alternative to the traditional monograde classroom (Kappler & Roellke, 2002). With its focus on differentiated instruction (Tomlinson, 2005) and potentials of offering opportunities for interaction and collaboration with more capable peers (Fawcett & Garton, 2005; Gnadinger, 2008), multigrade education could be a positive alternative to the monograde classroom (Mulryan-Kyne, 2007). However, research on monograde and multigrade classrooms and their difference in student achievement remains inconclusive, controversial, and inconsistent (Brinegar, 2010; Fosco, Schleser, & Andal, 2004; Little, 2008). So the specific problem is if there is a difference in sixth grade students’ achievement in reading, writing, and mathematics between multigrade and monograde classes (Cornish, 2009).

The practice of multigrade education continues to be controversial (Fosco, Schleser, & Andal, 2004). As a result, knowledge gained from the current study offers educational organizations, such as school boards and Department of Education, evidence if multigrade education is a viable alternative to monograde education. The findings also contribute to learning theories on differentiated instruction (Tomlinson, 2005) and peer collaboration (Fawcett & Garton, 2005).

**Purpose Statement**

The purpose of this quantitative study with a causal-comparative *ex post facto* research design was to examine existing test results to determine if there was a difference
in sixth grade students’ achievement in reading, writing, and mathematics between multigrade and monograde classes. Student selection comprised two groups; monograde and multigrade classrooms. A random selection included a sample from the 4995 students in the monograde population to match the small population of the 198 multigrade students. The match involved sixth grade students in the Canadian province of Newfoundland and Labrador who participated in the English Language Arts and Mathematics Criterion-Referenced Test (CRT) in 2009. The test results on the CRTs by the same students in 2006 (when these students were in 3rd grade) served as baseline student achievement. Any potential influence by demographic variables, such as location (rural/urban), parental socio-economic status, and parental education level (Haciemînoğlu, Yilmaz-Tüzün, & Ertepinar, 2009; Haifeng & Cowen, 2009; Rpuse & Barrow, 2006; Shin & Chung, 2009) were used as controls through a stratified random selection. Additionally, the research implemented the statistical technique of multivariate analysis of variance (MANOVA). The study contributed to research and educational theories on differentiated instruction and social interaction (Fawcett & Garton, 2005; Tomlinson, 2005). Knowledge gained through the study also provided evidence for decision makers if multigrade can be a viable alternative to monograde education.

**Theoretical Framework**

Classrooms organizations should maximize student learning. Unlike the traditional graded classroom, classrooms organized on a philosophy of differentiated instruction are sensitive to individual student variance and learning styles (Tomlinson, 2005). The concept of multigrade education is aligned with the same educational theory as differentiated instruction insomuch that the traditional graded classrooms should be
avoided and in its place the implementation of nongraded classrooms (Anderson & Pavan, 1993). Theories on student learning suggest differentiated instruction (Tomlinson, 2005) and the opportunity for student peer collaboration (Fawcett & Garton, 2005) maximizes educational opportunities and not the more traditional fixed-grade configuration.

The current theoretical framework falls within a study of educational leadership. Social interaction and its link to the cognitive growth process is an important part of the educational organization (Vygotsky, 1978). In the modern era, in multiage or multigrade classrooms, the educational theory of learning through social interaction continues to guide the basic philosophy of classroom organizations (Cornish, 2009). Peer collaboration is an effective classroom organization for teaching and learning (Gnadinger, 2008). As well, the theoretical framework for organizing classroom based on peer collaboration has been shown to maximize student learning (Chick, 2006; Swenson & Strough, 2008). Research on peer collaboration and the link to student learning has suggested that in fact students learn better when provided opportunities to interact with more knowledgeable peers (Wood & Frid, 2005). This type of educational framework would be found in the multigrade classroom.

In educational theory, multiage or multigrade classrooms are distinctly different from monograde classrooms. Monograde classes are rigid classroom structures that comprise students of similar age and grade (Cornish, 2006) with no special attention to individual differences. Whereas the multiage or multigrade classrooms contain students with varying grades, abilities, and ranges in developmental stages (Cornish, 2006; Little,
As a result the teaching and learning environment in the two different educational organizations vary greatly in grade, age, development, and ability.

Multigrade classrooms require attention to individual student learning styles and ability, not found in the graded classrooms (Anderson & Pavan, 1993). Differentiated instruction provides one measure of individualized attention to student learning which is not necessarily tied to grade level configurations (Tomlinson, 2005). Differentiated instruction is more congruent with the needs of the individual student rather than whole group instruction, such as the monograde configuration (Reis, McCoach, Little, Muller, & Kaniskan, 2011). The current research in educational organization of monograde classrooms suggests that modern classrooms are not meeting the individual needs of students (Tomlinson, Brighton, Hertberg, Callahan, Moon, Brimijoin, Conover, & Reynolds, 2003).

Societal, parental, and educational factors influence student learning (Rouse & Barrow, 2006). Given the link between student social interaction and improved academic achievement, the structuring of classrooms around the individuality of student interest and ability, such as the nongraded classroom may offer a more appropriate conceptualization of the educational process than the traditional grade-fixed classroom (Burns & Mason, 1998). As a result, the social context of student learning and differentiated instruction will provide richer learning opportunities for students (Many & Henderson, 2005; Tomlinson, 2005). The theoretical basis that students learn best through differentiated instruction (Geisler, Hessler, Gardner, 2009; Reis, McCoach, Little, Muller, & Kaniskan, 2011) and social interaction and peer collaboration (Stuart,
Connor, Cady, & Zweifel, 2006) underpins the education philosophy of the multiage classroom.

**Research Questions**

This quantitative study sought to determine if there was a difference in sixth grade student achievement in reading, writing, and mathematics between multigrade and monograde classes when controlling through the statistical method MANOVA for other factors, such as location (rural/urban), parental education level and socio-economic status. To achieve that goal the research required an examination of student achievement in core subject areas of English Language Arts and Mathematics of multigrade and monograde classes. The research questions below guided the research.

- **Q1.** What is the difference in 6th graders’ achievement in reading comprehension between multigrade classes and monograde classes?
- **Q2.** What is the difference in 6th graders’ achievement in writing between multigrade classes and monograde classes?
- **Q3.** What is the difference in 6th graders’ achievement in mathematics between multigrade classes and monograde classes?

**Hypotheses**

- **H10:** There is no statistical difference in 6th graders’ achievement in reading comprehension between multigrade classes and monograde classes.
- **H1a:** There is a statistical difference in 6th graders’ achievement in reading comprehension between multigrade classes and monograde classes.
- **H20:** There is no statistical difference in 6th graders’ achievement in writing between multigrade classes and monograde classes.
H2a: There is a statistical difference in 6th graders’ achievement in writing between multigrade classes and monograde classes.

H3b: There is no statistical difference in 6th graders’ achievement in mathematics between multigrade classes and monograde classes.

H3a: There is a statistical difference in 6th graders’ achievement in mathematics between multigrade classes and monograde classes.

Nature of the Study

Students are assigned to classrooms in their respective schools. It was not possible to perform an experimental design given that students are part of an educational organization pre-defined by the school size, location, and teacher allocation. Therefore, the study examined achievement levels of students who were already assigned to either multigrade or monograde classes. As a result, the study employed a causal-comparative design. A causal-comparative design involved the examination of existing student achievement data (Black, 1999). Additionally, a Multivariate Analysis of Variance (MANOVA) was appropriate in this study because there was more than one dependent variable (Black, 1999). More specifically, there were controls for the variables of parental income, parental education, and location (urban/rural) to study student achievement results on the 2009 Grade Six Criterion-Referenced Tests (CRTs) in reading, writing, and mathematics. The MANOVA tested the null hypothesis of no difference between multigrade and monograde student achievement controlled for demographic factors that may influence student learning.

There were two separate groups of students in the study: multigrade and monograde. The students’ test results in the 3rd grade in 2006 established a baseline of
student achievement in mathematics, reading, and writing. Subsequently, there was an analysis of the data for the same cohort of students in the 6th grade in 2009, controlled for demographic factors, to determine if a significant difference existed between the separate classroom organizations.

The independent variable was classroom organization of multigrade and monograde. The dependent variables were the student achievement (test results) on the 2009 Criterion-Referenced Tests (CRTs) of 6th grade students in reading comprehension, writing, and mathematics. There were 195 schools in Newfoundland and Labrador offering the Grade Six program to 5221 students. There was a random sample from the 141 monograde schools controlling for demographic factors. The remaining 54 schools offered a multigrade Grade Six program, but with a total student enrollment of 198 students. As a result, the study included all multigrade Grade Six students using a stratified random sample of an equal number of students from the monograde group matching the multigrade students in parental education, income, and location variables.

In this causal-comparative study, in addition to student achievement data collected from the Grade Six (CRTs) in reading, writing, and mathematics, there was a baseline for student achievement also. The baseline achievement referred to the CRT test scores for each student while in the third grade in 2006. This score served as a statistical control for any effects of prior skill level on students’ test results in 2009 when in Grade Six. As a result, the CRT served as the instrument to measure student achievement. Information from the Government of Newfoundland and Labrador, referred to as Community Accounts, provided information about urban/rural communities, parental socio-economic status, and parental education level. In 2009, monograde classes
represented 72.3% of the entire Grade Six classroom school organizations. While 27.7% of classrooms are multigrade, as a student population, only 4.3% of the entire 5221 student population received multigrade instruction. Therefore, there was an analysis of all 198 Grade Six multigrade student achievement data which was analyzed with the stratified random sample of 198 students from the monograde population.

**Significance of the Study**

Research in multigrade education on student achievement fails to provide any conclusive evidence. In fact, some research reports that multigrade education has a positive impact on student learning (Benveniste & McEwan, 2000; Blum, 2009; Gutierrez & Slavin, 1992; Lloyd, 2002; Nye, 1995; Ong, Allison, & Haladyna, 2000). Other research suggests there are negative effects of multigrade education (Mason & Burns, 1996). Further still, other research indicates that there is no significant difference between multigrade and monograde classes (Gerard, 2005; Mulryan-Kyne, 2005; Pratt, 1986; Veenman, 1995). Given this incongruity in research conclusions and given that research on multigrade student achievement has reported mixed findings providing inconclusive and inconsistent results (Brinegar, 2010; Kappler & Roellke, 2002; Kinsey, 2001; Little, 2008), further research was important. There is a continued reduction in student enrollment in Newfoundland and Labrador, and an increased implementation of multigrade education (Govt. NL, 2009). Therefore, there was a need for further research. Current research fails to provide definitive direction on the possible influence of expanded implementation of multigrade education as a viable alternative to monograde education.
A study on the effects of the continued increase and prevalence of multigrade classes (Govt. NL, 2009) was imperative to ascertain student achievement levels in Newfoundland and Labrador. The research was critical to determine if multigrade education is a viable, and successful, alternative to monograde classes. It is likely that multigrade education will continue, and increase, into the future (Mulryan-Kyne, 2007). Given the rural nature of the province, declining enrollment, and small schools (Govt. NL, 2009), multigrade education is also likely to increase in that Canadian province despite the inconclusive results (Little, 2008).

Student enrollment decline is a significant issue facing small and rural schools in Newfoundland and Labrador. In the past decade alone the province has realized a student enrollment decline from 93,957 to 70,631, and over a 50% decline from an enrollment high of 162,818 in 1972 (Govt. NL, 2009). Each year this student enrollment decline places significant pressures on the provincial ministry of education, school districts, and school administrators to maintain quality programming. In cases such as student population decline, multigrade education is an alternative to monograde education (Little, 2004). However, research on the issue if multigrade education is a viable solution to the monograde education is inconclusive (Brinegar, 2010; Little, 2008) and controversial (Fosco, Schleser, & Andal, 2004).

School officials and administrators benefit from the current study when implementation of multigrade education is considered. The information from this research benefit educational stakeholders in determining if multigrade classrooms offer educational benefits to students. Prior research in multigrade education, as it relates to student achievement, is sparse and inconclusive. The current study contributed to the
educational research if multigrade education is an equally effective alternative to
monograde education and it also informed education stakeholders if the projected
increase of multigrade education (Mulryan-Kyne, 2007) is likely to be in the best interest
of the students. The study offered educational decision-makers insight into the effects of
multigrade education.

Definitions

The literature refers to many terms for classroom organization outside the
traditional monograde classroom. With respect to terminology of multigrade classrooms,
the research literature includes a host of other terms, which generally encapsulate the
same concept, which is, any classroom with a structure outside the traditional monograde
design. To be clear, the term multigrade classroom, while distinctive, and unique in
educational design in its own respect, also often captures a host of other classroom terms
in the literature outside the single-teacher, single-grade classroom. The research reveals a
plethora of terms for multigrade classrooms, in a generic sense, which are not defined by
the traditional single-teacher-monograde classroom. There are other commonly
referenced terms, which are often synonymous with multigrade classrooms, which while
unique in their own right, often overlap in design, function, and implementation as the
notion of the multigrade designation. As a result, the research literature refers to classes,
which exist outside the monograde system in varying degrees of terms to include:
combination class, composite, continuous progress, double-graded class, family group,
force mixed grade, force mixed-age classes, grade combination, mixed-age, mixed-grade,
mixed-year, multiage, multi-ability, multilevel, multiple class, nongraded, nonfixed, split
class, split level, ungraded classroom, ungradedness, unitary school, vertical grouping.
Consequently, “various terms are used in different countries to describe multigrade settings, e.g. multigrade, mixed-year, combination class, vertical grouping, family grouping, composite class, split class, double-graded class, unitary class” (Berry & Little, 2006, p. 67). Given the range of terminology in the literature for classrooms that are not traditionally defined as monograde, there are several key definitions of classroom organization outside of monograde that are most often referred and require clarification.

**Monograde.** Traditional classrooms consist of one teacher with a classroom of similar-aged individuals. Basically, the most widely recognized and traditional classroom is “with grade peers...grade identity” (Cornish, 2006, p. 123). The monograde classroom groups students together with their grade level equivalents.

**Multigrade.** Multigrade in the research literature is the most often referenced term in defining a classroom that is not single stream, or monograde. The single teacher with a common cohort of students in the traditional classroom is the most familiar and prevalent form of the educational experience. However, while there are slight variances and nuances once there is a departure from the traditional monograde system, generally, classes that consist of students outside the traditional single teacher-single stream students are known as multigrade. More specifically multi-grade teaching is “where a teacher is responsible for learners in two or more curriculum grades at the same time” (Little, 2008, p. 1). Furthermore, multigrade classrooms are not entirely the same as multiage, nongraded, or mixed-age classes. However, additionally they, in fact, do share a key characteristic inasmuch that they are not the traditional single stream class. The
term ‘multigrade classroom’ will capture the predominate premise in this research study to encapsulate all terminology outside the monograde classroom.

**Multiage.** Multiage is another critical term in research outside monograde single stream classes. In the more general sense, multigrade education is a classroom that places students of different ages, abilities, and grades into one classroom. However, in a more specific way, multiage education is not predicated on a student’s predefined and lock-step grade but other factors. Specifically, multiage education “usually describes classes containing several grade (commonly two or three) which are formed by choice and on the basis of a philosophical commitment to the type of learning which occurs when children of different stages of development learn together” (Cornish, 2006, p. 124). Of course, there are striking similarities between multigrade and multiage classes. However, where multigrade includes age, ability, and grade, multiage is not predicated on a student’s predestined and predefined grade as dictated by a sequential, serial, and successive educational system. While multiage is distinctively different from multigrade, given the vast commonalities between the two ideologies the term multigrade is understood to represent also multiage, particularly given the unique circumstances of the Newfoundland and Labrador educational system in which multiage and multigrade terms are interchangeable irrespective of individual ideology.

**Nongraded.** Nongraded is another educational concept in the research outside the regular monograde classroom. While multiage and multigrade classroom structures are very distinct in organization and implementation, nongraded classes are another alternative to monograde classes. As an operational definition “nongraded education is the practice of teaching children of different ages and ability levels together in the same
classroom, without dividing them or the curriculum into steps labeled by grade; designations” (Cotton, 1993, p. 1). The underlying premise of the nongraded classroom is the grouping of students, not by grade or age, but by placing students in one classroom devoid of preconceived labels. There are varying degrees of grades and varying degrees of ages in the nongraded classroom so consequently, any reference to grade or age is moot because assignment to a nongraded classroom is separate from a set of predefined criteria. How these definitions differ and how they are the same are meaningless in the educational context of Newfoundland and Labrador given that the structure of these classrooms are outside the monograde irrespective of their perceived advantages or disadvantages. In the local context, financial reality and not an educational philosophy determine student placement in a nongraded classroom.

**Mixed-age.** Mixed-age is another common reference in the literature for a classroom outside the monograde classroom. There are varying terms referring to classroom organizations outside the commonly held notion of monograde, single stream classes and “mixed-age grouping is a way of grouping children in which the children’s age range is larger than a year – sometimes 2 years and sometimes more” (Reese, 1998, p. 1). In a mixed-aged classroom, like multigrade, multiage, and nongraded, the students are in a classroom together based on a variance of age that rests outside arbitrarily imposed notions of pre-defined steps known as grades, irrespective of individual student learning needs and cognitive development.

**Composite.** This is another common term used to reference classes outside the monograde structure. Like many other educational precepts, composite classes are largely similar to multigrade and multiage classes. Composite “classes most often consist
of one class containing two grades or years of schooling” (Cornish, 2006, p. 124). As a result, composite classes share many similarities to the educational notion of multigrade education. The classroom organization that lies outside the traditional monograde classroom, such as composite classes, shares many similarities.

**Criterion-referenced test.** This is an educational assessment to measure student mastery against prescribed learning outcomes. To be specific, a Criterion-Referenced Test is a student’s test performance “interpreted according to how much of a defined assessment domain has been mastered by the student” (Popham, 2008, p. 359). The Criterion-Referenced Tests (CRTs) comprised the data to analyze student achievement results of multigrade and monograde classes in Newfoundland and Labrador. CRTs in English Language Arts and Mathematics are a provincially prescribed learning activity in every Grade Three and Grade Six classroom in the province. CRTs provide an assessment of the degree of proficiency of students compared to the curricular outcomes.

**Demographic factors.** There are many factors that influence student learning. Many factors outside the classroom affect student learning (Myberg & Rosén, 2008). There are causes outside the classroom which influence student achievement. Factors, such as parents’ education level, socio-economic status, location (rural/urban) may have an influence on student learning. Research suggests that in fact there exists “sociodemographic variables on students’ learning” (Haciemînçöl, Yılmaz-Tüzün, & Ertepinar, 2009, p. 72). The Government of Newfoundland and Labrador maintains data of community demographic factors. This study controlled these demographic factors in multigrade and monograde schools for any effect they had on student achievement.
**Location.** Location refers to urban or rural, which are demographic terms to define community size and services. Research reports an “achievement gap between urban and nonurban students” (Song, 2006, p. 481). More specifically, in Newfoundland and Labrador the community in which a school offers an educational program to service the students is either urban or rural. An urban community in Newfoundland and Labrador consists of residents in “communities 5,000 and over” (Govt. NL, 2009, p. 89). The remaining communities with resident populations of less than 5,000 are rural. This study of multigrade and monograde classes controlled for geographic location in rural areas only.

**Parental education level.** This is the highest level of educational attainment by the parent of a child (Ismail & Awang, 2008). Parental education has an effect on student achievement (Myrberg & Rosén, 2008). Parental education levels, which include the number of resources in the home and attention to literacy has an association with children’s achievement in school. For this study, the Government of Newfoundland and Labrador maintains statistics on parental education level divided into three categories: less than high school, high school diploma, and Bachelor’s degrees or higher.

**Student achievement.** This refers to the test results of each student on the provincial Criterion-Referenced Tests in English Language Arts (reading and writing) and Mathematics. Students receive individual reading and writing scores in English Language Arts as well as individual mathematics scores. In this study, these scores represented the student achievement results for data analysis. Rubrics provided scores on student achievement. A rubric is “used to score students’ response to a performance assessment” (Popham, 2008, p. 180). In Newfoundland and Labrador, rubric scores in
English Language Arts and Mathematics are a one to five scale with the minimum acceptable standard of proficiency representing a three, classified as “adequate.” Scores of four or five represent levels of exceeding grade level expectations. Students receiving a score of one or two are not yet meeting grade level expectations.

**Baseline student achievement.** This refers to the 2006 levels of student achievement in the third grade as prior skill level. This is a composite score of the subject areas in reading, writing, and mathematics. Students receiving a score of three, four, or five on the rubric used to measure student learning on CRTs are meeting or exceeding grade level expectations. Students receiving a score of one or two on the rubric are not yet meeting grade level expectations. The research study will use statistical control for any influence by students’ baseline achievement (Vogt, 2007).

**Socio-economic status.** This factor has long had an influence on student achievement (Cheadle, 2008). Socio-economic status, or SES, is “operationalized as an aggregate of economic and cultural capital in families” (Myrberg & Rosén, 2008, p. 507). As a result, a socio-economic factor on student achievement is basically the income-related gap among children as explained by parental income and investment capital (Evans & Rosenbaum, 2008). Basically, the socio-economic factor refers to the parental capital of their children as students in the classroom. Students’ socio-economic status has three separate income strata; lower (below $51,299), middle ($51,300 - $67,199), and upper (above $67,200) income earners (Govt. NL, 2009).

**Summary**

Chapter one identified the problem that multigrade classes are continually increasing in Newfoundland and Labrador, Canada (Govt. NL, 2009) without conclusive
research evidence on its effects on student achievement (Little, 2008). Multigrade classrooms are an educational reality throughout the industrialized world (Gerard, 2005; Lloyd, 2002; Mulryan-Kyne, 2007; Pratt, 1986) and developing nations (Aksoy, 2008; Benveniste & McEwan, 2000; Blum & Diwan, 2007; Little, 2004; Little, 2008; Pridmore, 2007; Vincent, 1999). While there are vast amounts of research on multigrade education generally, there is little research, specifically, on student achievement (Tomlinson, 2000).

The research questions were aimed at discovering if there existed a significant difference in student achievement between multigrade and monograde classes. Research on multigrade education student achievement reports inconsistent (Kinsey, 2001), mixed (Kappler & Roellke, 2002), disputed (Cornish, 2009), inconclusive (Brinegar, 2010; Little, 1995; Little, 2008), and controversial results (Fosco, Schleser, & Andal, 2004). The use of the annually administered CRTs in reading, writing, and mathematics in Newfoundland and Labrador, Canada provided specific information on student achievement in the multigrade classroom to determine if there existed a significant difference in student achievement between multigrade and monograde classes. This study informs educational stakeholders in the province to determine if multigrading classrooms in the key subject areas of English Language Arts and Mathematics is a viable alternative to the traditional monograde class.
Chapter 2: Literature Review

The effects of multigrade education on student achievement are inconsistent (Kappler & Roellke, 2002; Kinsey, 2001), inconclusive (Brinegar, 2010; Little, 1995; Little, 2008) and controversial (Cornish, 2009; Fosco, Schleser, & Andal, 2004). The purpose of this quantitative causal comparative study was to determine if there existed a significant difference in student learning between the traditional monograde classroom and multigrade classrooms in the Canadian province of Newfoundland and Labrador. Knowledge gained through the study provided evidence for educational administrators and decision makers if multigrade can be a viable alternative to monograde education in the elementary grades in a jurisdiction with student enrollment decline.

The literature review comprised relevant research perspectives on the effects of multigrade education on student achievement. The literature review began with a theoretical and historical context for the study as well outlining commonly referred terms for multigrade classroom organization in the research. The literature further delineated opposing findings that have reported positive effects, negative effects, and no significant differences in student learning between multigrade and monograde classes. Finally, the literature concluded with research findings on multigrade education from around the world, including the local jurisdiction for the current study in Newfoundland and Labrador.

Research in multigrade education, particularly as it relates to student achievement, remains largely unexplored (Tomlinson, 2000). While the term multigrade education is most widely used in the literature, there are many other comparable, but separate, terms used to describe a classroom that is organizationally different from the traditional
monograde class (Berry & Little, 2006). The literature research and review utilized search strings and terms, such as multigrade, multiage, nongraded, composite, and combination classes. Research in the general area of multigrade education is vast, but the current study centered on multigrade student achievement and therefore the literature review focused on this field specifically. Search for sources comprised ERIC, ProQuest, EBSCO, Wilson, Google Scholar, SAGE, WorldCat, ERICDigests. The sources involved peer-reviewed literature published in academic journals or peer-reviewed presentations to conferences. The literature in the review represented recent and historical academic studies with perspectives on multigrade student achievement.

**Multigrade Education Implementation in Newfoundland and Labrador**

Multigrade education is a well accepted and widely implemented form of classroom organization in Newfoundland and Labrador, Canada. In fact, multigrade classrooms comprise over one-quarter of all elementary classrooms in the entire province (Govt. NL, 2009). Additionally, it is a well-known fact that the province of Newfoundland and Labrador is experiencing an outward migration of citizens to other parts of the world (Govt. NL, 2011). To put these facts in context, in the 1971-72 school year Newfoundland and Labrador had a student enrollment of more than 162,000 students (Sparkes & Williams, 2000). Nearly 40 years later, the current student enrollment is less than half that number with just under 70,000 students enrolled in the K-12 school system (Govt. NL, 2009). This has presented significant challenges to the education system. More specifically, educational administrators must struggle with offering a comprehensive educational program for children with limited resources and declining student numbers.
Research in multigrade education and its effect on student achievement is nonconclusive (Brinear, 2010). The vast field of educational discourse provides few definitive findings on the effects of multigrade on student achievement. Multigrade education is an organizational reality in most jurisdictions throughout the world (Little, 2008). The multigrade classroom can be found in such industrialized countries of Canada, United States, Ireland, and Australia. Multigrade classrooms are an educational reality throughout the industrialized world (Gerard, 2005; Lloyd, 2002; Mulryan-Kyne; 2007; Pratt, 1986). As well, multigrade classrooms are a predominant educational structure in developing nations, such as Sri Lanka, Columbia, and Vietnam (Aksoy, 2008; Benveniste & McEwan, 2000; Blum & Diwan, 2007; Little, 2004; Little, 2008; Pridmore, 2007; Vincent, 1999). With respect to the difference between multigrade classroom organization and monograde education on student achievement, findings remain inconclusive (Little, 2008) and controversial (Fosco, Schleser, & Andal, 2004). While there is much research in multigrade education generally, little research has a focus on student achievement (Tomlinson, 2000).

The literature available on the differences between multigrade and monograde education on student learning in core subject areas, such as literacy and mathematics remains limited in examination. The findings in research on student achievement in multigrade classrooms compared to that in monograde classes vary (Kappler & Roellke, 2002). Additionally, other research has found that findings on multigrade student achievement are not only mixed but also inconclusive (Brinegar, 2010; Little, 2008). As a result, research has provided mixed findings, positive, negative, and no difference, on the effects of multigrade education on student achievement (Lloyd, 2002; McEwan,
2008; Mason & Burns, 1996; Gerard, 2005; Mulryan-Kyne, 2005). Consequently, the research literature on the practice of multigrade is certainly controversial (Fosco, Schleser, & Andal, 2004).

In Newfoundland and Labrador, smaller rural communities have experienced profound population decline, yet schools must offer a balanced education to students. As the educational system of Newfoundland and Labrador continues to face declining enrollment (Govt. NL, 2009), and funding to schools is contingent upon student enrollment, the education system also faces a decline in teachers and resources to sustain smaller schools. A common solution by districts in the province to maintain quality educational programming while facing smaller student numbers has meant continued, and increased, implementation of multigrade education (Govt. NL, 2009). While this solution may be a viable alternative to single stream classrooms, it is not without its challenges. Furthermore, the implementation of this model of education in the Newfoundland and Labrador context is not based on student achievement results. Consequently, multigrade education appears as a logical alternative to traditional classrooms without consideration to any possible ramifications on student achievement.

Multigrade education is an alternative to monograde classrooms. The rationale for the implementation of multigrade classrooms rests in the necessity to maintain schools and educational opportunities for students (Berry & Little, 2006). There are many rural schools with multigrade classrooms in Newfoundland and Labrador which are ‘necessarily existent’ (Mulcahy, 2009). These schools exist because of the unique rural, and remote, location of each educational institution. There are advantages of many aspects of multigrade education such as mental and social development (Linley, 2002).
In fact, in a local context, Newfoundland and Labrador teachers recognize that multigrade education does offer potential educational advantages to students (Mulcahy, 2000). However, while literature reports advantages to multigrade education, there is a lack of research on the advantages of multigrade education on student achievement. As a result, while teachers realize the advantages of multigrade education (Mulcahy, 2000), the research conclusions are not based on student achievement data. Multigrade classes are educational organizations that are prevalent in many schools and may increase through time (Mulryan-Kyne, 2007). Therefore any decision concerning multigrade education should be based on student achievement data. Any resulting information is important for all citizens, parents or educators, on the direction of multigrade education in the province.

**Theoretical Framework**

The modern model of education has its roots in progressive education in which the center of learning should rest with the interests of students with a focus on the process of living rather than simple acquisition of discrete subject matter (Dewey, 1916). Further research in the theoretical framework of modern education also found social integration and interaction of students links closely to student learning (Vygotsky, 1978). As a result, classroom organization has an effect on student learning. Consequently, the philosophy of multiage classroom organization falls within the framework of a progressive model of education (Stuart, Connor, Cady, & Zweifel, 2006).

From a theoretical perspective, peer social interactions in the classroom leads to a richer understanding of the reading and writing process (Many & Henderson, 2005). There is a close link to social learning and student achievement particularly with respect to literacy with an enriched environment for social interaction with peers (Dewey, 1916;
Vygotsky, 1978). In a study of multiage classrooms, Fosco, Schleser, and Andal (2004) also found connection with the theoretical concepts of cognitive development, reading ability, and classroom type. It has been found that students cannot effectively learn without peer interaction in the classroom (Wood & Frid, 2005). As a result, not only is student learning associated with social interaction, but also effective learning can only take place where a classroom consists of knowledgeable peers, usually in the form of a multiage classroom (Wood & Frid).

If the theory of Dewey and Vygotsky of social interaction is a necessary factor in student learning, the classroom organization requires serious examination to determine if there is an effect of peer collaboration in student learning (Fawcett & Garton, 2005). Through the design and implementation of multiage classrooms students learn from older peers through social interaction (Fawcett & Garton, 2005). It has been found that there are numerous benefits in a multiage classroom where students of different ages socially interact, peer model, and tutor (Stuart, Connor, Cady, & Zweifel, 2006). However, such benefits do not have confirmation specifically in student achievement due to successive studies that report inconclusive (Brinegar, 2010; Little, 2008) and controversial (Fosco, Schleser, & Andal, 2004) findings.

The multiage classroom provides a learning environment that fosters individual student learning, social collaboration, fostering different developmental levels, and individual responsibility for learning (Wood & Frid, 2005). The multiage classroom is an educational organization with a focus on individual student learning in a social context. Following the social learning model of multiage education and its link to academic student learning, multiage classroom students enjoy a richer learning process that may
result in future successes in reading and writing (Many & Henderson, 2005). The theoretical premise behind education is student learning which, through a multiage classroom, there is enhancement through social interaction.

    Multiage classes, unlike the more familiar monograde classes, have an educational theory of differentiated instruction that responds to the individual needs of each student in the class (Tomlinson, 2005). In fact, there is a suggestion that given the individual and unique needs of each learner, nongraded classes should replace the graded classroom (Anderson & Pavan, 1993). Optimal learning is not maximized in the lock-step graded classroom, but in the classroom that utilizes differentiated instruction (Tomlinson, 2005) and the opportunity for student peer collaboration (Fawcett & Garton, 2005).

    In the modern classroom, social interaction continues to be an important part of the educational process (Cornish, 2009). Peer collaboration continues to be an effective part of the teaching and learning process (Gnadinger, 2008) and educational theory grounded in maximizing student learning (Chick, 2006; Swenson & Strough, 2008). In fact, the importance of peer collaboration is such a critical component of the educational theory that students cannot thoroughly learn without more knowledgeable peers, such as those in the multigrade classroom (Wood & Frid, 2005).

    While monograde classes are rigid educational structures (Cornish, 2006), the multigrade classroom theory combines students of varying grades, abilities, and development (Cornish, 2006; Little, 2008). Multigrade classes are responsive to the individual needs of each student, unlike the monograde class (Anderson & Pavan, 1993). One measure of the multigrade classroom is to ensure the learning needs of the individual
student are met through differentiated instruction (Tomlinson, 2005), which is more appropriate than a whole class instruction in a monograde classroom (Reis, McCoach, Little, Muller, & Kaniskan, 2011). As a result, the multigrade classroom should replace the monograde classroom (Anderson & Pavan, 1993) because the modern monograde classroom is not meeting the individual needs of students (Tomlinson, Brighton, Hertberg, Callahan, Moon, Brimijoin, Conover, & Reynold, 2003). Therefore, given the positive link between social interaction and student learning, from a theoretical perspective, the multigrade classroom may offer a more appropriate classroom organization (Burns & Mason, 1998). A classroom that focuses on the educational theory of the critical role of social interaction and differentiated instruction will provide a richer learning environment for students (Many & Henderson, 2005; Tomlinson, 2005). The multigrade classroom is particularly appropriate for differentiated instruction and as a result provides an opportunity for students to maximize learning (Geisler, Hessler, & Gardner, 2009; Reis, McCoach, Little, Muller, & Kaniskan, 2011) through the educational framework of social interaction and peer collaboration (Stuart, Connor, Cady, & Zweifel, 2006).

**Rationale for Multigrade Education in Newfoundland and Labrador**

There is an array of terminology used in multigrade education in need of clarification for the current study. There is a need for recognition and commonality in the terminology. While the plethora of terms utilized in multigrade education are unique and distinctive in their own right, the most commonly referred terms are either multiage or multigrade. There may exist historical variance in terms and structure of the multiage classroom, but the fundamental philosophy has remained the same (Cornish, 2009).
The classroom organization of multiage and monograde are separate and distinct educational precepts. The implementation of multigrade classrooms is largely a product of declining enrollment in rural schools (Little, 2008). However, in the province of Newfoundland and Labrador, like many rural jurisdictions throughout the world, the decision to implement multigrade classrooms is a decision between that educational organization or no classes at all (Berry & Little, 2006). However, this precludes a discussion to close smaller schools and transport students to larger monograde schools or consider multigrade education. So while multiage and monograde classes are distinctive educational notions, in the province of Newfoundland and Labrador implementation of multiage or multigrade is not based on educational ideology but school sustainability. Consequently, whichever term one refers, multiage or multigrade, the implementation of this classroom reorganization is an educational reality in Newfoundland and Labrador to keep schools regardless of its own respective ideologies.

The research literature does not assist in the process of making informed decisions. There is no support in research in the consideration of implementing multigrade classrooms based on student achievement. In sum, there is not convincing evidence that multiage or multigrade classrooms offer an academic benefit or hindrance in classrooms. The totality of research is inconclusive on the effects of multigrade education on student achievement. However, there is ample research evidence to suggest factors, such as differentiated instruction (Tomlinson, 2000) and a supportive and enriched home environment (Morales, 2010) improve student learning irrespective of the class structure. The mixed findings may be a result of the greatest predictor of student success, regardless of social influences or classroom organization, which is the teacher
(Canestrari & Marlowe, 2004). Additionally, the research is not predominantly clear that multigrade or traditional monograde classrooms provide clear evidence that one instructional environment is more conducive to student learning than the other. As a result, a further study was necessary to determine if there existed a difference in student achievement, through a localized study in Newfoundland and Labrador, Canada between multigrade and monograde classroom results.

Research in multigrade education is rich and diverse. There are countless studies on the advantages and disadvantages of multigrade education; however, with respect to its effect on student achievement, and more specifically, the formative years of literacy for primary children, there is little evidence and therefore a need for additional investigation and inquiry. However, the problem in multigrade or multiage education is that the level of student performance is rarely a reason for multigrade education implementation (Tomlinson, 2000). It is a deeply disconcerting finding to note that the implementation of multiage classrooms is irrespective of the effects on student learning. Therefore, if the evaluation of the effectiveness of multigrade education does not use student achievement, what measure is appropriate for the justification of its continued and projected implementation (Mulryan-Kyne, 2007)? That is, by what scale are multigrade classrooms a viable alternative to monograde classrooms if the student achievement is not the frame of reference? Schools are institutions of student learning. The evaluation and merits of multiage or multigrade classrooms rest with the level of student achievement.

The current study was a focus on student achievement results of multigrade and monograde primary students in the Canadian province of Newfoundland and Labrador.
Like results throughout other educational jurisdictions on multigrade education within North America and the world, “in Newfoundland and Labrador in Canada the debate is contemporary” (Little, 1995, p. 31), which continues to be true. Multigrade education, especially given the rural nature of much of the population, has permeated many schools throughout the province (Govt. NL, 2009). It is a phenomenon not likely to recede into the educational background but in reality move to the forefront given the demographic realities. However, this point is moot when considering the implementation of multigraded classrooms is for the maintaining of schools irrespective of student achievement levels. In Newfoundland and Labrador, the annual Criterion Referenced Tests measure primary literacy in student learning versus the curriculum outcomes. Consequently, the analysis of student achievement levels should underpin the reasons for implementation of the multigrade classroom. It is this that measures the success of a multigrade classroom.

The current study involved an investigation of primary multigrade student achievement levels of reading and writing of all multigrade classrooms in the province of Newfoundland and Labrador, Canada. The province has a population of more than 500,000 residents with a Kindergarten to Grade 12 student population of just under 70,000 spread over more than 279 schools (Govt. NL, 2009). There is a very small body of research on multigrade education in Newfoundland and Labrador. Mulcahy (2000) found that teachers are aware of the potential benefits of multigrade education. Thinking anecdotally, this may not be surprising. In Newfoundland and Labrador, multigrade classrooms have low student enrollments. In fact, the Department of Education has mandated a class cap of 25 students as the maximum allowable in any primary classroom
regardless of classroom organization or structure. However, when analyzing student achievement data, there must be a careful examination of the findings of Mulcahy.

Mulcahy (2000) found that teachers are aware of the benefits of multigrade education. There must be a cautious view of this study. As Mulcahy has reported some teachers see the benefits of multigrade education and use the small student enrollment and individualized instruction as an optimal opportunity to maximize student learning. Obviously, when students are performing well academically in multigrade classrooms, teachers need not offer any reason for a lack of performance. However, schools that have multigrade classrooms performing below acceptable standards, teachers may state that there is too much curriculum to cover. Additionally, teachers may contend there are too many challenges, or a lack of training (Walser, 1998), or a lack or resources, which would account for the underperformance in student learning in the multigrade classroom. Both positions cannot be correct, and a study into any actual differences between multigrade and monograde student achievement is necessary. On this point, Little (1995), in an international review on multigrade education, found that some educators reported multigrade education as an opportunity to offer high quality education while other teachers reporting that students in multigrade education cannot receive an equal education comparable to those students in monograde classes. Clearly, the need for further and deeper examination may offer research-based information to inform decision-making on the implementation of multigrade education.

The need for research in achievement levels of multigrade education is clear. The continued implementation of multigrade education in Newfoundland and Labrador is an educational reality. In fact, there has been a historical prediction of continued levels of
increase in multigrade classrooms (Chapman, 1995) and a reasonable expectation to continue in the future (Mulryan-Kyne, 2007). However, considering this fact, despite continued implementation of multigrade education, in the literature there still exist inconsistent findings on the effects of student learning in multigrade education (Kappler \& Roellke, 2002). Consequently, further study on student achievement is imperative before even further multigrade implementation. However, before an examination of multigrade student achievement there must be a clear understanding of the whole notion of exactly what constitutes multigrade or multiage in the literature.

**Historical Background of Multigrade and Monograde Education**

The notion of a teacher-student educational model is an organizational framework that threads throughout history. Educational structures vary through time and jurisdictions. However, the modern structured monograde class consisting of a cohort of age-similar students traces back to the 19th century (Pardini, 2005). The more modern day classroom is more than the simple acquisition of subject matter (Dewey, 1916; Vgotsky, 1978). Like the traditional monograde classroom, multigrade classrooms are also prevalent throughout the world.

Multigrade and multiage classrooms are not new or innovative ideas in educational thought. In some educational contexts multigrade classes have been born out of necessity due to declining enrollments but in other educational environments the multigrade classroom is a voluntary arrangement seen as a significant means of improving student learning (Vincent, 1999). However, regardless of the reasons for multigrade implementation, the inevitable conclusion cannot be avoided that the benefits of multiage education are inconclusive (Brinegar, 2010; Little, 2008), inconsistent
It is common knowledge that young people learn far more in school than the academics of language, math, and science. While academia lies at the heart of the educational process, there are countless other lessons learned in school. In school students learn fundamental principles, such as respect, order, and discipline which govern society. These are important precepts, which students learn, yet also predicated on, the socialization of students in the classroom. On this issue, a great deal of the literature on multigrade education references the work of Vygotsky (1978) in which the role of social learning was found to have a connection to student learning. As stated, social interactions are an imperative facet in the learning process. This is particularly pertinent in multigrade education in which there is student integration into a classroom learning environment of different levels and ages (Berry & Little, 2006). The multigrade literature often reports the findings of Vygotsky because of the inextricable link between socialization and the learning process. This being the case, careful examination is prudent in examining student achievement in a classroom with a range of ability, grade levels, and ages like that of a multigrade classroom and unlike that of the traditional monograde, age-equivalent classroom.

The most predominantly referenced research, and general precursor, in multigrade research is the comprehensive study of Goodlad and Anderson (1959). While the researchers reported on several educational issues, such as retention and promotion, on the issue of multigrade education in elementary schools Goodlad and Anderson
undertook an examination of the effect of nongraded classrooms on students. The researchers concluded that despite new research on student learning and development, the school system has not changed to meet the needs of the social and cognitive development of students, later confirmed in future research (Anderson & Pavan, 1993).

In their study the researchers recognize that understandably there would be great concern if people were to learn that nongraded classrooms provide a less adequate education than monograde classes however no such evidence suggests such a difference (Goodlad & Anderson, 1959). This represents an early, and important, research finding on multigrade education. However, the research lacks standardized large-scale student testing and achievement. The modern era of accountability and high-stakes testing may offer even further valuable information that was not available in earlier research studies. The pervasive and ubiquitous nature of standardized assessments and testing affords current researchers even more data to draw conclusions on the levels of student achievement in multigrade, or composite, classrooms in a more comprehensive manner. In many later research studies in multigrade education, the study of Goodlad and Anderson is a common reference when providing a historical context for multigrade classrooms. This research represented a pivotal and contextual foundation in multigrade education.

Later, in an early study in multiage student achievement, Way (1981) found no significant difference on achievement indicators between multiage and single-age classrooms. While it was found in the area of the affective domain for student development there was higher mean scores in self-concept for students in multiage classroom, this did not mirror the same results found in academic achievement. This is
congruent with the research of Vygotsky (1978) inasmuch that social interactions have an effect on the learning process; however, in this early study there is no evidence that the multiage classroom had a statistically significant impact on student achievement. Although the limitations in the availability of uniform and consistent testing tools to conduct a comparative analysis may have presented a limitation in research conclusions and applicability. Nonetheless, this early study in multigrade student achievement set the stage for future research on the effects of multigrade classroom organization. The study by Way does suggest there are both advantages and disadvantages for multigrade classroom organizations in the social affect or achievement domains.

However, later one seminal study in multigrade education, specifically as it relates to student achievement, is the research by Pratt (1986). In this study, there was a comprehensive examination of multigrade academic achievement throughout the United States and Canada. The study involved an examination of 48 studies in multigrade research studies in North America. The study examined previous research studies on multigrade education using standardized assessments and achievement variables of reading and mathematics. This study found that multigrade classes have no effect on student achievement. However, while the research concluded, with respect to academic achievement that multigrade classrooms offer no difference in student learning than monograde classrooms, the study did find that multigrade grouping does enrich self-concept. The literature in multigrade studies often references the work by Pratt. It provides an important historical context for future studies, particularly in a modern milieu of high-stakes and standardized testing making academic achievement results more available for
study. Because the research by Pratt represents early, and important, information analysis of multigrade education based on achievement, it is a pivotal study.

The research from Veenman (1987; 1995) also offered early research, one of the first, and most important studies, of multigrade education. The research and studies by Veenman is seminal in multigrade education. In an early study on multigrade education, Veenman (1987) concluded that there existed no significant difference between multiage and single-age classrooms. While later research by Veenman (1995) is more often cited, this research offered a pivotal insight into an empirical examination of multigrade education, when compared to monograde education, and its effect of student achievement.

However, as research in multigrade education increased in interest and study, there were also further studies. While historically the literature generally had been reporting that there existed no significant difference in student learning between multigrade and monograde classes, a landmark study by Gutiérrez and Slavin (1992) suggested that students in multigrade classes performed better than those students in a monograde class. That is, the research reported significant positive effects on achievement for students in a nongraded elementary program.

The research represented a comprehensive review of research on achievement effects of nongraded organizations. The study included a wide array of multigrade structures that included five multigrade classroom organizations: 1.) multigrade in one subject only, 2.) comprehensive multiage classrooms for all subjects, 3.) multigrade classroom where there was an emphasis on individualized instruction, 4.) multigrade classes, which included guided, but individualized instruction, and 5.) unspecified
multigrade classrooms. The study reviewed 57 previous research studies on achievement. The conclusion suggested that multigrade classes have a positive effect on student achievement. However, certain limitations of the study rests in the individualized case studies, as individualized instruction may negate any effect on classroom organization, either multigrade or monograde. Nonetheless, the research departs from historical findings of no significant difference in student achievement between multigrade and monograde classes and suggested the need for further study in the field on multigrade academic achievement.

Further research increased in the field multigrade education. In a highly referenced work, Anderson and Pavan (1993) provided an examination of the multigrade and monograde system of education. The researchers suggested that the organization of classrooms should be around the ability of the learner rather than age. While the research provides a comprehensive overview of the nongraded system to include such things as curriculum delivery, teaching, and assessment, but the general impetus for the book suggests that the research supports a nongraded system of education as most beneficial for students of all abilities.

Furthermore, Anderson and Pavan (1993) present a strong position for the abandonment of the current method of education in the traditional monograde classroom, in favor of a nongraded classroom based on the individual needs of the student. The work of Anderson and Pavan represented an important and seminal study in monograde education in which later studies often reference for its progressive approach to education with respect to nongraded classrooms. Additionally, following the ground breaking research and seminal studies of Goodlad and Anderson (1959) who concluded students
were not disadvantaged by receiving a multigrade education, Pratt (1986) reported no difference in multigrade classroom achievement to that of monograde classrooms. Whereas, in contrast to other research, Gutiérrez and Slavin (1992) reported a positive influence on student achievement in the multigrade classroom but Anderson and Pavan (1993) called for the rejection of graded classrooms and a replacement with nongraded classes.

Veenman (1995) conducted a thorough study on the effects on student achievement in multi-age/multigrade learning when compared to monograde learning. In a review of 56 studies Veenman concluded that students in multigrade classes had no consistent difference in achievement scores in core subject areas of reading, mathematics, and language to that of the single-grade classroom. Veenman’s study is an often reference in the refutation of arguments against the implementation of multigrade education. The study is a landmark investigation in educational research. After the foundational study of Goodlad and Anderson (1959), researchers reference the Veenman study as a preeminent study in the field of multigrade education and student achievement. The research references this study throughout the literature in multigrade education.

In response to the study of Veenman (1995), Mason and Burns (1996), a sole source, refuted the claim of Veenman and suggested that multigrade education has a negative effect on student achievement. The researchers suggested that multigrade classrooms have students of stronger ability and independence, and as a result there is not a representative sample of a classroom of heterogenous learners. Therefore, given that teacher-led multigrade classrooms require a higher degree of responsibility in such areas as delivering different curricula and attending to individual student needs, Mason and
Burns reported that multigrade classes leads to a lower quality education. The pivotal point of this important study is that it refutes the landmark study of Veenman and also departs from other research that has reported no difference or a positive influence on student achievement in multigrade classrooms. This study added to the literature on the varying positions on multigrade education.

These early findings provide an important historical perspective if multigrade education is a viable alternative to monograde classes. A multigrade classroom offers challenges to teachers and teaching strategy but also has demonstrated no significant differences in some studies to the monograde classroom. As a result, the early research clearly offered no definitive guidance to educational decision-makers seeking to make sound and informed decisions about multigrade education when considered within the specific student achievement framework.

Any change in educational organization that has an associated “risk factor” is something which there must be a clear evaluation. Given that schools are institutions of learning, the degree of student learning should be the preeminent factor in the decision if to implement multiage classroom. The simple weighing of advantages versus disadvantages may not prove to be the most prudent method in educational decision-making. There are, of course, advantages and disadvantages to any educational endeavor. However, when considering advantages and disadvantages for potential risks, closer scrutiny is necessary. These early studies offer a historical starting point to contextualize later and current research studies. Historically, in multigrade education generally, and its effect on primary literacy levels of student achievement specifically, does not yield voluminous amounts of literature. Further research was most certainly beneficial.
The most current research does not offer definitive findings on the effect of multigrade classrooms on student achievement and, in fact, the research is nonconclusive (Brinear, 2010). Therefore, these findings suggested a need for further study to determine if multigrade education has an effect on student achievement. The historical research provided a framework for the current study.

**Terminology for Multigrade and Monograde Education**

The research literature on classroom organizations in educational systems that are structurally different from the traditional monograde class consisting of likeminded, similar-aged individuals, revealed a range of terms. The general term for the traditional classroom taught by one teacher is monograde education (Little, 2004). When referencing classrooms, which are not monograde, the literature generally refers to classrooms as multigrade or multiage (Berry & Little, 2006). While there are a broad range of terms to capture essentially the educational organization of multigrade classrooms, the research literature includes a host of other terms, which generally encapsulate the same concept, which is, any classroom organization outside the traditional monograde design (Cotton, 1993). To be clear, the term multigrade classroom, while distinctive and unique in educational design in its own respect, also often captures a host of other classroom terms in the literature outside the more traditionally understood single-teacher, single-grade classroom most often referred to as monograde.

The literature reveals a plethora of terms for multigrade classrooms, in a generic sense, which are not defined by the traditional single-teacher-monograde classroom. There are other commonly referenced terms, which are synonymous with multigrade
classrooms, which while unique in their own right, often overlap in design, function, and implementation as the notion of the multigrade designation. As a result, the literature refers to classes that exist outside the monograde system in varying terms including: combination class, composite, continuous progress, double-graded class, family group, force mixed grade, force mixed-age classes, grade combination, mixed-age, mixed-grade, mixed-year, multiage, multi-ability, multigrade, multilevel, multiple class, nongraded, nonfixed, split class, split level, ungraded classroom, ungradedness, unitary school, vertical grouping. It is important to note this range of terminology really results in the notion that these terms are simply referring to the same concept (Cotton, 1993).

While the terms delineated to capture classrooms, which are not graded in the more traditional sense is expansive and diverse, the more common terms for classrooms that lie outside single stream, traditional monograde structures include: multigrade, multiage, and composite (Cornish, 2009). In the research these terms, while distinctive in their implementation, organization, and delivery also possess many similarities. Basically, the most basic and common structure found throughout these educational classrooms is that they do not consist of a single-grade classroom of students grouped purely on a common grade alone. Instead, multiage, multigrade, or composite classrooms use a criterion that rests outside a child’s birthday of a lock step grade level, but follows a philosophy that focuses more on educational, cognitive, social, moral, and academic development. However, while in theory there should be a consideration for each of these organizations in making decisions about a possible change from the traditional monograde classroom, but in Newfoundland and Labrador this is not the case. There is no such consideration in the majority of these classrooms because these classes are
multigraded due to the financial reality of school sustainability because of declining student enrollment (Govt. NL, 2009) and not the multigrade pedagogical philosophy.

As referenced, the most common terms in the research to describe classes, which are not monograde are multigrade, multiage, and composite. While each term in philosophical and pedagogical reality possesses their own unique and distinctive characteristics, they also share a significant amount of commonality. Individually, each classroom structure has specific characteristics. A multigrade class possesses the characteristic of a teacher responsible for students in two or more curriculum grades at the same time (Little, 2008). Similarly, but not exactly a multiage class is one in which children of different ages, as opposed to grades as in the multigrade philosophy, learn in one classroom (Stuart, Connor, Cady, & Zweifel, 2006). A composite class is an organization with a two grade class to compensate for uneven grade enrollments (Cornish, 2009). Therefore, each classroom organization, which is not monograde in design, possesses its own unique educational philosophy. However, monograde classes stand alone and distinctively set apart from these other classroom organizations. Consequently, while there are various terms around the world to describe multigrade settings generally the research references the term multigrade (Berry & Little, 2006)

There is a varying amount of terminology in multigrade education, therefore it is necessary to delineate the key concepts. While there are many differences in each of the varying classroom organizations, they do share a common theme. The common link is that these classrooms do not follow a predefined birthday or a predefined grade found in the monograde organization. Instead multigrade and multiage classes follow a structure outside the criteria of birth date and a pre-defined grade level. Multigrade, multiage, and
composite groupings have comparisons and similarities that are exclusive to a student’s birth and inclusive to other domains, such as ability and social and psychological development. In short, these models may be unique individually, but they all represent a general model of education of a continuous progress of learning whereby the philosophy may be somewhat different, but in essence, the foundations are basically the same (Mack, 2008).

Similarly, the model of multigrade or multiage classroom organization in Newfoundland and Labrador is not based on the philosophy of each ideology. Rather, it is a means of grouping students together in one classroom effectively to meet educational outcomes in a financially prudent manner with a declining student population (Govt. NL, 2009). In Newfoundland and Labrador these small schools with multigrade classes are a resource-depleting system because multigrade education is the only option in maintaining a school (Mulcahy, 2009). The terms multiage and multigrade are synonymous in Newfoundland and Labrador. In the provincial educational reality, where multiage involves grouping students in a classroom whereby ages are greater than one-year (Reese, 1998) and multigrade involves grouping students in a classroom with a minimum of a two grade level span (Vincent, 1999), the terms are interchangeable. In fact on this point, Newfoundland and Labrador researcher Mulcahy (2000) has also concluded both types of classrooms have many common features. This point may need further qualification, inasmuch that both multiage and multigrade classroom have far more in common in educational structure with each other than they have with the monograde classroom structure.
As a result, given the implementation of multiage and multigrade educational classrooms in Newfoundland and Labrador irrespective of their unique philosophies and that the terms are generally synonymous both in the literature and in the province, therefore they were also synonymous in this study. This fact notwithstanding, be it multigrade or multiage, their very raison d’etre in schools, in most cases, is not based on their philosophy but their economic prudence (Little, 2004). Therefore, given that multigrade classrooms are organizationally much different from the widely accepted traditional monograde classroom and are becoming far more prevalent with a projected continuation of increase into the future, it was thereby worthy of study (Mulryan-Kyne, 2007).

**Positive Effects of Multigrade Education on Student Achievement**

Multigrade classrooms are not the traditional or normative types of classrooms in most schools. The premise of the structure of a classroom is the maximization of student learning. Schools are institutional organizations of learning. Pedagogical initiatives that result in an improved learning environment are critical to success while impediments to learning must be necessarily addressed, and if possible, removed. Some historical and recent studies have found that multigrade education, in a general sense, not only has an effect on students, but also that effect is positive and significant (Aina, 2001; Gutiérrez & Slavin, 1992; Kolstad & McFadden, 1998; Lloyd, 2002; Lloyd, 1999; Ong, Allison, & Haladyna, 2000; Pratt, 1986; Stone, 1998). However, these studies do not all specifically relate to the positive effects on student achievement in multigrade classes. Multigrade studies have found positive effects on such things as social development and mental development, (Pratt, 1986; Lloyd, 2002). Although generally there is a paucity of
research on the effects multigrade education specifically as it relates to student achievement (Tomlinson, 2000).

From the outset, if there is consideration for multigrade education implementation, its very success may hinge on the very reason for implementation. The conditions for implementation of an educational initiative, particularly in the reorganizing of a classroom from a monograde to a multigrade classroom may greatly affect its projected longevity and ultimate success because implementing multigrade education will have an impact on the quality of teaching and learning in the classroom (Little, 2004). However, if the implementation is successful, this is not equal to successful learning, or at the same level, when compared to monograde classrooms. The reported positive effects on students in multigrade classrooms, while important, generally are applicable to student development in the human affect domain and not the academic domain (Pratt, 1986; Lloyd, 2002).

Society demands that schools produce educated individuals. The research on the effects of multigrade classrooms on students stresses the value of individuality in the student (Aina, 2001; Gaustad 1997) and provides an environment that produced both cognitive benefits (Stone, 1998) and social benefits (Pratt, 1986). These are revealing and important research conclusions. Schools offer students more than academic lessons. The importance of the social lessons imparted on students by the school system cannot be dismissed. However, these human affect lessons cannot come at the expense of academic learning. A multigrade classroom demonstrates positive effects on students but the effects of these studies are often not extended in research into the student achievement domain (Tomlinson, 2000). As a result, there must be a tempering of the optimistic
results in the human affect learning because of the lack of exploration into the academic realm. Nonetheless, there does exist a body of literature that has found that multigrade education is not only a viable alternative to monograde classrooms but also has a positive effect on student achievement (McEwan, 2008; Lloyd, 2002).

As previously referenced, in multigrade education early historical research concluded there was no significant impact on student learning. However, later studies using more standardized testing instruments and data have found that not only is there a difference in the student achievement levels between multigrade and monograde classes, but also multigrade instruction has a positive impact on student achievement (McEwan, 2008). The most commonly cited study that refutes studies that multigrade education has no effect on student learning is a study by Gutierrez and Slavin (1992), which reported that the nongraded classroom can have a positive impact on student learning. This study represents an early and pivotal point in multigrade education research. After an examination of research on multigrade student achievement, the researchers found that multigrade classrooms are not only a viable alternative to single stream classes, but also have a demonstrable positive effect on student learning. Previous arguments that either cite the negative effects or no effects on student achievement in multigrade classrooms appear to be in question. The study consisted of an examination of achievement levels in an elementary program. While this study represents an important point in multigrade education on student achievement, further research later reinforced and supported findings of positive effects of multigrade education.

Later studies found that multigrade education has a positive effect on student achievement (Linely, 2002, McEwan, 2008; Nye, 1995; Ong, Allison, & Haladyna,
2000). These studies represent research through the world, in varying subject matters and
grade levels. Nye (1995) conducted a comparative analysis of primary and elementary
multigrade student achievement to single-grade classes. The study, while limited to one
US state using seven multigrade schools as a comparative measure to five monograde
classes, it was found that there was an increase in student achievement in multigrade
classes. Similarly, Ong, Allison, and Haladyna (2000) studied primary-aged students.
The research consisted of an examination of student achievement of 3rd grade students in
both multiage and single-age classrooms. The researchers found that multiage students
performed better than single-age students for reading, writing, and mathematics. The
research included a small sample size in one US state and included in the sample Title 1
and non-Title 1 students and Hispanic and non-Hispanic students. As expected, the
largest gap in student learning existed between Title 1 and non-Title 1 students and
Hispanic and non-Hispanic students. It must be acknowledged that these students may
face significant struggles on state-mandated tests regardless of classroom configuration.
Nonetheless, the study did find that students in multiage classes showed higher
achievement in reading and writing than students in single-age classes. In addition, using
such a limited sample size may present certain difficulties on extrapolating meaningful
conclusions to the entire population. However, the study does provide an interesting
perspective inasmuch that the research not only demonstrated that students in multigrade
classrooms outscored their monograde classmates, but also significantly so. However,
given the large gaps in time in the research literature on the positive effects of multigrade
student achievement, there must be careful examination of the results.
In a more current research, Linley (2002) further substantiated earlier, albeit limited research findings, which were the positive effects on student achievement of multigrade classes when compared to single stream classes in addition to other positive effects on students in psychological and social developments. Like any classroom, the continued success of the multigrade structure was contingent on teacher influence (Berry, 2006) and parental support (Cornish, 2006). As a result, the research does offer some positive evidence on the effects of multigrade education.

These studies on the positive effects of multigrade education on student achievement have the net effect of providing, at least in some limited measure, insights into the effects of multigrade education on student achievement. In addition, the literature on the positive effects of student achievement in multigrade classrooms is sporadic. There are few and infrequent studies to support the idea that multigrade education has a positive effect on student achievement. The lack of information may thereby be providing some insight for the need of more study. In short, there is research that has found positive effects of multigrade education on overall student learning generally (Gutierrez & Slavin, 1992; Lloyd, 1999; Lloyd, 2002; McEwan, 2008; Nye, 1995; Ong, Allison, & Haladya, 2000). However, the need for more formal and comprehensive data is critical to ascertain actual or perceived benefits of multigrade education on student achievement.

**Negative Effects of Multigrade Education on Student achievement**

The research literature does not contain a great deal of research on the effect of multigrade education on student achievement. While some research has found that multigrade education has a positive effect on student learning other research has found no
effect (Gerard, 2005; Little, 2004; Vincent, 1999). However, there is very little research, which concludes that multigrade education has a negative effect on student achievement.

As the previously referenced, and much cited, study of Veenman (1995), it was found that there was no significant difference in student achievement between multigrade and single grade classrooms. There is an often reference to this study in the literature concerning the issue of multigrade education and student achievement. However, a study by Mason and Burns (1996) stands in stark contrast to the findings of Veenman. The research, which is a critique of the study of Veenman, refuted the findings that multigrade education has no effect on student achievement. In rebuttal to Veenman, Mason and Burns (1996) conducted a further study on multigrade education student achievement. The conclusions of the study found that while there is an acknowledgement and concession in the study that generally the literature has held there are no significant differences in student achievement in multigrade classes compared to monograde classes, nevertheless multigrade classes have a small negative effect on achievement. The researchers suggested that in Veenman’s study there is no difference in student achievement in multigrade classes because principals placed strongly academically students in multigrade classes, with stronger teachers. This is a deeply troubling conclusion, especially considering the continued prevalence of multigrade education in the education system in many jurisdictions, not only in Newfoundland and Labrador, but also around the world.

The study by Mason and Burns (1996) stands nearly alone in the conclusion that multigrade education has a negative effect on student achievement. Naturally, any classroom organization that affects student learning in a negative way, even if it is only in
a small way, certainly deserves deeper reflection, examination, and consideration. Mason and Burns criticized the findings of Veenman (1995) as suffering from an omission in selection bias and lower-quality instruction. The work of Mason and Burns offers a balance to the work of Veenman. Their study certainly conceded an awareness of the consistent research findings of no significant difference in student achievement of multigrade classes. The study further added that if researchers consider the conditions of how student learning in a multigrade is affected, then multigrade classrooms may have a negative effect on student achievement. Of course, the critical aspect of this study is that its conclusions stand in relative isolation in the research.

The finding of Mason and Burns lies in contrast to other research literature that holds there are either no significant differences, or small positive effects on student learning, in multigrade classes. However, the conclusion of Mason and Burns must be read with a note of caution that this research lies in stark minority of other findings in the area of multigrade education. While there is ample research literature that the level of student learning in multigrade education is not significantly different, or possibly better than single stream classes, the study by Mason and Burns reported negative effects on student achievement. This is a small amount of research but requires examination and consideration.

No Significant Differences between of Multigrade and Monograde Education in Student Achievement

Multigrade education has been the subject of a great deal of attention and study. While multigrade education is not a new concept in educational organization, it has lacked a certain degree of attention in its effectiveness in realizing conclusive studies on
primary student achievement. The implementation of multigrade classrooms is usually for financial reasons due to a lack of resources and low student enrollments (Little, 2004), without consideration if the classroom structure is a viable alternative. In short, multigrade classrooms are, and promise to continue to be, a prevalent part of the educational experience for countless students throughout the world (Mulryan-Kyne, 2007). However, the reasons for the introduction of multigrade classrooms are not usually based on the altruistic ideology of maximized individual student learning. Instead, the implementation of multigrade classrooms is for the much more non-educational reasons of financial prudence (Little, 2004) irrespective of its effect on student learning. When multigrade education is being proposed the research does not provide conclusive evidence to assist educational stakeholders in the decision-making process if indeed it is a viable alternative to the monograde classroom.

Research in the area of multigrade student achievement appears to offer divergent opinions and findings on the differences between multigrade and monograde classrooms (Kappler & Roellke, 2002). While it is certainly clear there are no definitive findings on the differences between multigrade and monograde classrooms there is one significant body of research findings about the differences of student achievement between multigrade and monograde classes. Research has found multigrade education has a positive effect on student achievement (Gutierrez & Slavin, 1992; Lloyd, 1999; Lloyd, 2002; McEwan, 2008; Nye, 1995; Ong, Allison, & Haladyna, 2000). Some limited research has also found that multigrade education has, in fact, a negative effect on student achievement (Mason & Burns, 1996). However, in the pantheon of educational discourse on the levels of multigrade student achievement, a significant body of research finds that
there exists no significant difference in student achievement between multigrade and monograde classes (Gerard, 2005; Little, 2004; Mulryan-Kyne, 2005; Pratt, 1986; Veenman, 1995).

The most preeminent and frequently referenced research in multigrade student achievement is the work of Veenman (1995). Generally, student achievement research in multigrade education does not provide a deep resource of literature. While the whole notion of multigrade education is not a new idea, inferential research on its effects on student achievement is. There exist few empirical studies that assess and evaluate the levels of student achievement in multigrade classroom using empirical data. However, even more important, is comparing those levels of student achievement in multigrade classes to the more traditional monograde classrooms. As a result, studies that provide a comparative analysis in student achievement between multigrade and monograde classes certainly demand further and deep reflection. The work of Veenman is one such seminal and important study.

In the landmark study, Veenman (1995) conducted an analysis of achievement levels between multigrade and monograde classes. Veenman’s research revealed no significant differences between the monograde and multigrade classrooms. This represents a very important milestone in multigrade education. The early research of Goodlad and Anderson (1959) reported that there was no difference in the levels of education received by students in multigrade classroom when compared to students in monograde classes. However, studies in multigrade education had a void due to a lack of specificity through the analysis of student achievement levels. While historically the literature certainly offered a thorough analysis of the effects and differences of
multigrade education to monograde classrooms, and some limited research in student achievement, the general overall omission of large-scale empirical student achievement data is glaring. The study by Veenman contextualized multigrade education with a particular focus on student achievement levels. This is an important and salient point in academic discourse on multigrade education.

Parenthetically, early research certainly referenced and studied multigrade student achievement. Even Veenman (1987) conducted an earlier study in the time spent by students and teacher in reading of both single-aged and multi-aged classes. The research concluded that there was no significant difference in learning time between the two types of classes. While this is an earlier study on multigrade education, the research did not focus on multigrade student achievement levels. However, research such as this laid the groundwork for further studies to follow of assessing student achievement levels of multigrade and monograde classes.

Concurrently to the research by Veenman, Pratt (1986) conducted a very important study. The early work by Pratt is a consistent reference in the literature on the differences between multigrade and monograde education. Similar to the important, and later, work of Veenman (1995), Pratt conducted a study of multigrade and monograde classrooms. The research represents a seminal study, and often referenced comprehensive study, in multiage education. The study involved an examination of 48 studies in multiage research studies in North America. Using standardized assessments and achievement variables of reading and mathematics, the study examined previous research on multigrade education. This study found that multigrade classes have no effect on student achievement but they do have a positive effect on social and
psychological development. The findings of this research are extremely important in multigrade student achievement. Pratt found, like much later and well documented research in the area of multigrade education (Gaustad, 1997; Lloyd, 2002; Stone, 1998), positive effects on such things as student affect and social growth (Aina, 2001; Gnadinger, 2008; Linley, 2002; Wood & Frid, 2005). However, while Pratt identified these traits as important and positive in multigrade education, the research also examined student achievement. After an examination of multigrade studies in both the United States and Canada spanning a time frame of 35 years, Pratt found multiage classes have no effect on student achievement. This study represents a significant finding in multigrade education, particularly as it relates to student achievement.

Pratt’s (1986) study presented a thorough analysis in education and offered significant insight into the rarely studied aspect of multigrade student achievement. Literature had generally held that multigrade education provided positive influences on students in the human affect domain, and the findings of Pratt supported previous research that multiage grouping is associated with better self-concept. However, if schools are institutions of academic learning, and the greatest importance in that learning is the successful acquisition of knowledge and critical thinking then Pratt’s research into student achievement of multigrade classrooms is critical. The study refuted detractors who held that multiage classrooms are undesirable and in fact multiage classrooms offer some benefits, in the human affect domain, and no disadvantages, academically. The conclusion that multigrade classes have no significant differences than monograde classes extends beyond previous studies into student affect and extends to include the very
important realm of student achievement. This framework marks a pivotal point in student achievement of multigrade classes and provided reference points for future studies.

After Pratt (1986), there were further studies to measure the effects of student learning in multigrade classrooms. In the ensuing decades increased standardized testing and assessment allowed researchers to delve deeper into the realm of multigrade student achievement. The continued presence and availability of standardized test data has resulted in increased empirical data to measure the differences, if any, between multigrade and monograde classes. Following the research of Pratt further literature continued to support the notion that there existed no significant difference in student achievement between multigrade and monograde classes (Cotton, 1993; Gorrell, 1998). For example, Gorrell (1998) examined the effects of multiage reading achievement levels of Grade Three - Four students to traditional single-aged, single-graded classrooms. While the research is older, has a limited number of participants, and restricted to only one state, the findings were consistent with some previous conclusions that there exists no significant difference in reading between student in multiage and monograde classrooms. This literature also substantiates the notion that multigrade student achievement has no significant difference than single grade classes and students in nongraded classes.

The most current research further substantiates previously held research that there exists no significant difference in student achievement between multigrade and monograde classrooms (Gerard, 2005; Mulryan-Kyne, 2005). In current research reviews, a significant body of literature has held that there is no significant difference in student achievement levels between multigrade and single grade classes (Little, 2004;
Vincent, 1999). Additionally, in the modern era of accountability standards and high-stakes testing, current research studies consistently maintains that between multigrade and monograde classes there is no difference in the level of student achievement (Gerard, 2005; Kannapel, Aagaard, Coe, & Reeves, 2000). Building on previous research findings, some modern research reiterates that multigrade education has no effect on student achievement when compared to single stream classes.

The effects of multigrade education have shown positive effects in the human affect domain (Aina, 2001; Gnadinger, 2008; Linley, 2002; Wood & Frid, 2005). However the most current research continues to demonstrate that multigrade education has no significant difference on student achievement to single grade classrooms (Gerard, 2005; Little, 2004; Mulryan-Kyne, 2005). Gerard (2005) conducted a study that involved an examination of elementary aged students in multigrade classrooms. The study investigated the viability of multiage classrooms versus traditional single stream classes. The study compared the academic achievements of one group of multiage students to the national scores on standardized achievement tests. However, the research included just one multiage group of 29 nine, ten, and eleven year old students in a suburban area of western United States. Nevertheless, the researcher found that there was no significant difference in scores using the Stanford Achievement Test for reading and mathematics in multiage classrooms when compared to single stream classrooms. However, the researcher did find a difference in language scores. As a result, from early research to contemporary studies, the literature has reported that there exists no significant difference between multiage and single age classrooms concerning student achievement.
In sum, there is a body of research that indicates that there is no significant difference between multigrade and single grade classes with respect to student achievement. Additionally, research exists that has also found both positive and negative effects in student achievement levels between multigrade and monograde classes. Given the lack of clarity on the effects on student achievement in the multigrade classroom, and the pervasive implementation of multigrade classrooms (Mulryan-Kyne, 2007), a further study was prudent.

**Controversies Concerning Multigrade Education and Monograde Education**

The research in multigrade education on student achievement has reported various findings. Multigrade education research reported no significant differences, positive effects, and negative effects on student achievement. These mixed research findings therefore suggest an inconclusive and inconsistent difference between multigrade and monograde education with respect to student achievement. However, research literature exists that supports this necessary conclusion.

Some research has reported that multigrade classes have a positive effect on student learning when compared to monograde classes (Lloyd, 2002; Logue, 2006; McEwan, 2008). Other research has reported a negative effect on student learning (Mason & Burns, 1996). Still other research has reported that there is no difference (Gerard, 2005; Little, 2004; Mulryan-Kyne, 2005; Veenman, 1995). As a result, it is apparent that the research in multigrade education is controversial (Fosco, Schleser, & Andal, 2004).

The multigrade classroom is an educational organization found throughout the world that promises even further implementation into the future (Mulryan-Kyne, 2007).
In an examination of multigrade classrooms and the effect on student achievement, Kappler and Roellke (2002) reported that findings in the literature are mixed. While some research has offered multiage classrooms as a viable alternative to the monograde, this research, after reviewing previous studies, concluded that there are various research findings on the subject.

Additionally, while some research has found various findings in the difference between multigrade monograde classes (Kappler & Roellke, 2002), in a similar, but another direction, researchers have found that the differences between the two classroom organizations are inconclusive (Brinear, 2010; Little, 2008). As a result, while research may vary on the differences between multigrade and monograde, an even deeper examination suggests that the findings are more than mixed but also inconclusive. This research evaluated previous studies, and while studies may reveal mixed findings, ultimately, the results of these studies suggest that the effects of the multigrade are, in fact, inconclusive.

As a result, given that findings in multigrade education on student achievement are mixed (Kappler & Roellke, 2002) and inconclusive (Brinear, 2010; Little, 2008), further research has categorized the field as controversial (Fosco, Schleser, & Andal, 2004). Previous research has provided positive, negative, mixed, and inconsistent findings in multigrade education. Therefore, research that describes multigrade student achievement as controversial warrants further investigation.

Research in multigrade education does not provide clear guidance on the effect on student achievement. Research reports that when implementing a multigrade classroom the effect on student learning, when compared to the traditional monograde classroom, is
inconclusive (Brinegar, 2010, Little, 1995, Little, 2008). The shift in educational organization from monograde to multigrade education reveals inconclusive findings. Furthermore, additional research has reported that the difference between the two classroom structures on student achievement reveals inconsistent findings. So as opposed to the research not being conclusive, some research has, in fact, stated that the findings are inconsistent (Kappler & Roellke, 2002; Kinsey, 2001). As a result, given that research on multigrade education provides no definitive direction on if multigrade classes are a viable alternative option to monograde classes, the research on the effects of multigrade education on student achievement are controversial (Fosco, Schleser, & Andal, 2004).

Additionally, it must be clearly understood that multigrade classes are not a North American phenomenon or educational event. Multigrade classrooms can be found throughout the world (Little, 2008). Multigrade classes, as opposed to the more widely understood monograde classrooms, can be found throughout the world (Vincent, 1999). An examination of international student achievement in multigrade classes would be beneficial in contextualizing educational processes in not only developed, but also developing, countries.

**International Research on Multigrade and Monograde Education**

Education is a critical component of society. In North America, and the United States and Canada specifically, education is a fundamental right enjoyed by each citizen. While the level of learning varies greatly from person to person, class to class, school to school, and jurisdiction to jurisdiction, the educational delivery model is strikingly similar throughout the world consisting of either the multigrade or monograde classroom
(Little, 2004). However, the implementation of either multigrade or monograde is not always based on maximizing learning opportunities (Vincent, 1999) but based on the financial realities of administering a school, teacher supply, and student enrollment (Blum & Diwan, 2007; Little, 2008).

In many societies across the world multigrade classrooms are not only the only alternative to monograde classes, but also in fact, the only educational structure available at all (Blum & Diwan, 2007). That is, if students do not receive a multigrade education, then they do not receive any education at all (Berry & Little, 2006). Outside the United States and Canada, while empirical data are difficult to verify, nonetheless multigrade education is a very prevalent and customary educational practice (Little, 2004). This fact notwithstanding, a study of the effectiveness of multigrade versus single stream student achievement levels is certainly pertinent. While multigrade classrooms may be a normal and pervasive educational practice in both industrialized and developing countries, as previously noted that does not mean the research is conclusive on the merits of the multigrade educational practice (Brinegar, 2010, Little, 1995, Little, 2008).

Obviously, developing countries differ significantly than the United States and Canada in just about every aspect of social strata. However, while there are various approaches to teaching and learning, developing countries share a common link in education inasmuch that these schools are small, rural, low income, and structured in a multigrade organization (Little, 2008). As a result developing countries have schools, teachers and classrooms like any other part of the world, albeit in profoundly different circumstances.
Therefore, while developing countries may share similarities in the utilization of multigrade classes with more industrialized nations, there is a significant disparity in the levels of isolation, societal differences, and lack of access to meaning educational goals (Blum & Diwan, 2007). Nevertheless, research exists from around the world, in both the industrialized and developing world that examines multigrade versus monograde educational opportunities.

In an early research review of multigrade classrooms throughout some of the developing world, such as Peru, Sri Lanka, and Vietnam, and the industrialized world, such as Denmark and North America, Vincent (1999) found that multigrade classrooms present challenges, but it does not negatively affect academic achievement. Additionally, in a study review throughout many parts of the world, including developing nations, such as Nepal and India and the industrialized nations, such as Australia and England, Little (2004) found, given the limited amount of evidence that while there are negative perceptions surrounding multigrade education, there is no disadvantage cognitively to students. Unquestionably, student learning in the developed world faces significant problems in comparison to the industrialized world. Therefore, some early research globally, albeit limited, suggests that there may be no negative effects in receiving a multigrade education although in many instances multigrade education, despite the inconclusive findings may be the only education students receive at all (Blum & Diwan, 2007). The cost of implementing a multigrade class with the real possibility of limited student enrollment is something policy makers weigh in developing nations (Little, 2004).
Further studies are also consistent in other countries that suffer from significant challenges in maximized education actualization. In a study of Columbia, Benveniste and MacEwan (2000) acknowledged multigrade education may, in fact, be a means to raise student achievement. In later research, McEwan (2008) conducted a study of multigrade classes in Latin America and reported positive effects on student achievement. Similarly, in such developing nations as Turkey and India, there are positive effects on student achievement in multigrade classes (Aksoy, 2008; Blum, 2008). However, successful implementation of multigrade education is not a simple or well accepted educational philosophy. Successful implementation requires local support, training, and resource. To realize any possible benefits of already implemented multigrade classroom in the developing world, there are significant hurdles that must be overcome (Little, 2004). To date, multigrade education remains a problematic goal limited by student enrollment issues, teacher supply, and resources (Blum & Diwan, 2007). However, developing nations are not industrialized nations, so comparisons to North American educational models require careful examination.

Evaluation of the multigrade education model in the industrialized nation provides more research literature although the research results remain inconclusive (Brinegar, 2010). Early seminal research by Pratt (1986) conducted a thorough analysis of 48 studies in multigrade student achievement in the United States and Canada. The research concluded that students in multiage classrooms experienced a number of benefits from this classroom organization and with respect to student achievement there was no general pattern in achievement in learning to single age classrooms. Later research in North America predominantly reported either no significant differences (Gerard, 2005) or
inconsistent and controversial findings (Fosco, Schleser, & Andal, 2004) on the difference of student achievement between multigrade and monograde classes. However, other literature exists on multigrade student achievement in other industrialized nations.

Educational systems in the developed nations of Europe and Australia are not completely dissimilar to those in Canada and the United States. Like North American models of education, multigrade education in Australia and Europe are quite similar. Again, reviewing achievement data of other industrialized countries, while not comparing to North American achievement results, provide interesting insights into student achievement of multigrade and single grade classes. It has been found that in other developed nations around the world, through a comparison of student achievement results, there are either no differences, positive effects, or inconclusive findings of multigrade education to single grade classrooms (Little, 2004; Little, 2008; Lloyd, 2002; Mulryan-Kyne, 2005). Similarly, the research in these developed countries is completely congruent with North American research that multigrade student achievement results, at minimum, show mixed results from the monograde classrooms. There are significant parallels to other developed nations multigrade classrooms regarding North American models.

Mixed research findings in other nations support the inconsistent findings of the multigrade educational organization in Canada and the United States. Studies in countries, such as Ireland (Mulryan-Kyne, 2005), England, (Berry & Little, 2006) and Australia (Lloyd, 2002), have found no significant differences in student achievement between monograde and multigrade classes. This research further added to the body of research in which there are no conclusive results in the literature on the differences
between multigrade and monograde student achievement continues to be inconclusive around the world (Little, 2008).

The research is quite clear that multigrade education is not a North American ideology. The notion of multigrade classrooms exists throughout the world and extents into both the developed and developing nations. In addition, the research is equally clear that the effects on student achievement internationally are very similar to those in the United States and Canada. To be clear, while multigrade education faces significant challenges in developing countries, it may be a viable alternative to monograde education if the only other option is no education at all (Blum & Diwan, 2007). Consequently, a review of the literature strongly suggested that multigrade student achievement levels, nationally and internationally, required further examination.

**Other Benefits to Multigrade Education**

Multigrade education may be an appropriate educational alternative to the monograde classroom, however, it still faces a series of educational challenges, such as declining student enrollment, available teachers, and resources (Blum & Diwan, 2007; Little, 2004). However, the literature on multigrade education, and more specifically student achievement is inconclusive (Brinegar, 2010; Little, 2008) and in need of study (Kinsey, 2001). Specifically, multigrade education is not generally based on student achievement levels (Tomlinson, 2000).

There is significant research on the social benefits of multigrade education (Aina, 2001; Gaustad, 1997; Kappler & Roellke, 2002; Katz, 1992; Kolstad & McFadden, 1998; Lloyd, 2002; Pratt, 1986; Stone, 1998). There are apparent benefits to having classrooms switch from a homogenous arrangement to a more heterogeneous environment. The
structure of such a classroom would not be on the criteria of arbitrary constrictions of age. There are significant advantages to having a classroom that resembles an environment more reflective of society, consisting of different ages and abilities in which student individualization is acknowledged and integrated through peer collaboration (Stuart, Connor, Cady, & Zweifel, 2006; Wood & Frid, 2005) and differentiated instruction (Tomlinson, 2005).

Furthermore, if indeed socialization has an effect on student learning (Vygotsky, 1978), fostering a culture of enriched socialization to enhance student learning should be obvious. Despite trepidations and misgivings about multigrade education implementation (Cornish, 2006; Aðalsteinsdóttir, 2008), the benefits of socialization are relevant when considering student achievement inasmuch that social development impacts academic development (Kasten, 1998). As a result, this suggests, multigrade socialization and student achievement may enjoy a synchronous and symbiotic relationship. Furthermore, while the social benefits may be apparent, the academic achievement levels required further study.

Based on the literature, with any implementation or continuation of multigrade classrooms, there are certain considerations that are very significant. Perhaps importantly, and parenthetically, the literature consistently references research that discusses how to implement, and the implications of, multigrade classrooms. Miller (1994) and Gaustad (1995) are consistent references in the research on the measures needed to implement a multigrade classroom. These findings in the research are pivotal studies in the requisite knowledge needed to implement a multigrade classroom. An important study by Katz (1992) may allay any trepidation about the introduction of
multigrade education. The study concluded that despite any perceived, or real, risks to implementation of multigrade education, the advantages certainly do outweigh the disadvantages, although not on student achievement. Understandably, the research of Katz is a frequent citation in later studies when referencing the effects of multigrade education on student learning.

Any classroom organization should have a structure in which the fundamental educational maxim is student learning. There must be a careful examination of any classroom organization that either hinders or harms potential student learning. Of course, preferably the implementation of multigrade education should be a policy in which there is support in the educational culture of the school community given that the very conditions for the introduction of multigrade classrooms have an impact on the level of teaching and learning the students will receive (Little, 2004). The link between classroom organization and level of learning is an important one. In fact, in the primary classroom, it has been found, that there is a connection between reading ability and classroom type, such as multiage and single-age (Fosco, Schleser, & Andal, 2004). As a result, given the prevalent presence of multigrade classrooms in Newfoundland and Labrador, a study on reading ability and classroom organization was an important research topic.

**Summary**

Multigrade education and its relationship to student achievement remains largely an area of educational research without strong conclusions. In fact, the effects of multigrade education on student learning are inconclusive (Little, 2008) with research findings reporting inconsistent, negative, positive, and no significant differences, when
compared to monograde classes. Given the disparity in the research findings on multigrade education on student achievement, the current study offered further research to inform educational administrators when considering multigrade implementation.

Some research has reported that multigrade education has a positive effect on student achievement (Gutierrez & Slavin, 1992; McEwan, 2008; Ong, Allison, & Haladyna, 2000; Linely, 2002). Other research has reported that multigrade education has a negative effect on student achievement (Mason & Burns, 1996). However, predominantly, research on the effects of multigrade education on student achievement is mixed (Kappler & Roellke, 2002), inconsistent (Kinsey, 2001), inconclusive (Brinegar, 2010; Little, 1995; Little, 2008) and controversial (Cornish, 2009; Fosco, Schleser, & Andal, 2004). The literature does provide an informative and enriched insight into multigrade student achievement; however much of the literature uses limited participant groups and have been undertaken only on a small scale. This current research study examined the reading and writing levels of all Grade Six students in the province of Newfoundland and Labrador controlled for demographic factors. These results compared multigrade and single grade classrooms to determine if there existed a difference in the levels of student achievement between the two classroom organizations. Given the ubiquitous nature of multigrade classes throughout the world and that it is likely that multigrade classrooms will continue to increase into the future (Mulryan-Kyne, 2007). A deeper and more comprehensive study on the effects of multigrade education on student achievement was important.
Chapter 3: Research Method

In an effort to maintain schools in shrinking communities for small and rural areas, multigrade education is an alternative to the traditional monograde classroom (Kappler & Roellke, 2002). With its focus on differentiated instruction (Tomlinson, 2005) and potentials of offering opportunities for interaction and collaboration with more capable peers (Fawcett & Garton, 2005; Gnadinger, 2008), multigrade education could be a positive alternative to the monograde classroom (Mulryan-Kyne, 2007). However, research on monograde and multigrade classrooms and their difference in student achievement remains inconclusive, controversial, and inconsistent (Brinegar, 2010; Fosco, Schleser, & Andal, 2004; Little, 2008). So the specific problem was if there was a difference in sixth grade students’ achievement in reading, writing, and mathematics between multigrade and monograde classes (Cornish, 2009).

The purpose of this quantitative study with an ex post facto causal-comparative research design was to examine existing test results to determine if there was a difference in sixth grade students’ achievement in reading, writing, and mathematics between multigrade and monograde classes. The student selection process involved a stratified random selection technique from a population of the 4995 monograde sixth grade students and the 198 students in the multigrade population in the Canadian province of Newfoundland and Labrador who participated in the English Language Arts and Mathematics Criterion-Referenced Test (CRT) in both 2009 in sixth grade and 2006 in third grade. The independent variable was class organization, multigrade class or monograde class. The dependent variables were students’ achievement in three subject areas: reading, writing, and mathematics on CRTs for the 2009 school year. The test
results on the CRTs by the same students in 2006 (when these students were in 3\textsuperscript{rd} grade) served as baseline student achievement. Any potential influence by demographic variables, such as location, parental socio-economic status, and parental education level (Haciemînoğlu, Yilmaz-Tüzün, & Ertepinar, 2009; Haifeng & Cowen, 2009; Rpuse & Barrow, 2006; Shin & Chung, 2009) were controlled through stratified random selection as well as the statistical technique of multivariate analysis of variance. The study contributed to research and educational theories on differentiated instruction and social interaction (Fawcett & Garton, 2005; Tomlinson, 2005). Knowledge gained through the study also provided evidence for decision makers if multigrade can be a viable alternative to monograde education.

The research questions below guided the research.

**Q1.** What is the difference in 6\textsuperscript{th} graders’ achievement in reading comprehension between multigrade classes and monograde classes?

**Q2.** What is the difference in 6\textsuperscript{th} graders’ achievement in writing between multigrade classes and monograde classes?

**Q3.** What is the difference in 6\textsuperscript{th} graders’ achievement in mathematics between multigrade classes and monograde classes?

Because previous research on multigrade student achievement has found both no difference and inconsistent findings to that of monograde classes, the hypotheses were stated in terms of no expected difference.

**H1\textsubscript{0}:** There is no statistical difference in 6\textsuperscript{th} graders’ achievement in reading comprehension between multigrade classes and monograde classes.
H1a: There is a statistical difference in 6th graders’ achievement in reading comprehension between multigrade classes and monograde classes.

H20: There is no statistical difference in 6th graders’ achievement in writing between multigrade classes and monograde classes.

H2a: There is a statistical difference in 6th graders’ achievement in writing between multigrade classes and monograde classes.

H30: There is no statistical difference in 6th graders’ achievement in mathematics between multigrade classes and monograde classes.

H3a: There is a statistical difference in 6th graders’ achievement in mathematics between multigrade classes and monograde classes.

This outline of this chapter includes the research design, participants, instruments, definition of variables, data collection, limitations, and ethical assurances.

Research Method and Design

This research was a quantitative ex post facto causal-comparative study. The independent variable was classroom organization of multigrade and monograde. The dependent variables were the student achievement (test results) on the 2009 Criterion-Referenced Tests (CRTs) of 6th grade students in reading comprehension, writing, and mathematics. The CRT results in reading, writing, and mathematics provided data on levels of student learning for all students, both in multigrade and monograde classes. The baseline of student achievement utilized the CRT results of the same cohort of students while in the 3rd grade in 2006.

This study collected quantitative data that allowed for an investigation of the relationships among variables so that “a comparable study should be able to produce
comparable results” (Black, 1999, p. 21). The CRT scores are archival numerical interval data and as a result, a quantitative *ex post facto* causal-comparative was appropriate for the examination of the data to determine if there existed a difference in student achievement between multigrade and monograde classes. Historical and recent seminal studies on multigrade student achievement have all used quantitative research designs (Gerard, 2005; Goodlad & Anderson, 1959; Gutierrez & Slavin, 1992; Veenman, 1995). Consequently, quantitative design for this study utilizing student achievement data was reasonable.

A causal comparative research design allowed for the examination of existing data for a comparison study between the two groups of multigrade and monograde classes in all three core subject areas. The causal-comparative design was an *ex post facto* (after the fact) design used to analyze existing data to determine the cause for some existing differences (Gay, Mills, & Airasian, 2009). This research design allowed for a comparison of the levels of student achievement between multigrade and monograde classrooms. An experimental design allowed for controls in the research process to determine if an independent variable had an effect on the dependent variable. However, an experimental design would not have been an appropriate research design in a study that needed to use existing data. It was not possible to conduct an experimental design (Vgot, 2007) to study the differences in achievement between multigrade education and monograde education. This was so because it was not possible to randomly select students from the entire provincial Grade Three and Grade Six populations and assign them to either of the two groups. *Ex post facto* design was appropriate because the researcher did not have control over the independent variable as it involved life
experiences that included “type of school attended” (Black, 1999, p. 69). Therefore, using existing data was the best alternative for an examination of the difference between multigrade and monograde education on student achievement.

There was a study of all student achievement results for the 2009 school year on the provincial CRTs in reading, writing, and mathematics for schools offering multigrade education in the sixth grade. There was a calculation of a composite score for these three domains of student achievement of the same cohort of students while in the third grade in 2006. Student achievement results consisted of meeting/exceeding grade levels expectations or not yet meeting grade level expectations (Govt. NL, 2006). A composite score for reading, writing, and mathematics consisted of the averaging of these three subject areas for each student. This data provided a baseline of student achievement for the same cohort of students in the sixth grade in 2009 to control for learning and maturation.

There was an examination of the student achievement results for sixth grade students in multigrade and monograde classes in 2009 for reading, writing, and mathematics. The study included all multigrade classes and its students. During the comparison of the multigrade classes to monograde classes there was a control for demographic factors or rural/urban, parental education, and socio-economic issues. The Government of Newfoundland and Labrador maintained a record, through Community Accounts, of all demographic factors for each community in the province. As a result, there was a comparison of the schools in these communities that have multigrade classes to schools of comparable demographics in which the classroom organization is
monograde. There was a comparison of student achievement results of multigrade classes to similar controlled classes in monograde schools.

A causal-comparative design can determine possible causes of differences in existing data in student achievement between multigrade and monograde education (Black, 1999). However, a major limitation of the causal-comparative design is because it uses existing data, it cannot control variables through an experimental design, such as prior skill level, socio-economic status, parental education level, and rural versus urban factors that have a historical relationship to student learning (Haifeng & Cowen, 2009; Song, 2006). As a result, this design attempted to control for these demographic variables in both the multigrade and monograde groups by stratified random sampling technique and statistical controls.

**Participants**

There were 5255 Grade 6 students eligible to participate in the 2009 CRTs. A power analysis was conducted using G*Power and identified the necessary sample size of multigrade and monograde students. A power analysis with an alpha = .05, power = .95, and effect size = .50 resulted in a sample size 105 participants for each multigrade and monograde classes for a total sample size of 210 students. However, given that there were 198 students in the entire Grade 6 multigrade population, a sample of 105 students was replaced to include the entire multigrade population in the study. An equal number of 198 students were selected from monograde population. All participants in the multigrade population and the monograde sample were selected from rural schools only. As a result, given the small number of participants in the multigrade population, there was no sampling and the study included all students. The number of monograde students
was too large to be all included in the analysis. A stratified random sampling selected a comparable 198 students from the monograde 1928 student population in only rural schools controlling for the demographic variables of socio-economic status and parental education level of schools of the multigrade classes. Stratified random sampling “involves dividing your population into homogeneous subgroups and then taking a simple random sample in each subgroup” (Trochim & Donnelly, 2008, p. 44). Through stratified random sampling, the study selected 198 equally matched monograde participants based on similar socio-economics (low, average, high) and parental education (high school or post secondary) to 198 student multigrade population.

**Materials/Instruments**

Each year students in Grade 3 and Grade 6 take English Language Arts and Mathematics Criterion Referenced-Tests (CRTs). The English Language Arts CRTs are tests in reading and writing aimed at assessing the degree of student learning of provincially prescribed curriculum. There are CRT results at a student, school, district, and provincial level. The results of the CRTs are public reports available by school, district, and the province; however, individual student level results are not publicly reported for reasons of confidentiality. Therefore, there was an approved request for permission from the Department of Education to review individual student achievement results, although there was no recording or reporting of students, schools, or districts. Rather, the random sample identified student participants and related CRT scores for study with no reporting of individual student results. The CRT instrument taken by students in English Language Arts and Mathematics for 2009 in Grade 6 and the same cohort of students for Grade 3 in 2006 was sent to schools and is available for public
viewing. Therefore, the assessments written by students are a part of the dissertation manuscript as appendices. The instrument used to measure student achievement in multigrade and monograde classes was the CRT in Mathematics and English Language Arts.

**Criterion-Referenced Test.** The instrument collected interval data using rubric scores to measure student learning on an interval scale of 1 to 5 inasmuch that each score is equidistant from one another. The data for the causal-comparative study was from the instrument, an English Language Arts and Mathematics Criterion-Referenced Test (CRT). Newfoundland and Labrador has many diverse social, educational, and demographic factors, such as parental educational levels, affluence, and multigrade classrooms. The importance of CRTs in assessment rests in that they are an effective tool to ascertain mastery of specific learning outcomes despite the diverse backgrounds of students (Kubiszyn & Borich, 2007). CRTs were sent to schools with an accompanying administration guide to assist teachers in the proper CRT administration. The guide outlined specific parameters, dates, instructions, rules, regulations, policies, practices, and procedures which are acceptable for the CRT administration.

CRTs are an important educational assessment particularly when corrected by a centralized panel of teachers external to the school (Martinez, Goldschmidt, Niemi, Baker, & Sylvester, 2007) as is the case in Newfoundland and Labrador. In fact “criterion-referenced interpretations provide a far more lucid idea of what it is students can and can’t do” (Popham, 2008, p. 114). The CRTs provide relevant information on the degree of student learning. After CRT administration in Newfoundland and
Labrador, a panel of educators scored the assessments after training to determine student responses for minimal accepted levels of standards for proficiency.

In the current study, the measure of student achievement was the annual Criterion Referenced Tests (CRTs) in reading, writing, and mathematics. Validity refers to if the instrument measures what it is intended to measure. As part of the CRT construction the Department of Education for the Government of Newfoundland and Labrador (2003) has a policy concerning test validity for standardized testing. The provincial validity policy in testing states that after CRT item writing “a validation panel of three expert teachers should be convened to validate the examination [which] matched the table of specifications” (Govt. NL, p. 22). The panel of expert teachers ensures that the items on the provincial CRTs match the curricular outcomes taught in classrooms. Furthermore, the validation committee ensures that the rigors of the assessment are appropriate for the learner and the level of questioning reflects the Table of Specifications that delineates the curricular outcomes and depth of treatment. The validation process ensures that the provincial CRTs are appropriate for the learner and the curriculum so that the assessment appropriately measures what it should and is grade level appropriate for students.

Finally, test reliability refers to the obtaining of consistent test results over time. In the current study, there was a study of all student achievement levels in the multigrade class and not subject to sampling error. Nevertheless, any effect on reliability would apply to all students equally in the multigrade and monograde classroom. The Department of Education policy on test reliability states “Cronbach’s alpha should be calculated to determine test reliability. Reliability analysis provides a measure of discrimination for each item in the form of a correlation between item score and total
score” (Govt. NL, 2003, p. 22). The Cronbach’s alpha for Language Arts was .590 and .691 and Mathematics was unavailable. Given that the entire student body is assessed, and that each student completed the same assessment at the same time, controlled for demographic factors, any differences between multigrade and monograde classes are real differences and not subject to any sampling error in the multigrade population or test-retest reliability. While the current study did not use any experimental instrument per se, instead there was an investigation into the achievement statistics on CRTs in Newfoundland and Labrador without any limitation of sampling error given that the entire multigrade population was examined.

**Demographic data.** The demographic data was from the Government of Newfoundland and Labrador stored in the system known as Community Accounts. Parental socio-economic status, parental education level, and location (urban/rural) were nominal data. The Department of Education for the province of Newfoundland and Labrador annually publishes school demographic statistics. The data contained information about school size, student enrollment, and teacher allocation in addition to statistics on classroom organization consisting of such information as multigrade and monograde classes. As a result, the provincial government, through Community Accounts and the Department of Education, publicly releases information about school organization, student achievement, urban/rural communities, and parental socio-economic status as well as parental education level.
Operational Definitions of Variables

The main research variables and constructs were classroom organization (multigrade and monograde classes), student achievement in reading, writing, and mathematics, and demographic factors.

**Independent variable.** In this study the independent variable was classroom organization of multigrade or monograde. More specifically, “multi-grade commonly refers to classes containing more than one grade and often more than two grades” (Cornish, 2006, p. 124). There was a comparison of student achievement in literacy and mathematics of multigrade classes to the traditional monograde classes in which “students within the same grade are assumed to be more similar in terms of age and ability” (Little, 1995, p. 1).

**Demographic variables.** These are social and societal influences that might impact students but fall outside the classroom instruction. Factors, such as parents’ socio-economic status and community location (urban/rural) would encompass the demographic factors utilized in this study. The variable of students’ socio-economic status consisted of three separate income strata as determined by the Government of Newfoundland and Labrador (2009); lower (below $51, 299), middle ($51, 300 - $67,199), and upper (above $67, 200) income earners. In addition, the Government of Newfoundland and Labrador maintains statistics on parental education level that is divided into three categories; less than high school, high school diploma, and post secondary. Finally, urban areas are those municipalities with 5000 residents or more whereas a rural area is one in which there are less than 5000 residents (Govt. NL, 2009).
**Dependent variables.** There were three dependent variables: 1) Student achievement in reading comprehension that indicates the level of students’ proficiency and understanding of the reading curriculum by their response to written text as measured by the annual CRT and assessed by the reading scoring rubric and multiple choice items. 2) Student achievement in writing that indicates the level of students’ proficiency in the writing curriculum as measured by the annual CRT and assessed by the writing scoring rubric. 3) Student achievement in mathematics that indicates the level of students’ understanding of the math curriculum as measured by the annual CRT and assessed by the math scoring rubric and multiple choice items. For the CRT test, students receive scores based on a rubric that uses an interval scale from 1 (very limited) to 5 (outstanding) in proficiency.

**Baseline student achievement.** This refers to a combined CRT test scores for each student in the third grade in 2006. There was a composite score for each student in the three key subject areas of reading, writing, and mathematics. The reading score was an average of the multiple choice items and the individual student rubric score on written response items out of a possible of 5 converted into a percent out of 100. The writing score was the student score on a rubric out of a possible of 5 converted into a percent out of 100. Mathematic scores were an average of the multiple choice items with the individual student rubric scores on written response items converted from a score out of 5 into a percent out of 100. The three scores from reading, writing, and mathematics were then averaged into a single composite score. This score served as a statistical control for any effects of prior skill level on students’ test results in 2009 (Black, 1999).
Data Collection, Processing, and Analysis

This study used data collection from public schools. Monograde and multigrade school organizations were also public domain. The Government of Newfoundland and Labrador records, through public reporting, a system entitled Community Accounts, which delineates demographic factors of each community in the province, such as economic status, rural/urban communities, and parental education levels. There were controls for these demographic variables in the multigrade and monograde classes to compare student achievement results. Student achievement and demographic data collection took place using government stored data.

In this study, these scores comprised the student achievement for data analysis. The levels of student achievement were accessed by examining the Government of Newfoundland and Labrador’s Department of Education student achievement database. All third grade students in 2006 had a composite score in reading, writing, and mathematics based on an average of the three components. There was an examination of this same cohort of multigrade students in 2009 while in the sixth grade of their student achievement levels in reading, writing, and mathematics. The reading score was an average of the multiple choice items and the individual student rubric score on written response items out of a possible of 5 converted into a percent out of 100. The writing score was the student score on a rubric out of a possible of 5 converted into a percent out of 100. Mathematic scores were an average of the multiple choice items with the individual student rubric scores on written response items converted from a score out of 5 into a percent out of 100.
The demographic factors in the current study represent nominal data. There were controls for demographic factors for multigrade and monograde student achievement classes. Students’ socio-economic status have three separate income strata; lower (below $51,299), middle ($51,300 - $67,199), and upper (above $67,200) income earners (Govt. NL, 2009). For this study, the Government of Newfoundland and Labrador maintains statistics on parental education level divided into three categories: less than high school, high school diploma, and post-secondary. An urban community in Newfoundland and Labrador consists of residents in communities 5,000 and over (Govt. NL, 2009). The remaining communities with resident populations of less than 5,000 are rural. There were controls for data analysis of student achievement in multigrade and monograde on these demographic factors.

The data included sixth grade and third grade test results on Criterion-Referenced Test from 2009 and 2006 taken by the same group of students. From this raw data, there were three scores for each student. These scores consisted of a composite score of each of the three core subject areas in reading comprehension, writing, and mathematics. The Department of Education for the Government of Newfoundland and Labrador collates and reports test results. The Government of Newfoundland and Labrador also maintains and reports demographic statistics for all communities in the province. As previously defined, the Government of Newfoundland and Labrador publicly reports and defines clear strata for socio-economic status, parental educational levels, and communities defined as urban or rural. The demographic information was a consideration during the random selection of participants and for statistical controls.
A Multivariate Analysis of Variance (MANOVA) determined if there existed a
difference between multigrade and monograde classes in reading comprehension, writing,
and mathematics. MANOVA controlled for any influence of demographic variables and
baseline student achievement (a composite score for each student combining the student’s
scores in the three subject areas on the 2006 CRT test results). The use of a MANOVA is
appropriate when there is more than one dependent variable in a study (Black, 1999) and
there is a need to control for any effects by other variables that the researcher is not
interested in (Vogt, 2007). Therefore it was appropriate for this study that attempted to
examine the relations between one independent variable and three dependent variables.
Before this analysis, there was a full set of descriptive statistics to describe the data. In
addition, an alternative nonparametric test determined if there were any violations of the
assumptions.

The current causal comparative ex post facto method was appropriate for this
research given that students in schools, communities, and classrooms cannot be randomly
assigned as found in an experimental design. As a result, the current data collection and
analysis was an appropriate research design to study student achievement of students in
their normal classroom and community environments. The collection, processing, and
analysis of student achievement data through a causal comparative research design were
most appropriate for the parameters of the current study.

Methodological Assumptions, Limitations, and Delimitations

Assumptions. The selection of students was from two pre-existing groups;
multigrade and monograde classes. The learning environment of every classroom and
every child differ from student to student and class to class. When comparing academic
performances of differing classes there must be consideration of the cognitive
development of students. Students mature and learn at different rates. In addition, the
teaching in every class is not consistent. Teaching varies, depending on the service
delivery of the educator. As a result, the learning environment is different for each
different class in the study.

There were controls for socio-economic, parental education, and rural/urban
factors. However, academic performance between differing ethnic groups and gender are
not considered. While there may exist test score differences between ethnic and gender
groups, it was relatively minimal given that effects such as these were found in both the
multigrade and monograde classes, affecting both groups equally.

The current study used a MANOVA as there was more than one dependent
variable (Black, 1999). The use of MANOVA used similar number of cases in the study
with similar variance in the dependent variables. The assumptions were: (a) the data
from the dependent variables are normally distributed; (b) the variances should be
homogenous across the two groups.

**Limitations.** The study examined the student achievement results of all
multigrade classes in the province. There was a comparison of the level of student
achievement between multigrade and monograde education to determine if there existed a
difference between the two classroom organizations. The advantage of a study that
examines entire populations is that there is no sampling error, bias, or assumptions. A
causal comparative research design has a limitation of not using an experimental design.
Students attend school and are assigned to classrooms and teachers. Student enrollment
and financial considerations determine these educational organizations. Multigrade
classrooms are found in rural parts of the province. As a result, there could not be a random assignment of monograde or multigrade classes as in an experimental research design. Consequently, there was a causal comparative design with the caveat that in an experimental design there can be a control on external factors. There were controls on the causal comparative design for factors, such as rural/urban, parental education, and socio-economic factors.

The use of population data eliminated extrapolating results to the population. As a result, there was no threat to applying conclusions. Any differences in student learning were real differences with no margin of error in extrapolation in the multigrade population. Differences between multigrade and monograde student achievement cannot be attributed to sampling error. While the study examined all student achievement results, there was a limitation in determining the reason for the differences. However, the parameters of the current study were to ascertain if indeed differences in student learning existed between multigrade and monograde classes and not what were the reasons for those differences. Using public statistics of classroom organization and student achievement data diminished threats to validity and limitations of the study.

**Delimitations.** The measure of student achievement was the Newfoundland and Labrador provincial Criterion Referenced-Test (CRT). All students in multigrade and monograde wrote these tests. However, the study included students while in the third grade in 2006 who also wrote a different test in the sixth grade in 2009. As a result, there was a three-year time cognitive development for the learners from the point of the initial study until the current study. A study into multigrade and monograde education that examines every multigrade class greatly diminishes and may, in fact, negate threats to
reliability and validity. There was no margin or standard of error when studying an entire population as opposed to a sample. Criterion-Referenced Tests assess all students in the province of Newfoundland and Labrador. When there was a study of the entire multigrade population, there was no limitation in extrapolating to the entire population.

**Ethical Assurances**

In the current study, all statistics about school structure and organization were a part of the public domain. To be certain, the Department of Education for the Government of Newfoundland and Labrador publishes the classroom structure, be it multigrade or monograde, each year for every school in the province. Furthermore, the extent to which there were multigrade classes was also further a part of the accountability process in reporting in education. Not only does the Department of Education report on which schools are multigraded but also delineates the actual grade levels of multigrade for each school. As a result, public documents and reports were available to examine the degree to which there were multigrade schools in Newfoundland and Labrador.

The same policy of accountability also applied to reporting levels of student achievement. The Department of Education publicly reports the level of student learning for all schools in the province. All students in Grade Three complete the annually administered Criterion Referenced Test in reading and writing. The Government of Newfoundland and Labrador publicly reports student achievement levels of schools, but for obvious reasons, individual student results are not part of the public domain. In the current study, there was an examination of the student achievement results using the publicly reported student achievement results of each school.
Additionally, the Government of Newfoundland and Labrador, through a system entitled Community Accounts, publicly reports community socio-economic status and parental education levels. The level of parental income has three ranges; low, middle, and high. Parental education levels consist of three categories; less than high school, high school, and post-secondary. As well, communities with less than 5000 residents are rural and more than 5000 are urban. This information guided the causal comparative study and it is also available publicly.

Therefore, given that classroom organization of multigrade or monograde was a public report by school, and so was demographic information, there was no threat of disclosure or compromise to ethical assurances. Student achievement results were identified by student name. The student names were removed by researcher to ensure privacy, anonymity, and confidentiality and assigned numbers. These student numbers were used to track learning from 2006 and 2009. All students in the multigrade Grade 6 population were studied with no discrimination or exclusion. A random sample from the monograde population was selected with no bias to gender, ethnicity, religion, or disability. No students, teachers, schools, or school districts were identified in the study. IRB approval was granted for the investigative process. There was no identification of any particular student, teacher, school, or district in the study. The foundation of the study was whether or not there existed a significant difference in student learning between multigrade and monograde classes and not in which class, school, or district the differences existed. Therefore, the current study complied with all ethical codes of conduct in research.
Summary

In the research, multigrade education, particularly with respect to student achievement, has produced mixed findings on student achievement levels of multiage classrooms (Kappler & Roellke, 2002). The current research studied each multigrade classroom in the province of Newfoundland and Labrador compared to monograde classes to determine if there existed a difference in student achievement between both classrooms. Given that all classes in the province were the subject of the study, the results provided important information to all educational stakeholders on the current, and proposed, implementation of multigrade classes. The fact that there was a study of all multigrade classes provided important research on if the continued implementation of multigrade classrooms is a viable alternative to the monograde organization.
Chapter 4: Findings

The purpose of this quantitative study with a causal-comparative *ex post facto* research design was to examine existing test results to determine if there existed a difference in sixth grade students’ achievement in reading, writing, and mathematics between multigrade and monograde classes. A causal-comparative design is the most appropriate research design as archival student achievement data was studied and an experimental design of randomly assigning two groups into a multigrade or monograde classroom was not possible. The study involved all the multigrade Grade 6 students in Newfoundland and Labrador, Canada who completed the 2009 provincially prescribed annual Criterion-Referenced Tests (CRT) in Reading, Writing, and Mathematics. The study contributed to research and educational theories of differentiated instruction and social interaction utilized in the multigrade classroom (Fawcett & Garton, 2005; Tomlinson, 2005). The study provided evidence for decision makers in determining if multigrade education is a viable alternative to monograde education.

This chapter details the collection and analysis of the provincial assessment criterion-referenced test data. This chapter provides a link between the research questions and the quantitative data collection and analysis. The study examined the following three research questions:

**Q1.** What is the difference in 6th graders’ achievement in reading comprehension between multigrade classes and monograde classes?

**Q2.** What is the difference in 6th graders’ achievement in writing between multigrade classes and monograde classes?
Q3. What is the difference in 6th graders’ achievement in mathematics between multigrade classes and monograde classes?

The study consisted of testing three hypotheses:

**H1₀**: There is no statistical difference in 6th graders’ achievement in reading comprehension between multigrade classes and monograde classes.

**H1ₐ**: There is a statistical difference in 6th graders’ achievement in reading comprehension between multigrade classes and monograde classes.

**H2₀**: There is no statistical difference in 6th graders’ achievement in writing between multigrade classes and monograde classes.

**H2ₐ**: There is a statistical difference in 6th graders’ achievement in writing between multigrade classes and monograde classes.

**H3₀**: There is no statistical difference in 6th graders’ achievement in mathematics between multigrade classes and monograde classes.

**H3ₐ**: There is a statistical difference in 6th graders’ achievement in mathematics between multigrade classes and monograde classes.

This chapter will provide an analysis of the differences between multigrade and monograde classes in reading, writing, and mathematics. An examination of the student achievement data was conducted in SPSS using a Multivariate Analysis of Variance (MANOVA) to test the three null hypotheses. Each research question, and resulting data and analysis, will be examined. The first section presents the results of the differences in reading, writing, and mathematics between multigrade and monograde classes. The second section presents an evaluation of the findings.
Results

Descriptive statistics (number of participants, means, and standard deviations) summarizing the CRT results for the monograde and multigrade students in reading, writing and mathematics are presented. The results for the equality of covariance and error variances for MANOVA are provided. Furthermore, the multivariate tests and between subject effects for reading, writing, and mathematics between multigrade and monograde student achievement levels are interpreted.

In Newfoundland and Labrador there were a total of 198 students in the entire province who were enrolled in a multigrade class in Grade 3 in 2006 and again in a multigrade class in Grade 6 in 2009. These 198 multigrade students were matched to a random sample of 198 monograde students but each monograde student having a similar socio-economic status, in a rural school, and similar parental education levels to the multigrade student. A composite score, consisting of an average of reading, writing, and mathematics for the 2006 Grade 3 CRT (Appendix A), was used as a control variable for both the Grade 3 multigrade and monograde classes in 2006 to control for maturation, development, and learning.

A MANOVA in SPSS was conducted to compare the reading, writing, and mathematics scores on the provincial CRTs of both the multigrade and monograde Grade 6 students in 2009 (Appendices B & C). Reading scores on the CRT consisted of both written constructed response items and multiple choice items. Constructed response items were scored by teachers using a holistic reading rubric (Appendix D) scoring scale from 1 – 5. These scores for each individual student were then divided into the divisor of 5, multiplied by 100, and given a score out of 100 percent. Percent scores for the
multiple choice reading items were calculated by dividing the number correct by student into the total amount possible of 14 and multiplying by 100 to give a percent out of 100. The reading rubric scores were combined with multiple choice items and divided by two to derive a single reading score for each student in both the multigrade and monograđe classes.

Writing in Newfoundland and Labrador was scored on a five point holistic writing rubric (Appendix E). Each student work was assessed by a teacher and given a score from 1 to 5. This score was then divided into the divisor of 5 and multiplied by 100 to give a score out of 100%. The resulting score was a single percent score out of 100 for writing for each student in both the multigrade population and the matched monograđe sample.

In mathematics, like reading, scores were also derived through both a combination of rubric and multiple choice items. Constructed response items were scored by teachers using a holistic mathematics rubric (Appendix F) scoring scale from 1 – 5. These scores for each individual student were then divided into the divisor of 5, multiplied by 100, and given a score out of 100 percent. Percent scores for the multiple choice and written response items were calculated by dividing the number correct by student in Number Operations, Number Concepts, and Shape and Space, into the total amount possible of 37 and multiplying by 100 to give a percent out of 100. The mathematics rubric scores were combined with multiple choice and written response items and divided by three to derive a single mathematics score for each student in both the multigrade and monograđe classes.
A MANOVA was conducted to determine if there existed a significant difference between Grade 6 multigrade and monograde classes in reading, writing, and mathematics.

The control variable of the composite score of both the multigrade and monograde classes was introduced to control for learning and growth from Grade 3 in 2006 to Grade 6 in 2009. A MANOVA in SPSS was executed of the 198 cases in both the multigrade population and the matched 198 cases for rural, socio-economic, and parental education in the monograde classes, with the control variable for Grade 3 student achievement.

Table 1

*Descriptive Statistics of Demographic Variables for Grade 6 Students*

<table>
<thead>
<tr>
<th>Socio-Economic / Parental Education</th>
<th>Multigrade</th>
<th>Monograde</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low / Less than High School</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>Low / High School</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>Low / Bachelor’s Degree (higher)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Average / Less than High School</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>Average / High School</td>
<td>62</td>
<td>62</td>
</tr>
<tr>
<td>Average / Bachelor’s Degree (higher)</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>High / Less than High School</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>High / High School</td>
<td>43</td>
<td>43</td>
</tr>
<tr>
<td>High / Bachelor’s Degree (higher)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>198</td>
<td>198</td>
</tr>
</tbody>
</table>


**Research Question One / Hypothesis One**

**Q1.** What is the difference in 6th graders’ achievement in reading comprehension between multigrade classes and monograde classes?

**H1₀:** There is no statistical difference in 6th graders’ achievement in reading comprehension between multigrade classes and monograde classes.

**H1ₐ:** There is a statistical difference in 6th graders’ achievement in reading comprehension between multigrade classes and monograde classes.

It was hypothesized that there would be no statistical difference in reading between multigrade and monograde classes. Firstly, a histogram was conducted of the reading scores for the multigrade and monograde Grade 6 students to visually evaluate the normality of the scores (Figures 1 and 2). The scores did not show normal distributions but rather showed a negative skewed distribution however the distribution of the reading scores for both groups do closely approximate each other with a value of -1.15 for multigrade reading and -1.11 for monograde reading. Additionally, a Kolmogrov-Smirnov test for normality was conducted using a level of significance value of 0.05. The significance value for multigrade reading was $p = 0.00$ and for monograde reading it was $p = 0.00$ which indicated the population was not normally distributed.

The study used a large sample from the monograde population ($n = 198$) and the entire population from the multigrade students ($n = 198$) therefore the scores were then examined using a Normality Probability Q-Q Plot as small variations may have no practical effect on the results. The Q-Q Plots for Multigrade and Monograde classes did not show any significant deviation from the straight line or any significant outliers (Figures 3 and 4). As well, the Q-Q plots for multigrade and monograde classes showed
a significant similarity to one another. There existed just one outlier score of 26.30 above
the critical value of 16.27 for the Mahalanobis maximum value distance. Box’s Test of
Equality of Covariance Matrices revealed a value of 0.30 which is larger than 0.001 and
therefore there were no violations to the assumption of homogeneity of variance-
covariance matrices. The Levene’s statistic for equality in variances was $(1, 394) = .16, p
= .69$ for reading. This value is greater than the significant value of 0.05 so there was no
violation of the assumption of equality of variance for reading. A scatterplot between
each variable of reading, writing, and mathematics for multigrade and monograde did not
show and evidence of non-linearity and therefore the assumption of linearity was satisfied
(Figure 5).
Figure 1. *Multigrade Reading Scores*

![Multigrade Reading Scores](image1)

Mean = 69.86  
Std. Dev. = 11.204  
N = 198

Figure 2. *Monograde Reading Scores*

![Monograde Reading Scores](image2)

Mean = 71.32  
Std. Dev. = 10.498  
N = 188
Figure 3. *Normal Q-Q Plot of Multigrade Reading*

![Normal Q-Q Plot of Multigrade Reading](image)

Figure 4. *Normal Q-Q Plot of Monograde Reading*

![Normal Q-Q Plot of Monograde Reading](image)
The population size for the multigrade students and the sample size for monograde students \((n)\), the mean \((M)\), standard deviations \((SD)\), and confidence intervals \((CI)\) are compared in Table 2. The mean reading scores for the multigrade \((M = 71.3)\) were higher than the mean scores for the monograde students \((M = 69.9)\). This implies that the multigrade students performed better on reading tests than monograde students. The standard deviation for the multigrade student achievement in reading \((SD = 10.5)\) was lower than the monograde students \((SD = 11.2)\). This suggests that the variability in the reading test scores tended to be greater for monograde than the multigrade (Table 2).
Table 2

*Student Achievement in Reading for Grade 6 Students*

<table>
<thead>
<tr>
<th>CRT</th>
<th>Multigrade</th>
<th></th>
<th></th>
<th>Monograde</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>M(SD)</td>
<td>95% CI</td>
<td>n</td>
<td>M(SD)</td>
<td>95% CI</td>
</tr>
<tr>
<td>Reading</td>
<td>198</td>
<td>71.3(10.5)</td>
<td>[.31, .45]</td>
<td>198</td>
<td>69.9(11.2)</td>
<td>[-.61, 3.2]</td>
</tr>
</tbody>
</table>

*Note. CI = confidence interval*

There is a difference in reading comprehension between multigrade and monograde classes. The multigrade classes revealed an average reading score of 71.3% and the monograde classes had an average reading score of 69.9%. The difference between the reading comprehension levels of multigrade and monograde classes was 1.4%. Therefore the multigrade students in Grade 6 performed slightly better on average in reading than the monograde Grade 6 students. A one way Multivariate Analysis of Variance (MANOVA) revealed that there was no statistically significant difference between multigrade and monograde classes in reading \( F(1, 394) = 1.78, p = .183 \) at an alpha level of .050. As a result, there is insufficient evidence to reject the null hypothesis that there exists no significant difference between multigrade and monograde reading comprehension of 6th Grade students as measured on the provincial Reading Comprehension CRT.

The difference between the two classroom groups of multigrade and monograde did not reach statistical significance. The partial eta squared effect size statistic was 0.005. Therefore only 0.5% of the variance in reading comprehension scores was explained by class configuration of multigrade or monograde. The level of significance
between multigrade and monograde classes in reading comprehension was $p = .183$ which does not reach the statistical significant critical value of $p = .05$ and thus any differences in reading may be attributable to chance. Therefore, the null hypothesis can be accepted that there is no statistical difference between multigrade and monograde reading and there is insufficient evidence to accept the alternate hypothesis. As a result the evidence suggests that there is no difference between multigrade and monograde student achievement in reading comprehension.

**Research Question Two / Hypothesis Two**

**Q2.** What is the difference in 6th graders’ achievement in writing between multigrade classes and monograde classes?

**H2₀:** There is no statistical difference in 6th graders’ achievement in writing between multigrade classes and monograde classes.

**H2₁:** There is a statistical difference in 6th graders’ achievement in writing between multigrade classes and monograde classes.

It was hypothesized that there would be no statistical difference in writing between multigrade and monograde classes. Firstly, a histogram was conducted of the writing scores for the multigrade and monograde Grade 6 students to visually evaluate the normality of the scores (Figures 6 and 7). The scores did not show normal distributions but rather showed a negative skewed distribution however the distribution of the writing scores for both groups do closely approximate each other with a value of -0.87 for multigrade writing and -0.25 for monograde writing. Additionally, a Kolmogrov-Smirnov test for normality was conducted using a level significance of significance value of 0.05. The significance value for multigrade writing was $p = 0.00$
and for monograde writing it was $p = 0.00$ which indicated the population was not normally distributed.

The study used a large sample from the monograde population ($n = 198$) and the entire population from the multigrade students ($n = 198$) therefore the scores were then examined using a Normality Probability Q-Q Plot as small variations may have no practical effect on the results. The Q-Q Plots for Multigrade and Monograde classes did not show any significant deviation from the straight line or any significant outliers (Figures 8 and 9). As well, the Q-Q plots for multigrade and monograde classes showed a significant similarity to one another. There existed just one outlier score of 26.30 above the critical value of 16.27 for the Mahalanobis maximum value distance. Box’s Test of Equality of Covariance Matrices revealed a value of 0.30 which is larger than 0.001 and therefore there were no violations to the assumption of homogeneity of variance-covariance matrices. The Levene’s statistic for equality in variances was $(1, 394) = 4.18$, $p = .04$ for writing. This value is lower than the significant value of 0.05 so there was a violation of the assumption of equality of variance for writing at $p = .05$ but no violation at $p = .025$. However, this finding must be considered in the context of the other two dependent variables of reading and mathematics using a Benferroni adjusted alpha level of .017 which found no statistical difference on the three dependent variables considered separately. A scatterplot between each variable of reading, writing, and mathematics for multigrade and monograde did not show and evidence of non-linearity and therefore the assumption of linearity was satisfied (Figure 5).
Figure 6. *Multigrade Writing Scores*

Figure 7. *Monograde Writing Scores*
Figure 8. Normal Q-Q Plot of Multigrade Writing

Figure 9. Normal Q-Q Plot of Monograde Writing
The population size for the multigrade students and the sample size for monograde students \( (n) \), the mean (\( M \)), standard deviations (\( SD \)), and confidence intervals (CI) are compared in Table 3. The mean writing score for the multigrade (\( M = 58.3 \)) were higher than the mean scores for the monograde students (\( M = 56.3 \)). This implies that the multigrade students performed better on writing tests than monograde students. The standard deviation for the multigrade student achievement in writing was lower (\( SD = 9.4 \)) than the monograde students (\( SD = 10.3 \)). This suggests that the variability in the writing test scores tended to be greater for monograde than the multigrade (Table 3).

Table 3

*Student Achievement in Writing for Grade 6 Students*

<table>
<thead>
<tr>
<th>CRT</th>
<th>Multigrade</th>
<th>Monograde</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( n )</td>
<td>( M(SD) )</td>
</tr>
<tr>
<td>Writing</td>
<td>198</td>
<td>58.3(9.4)</td>
</tr>
</tbody>
</table>

*Note. CI = confidence interval*

There is a difference in writing proficiency between multigrade and monograde classes. The multigrade classes revealed an average writing score of 58.3% and the monograde classes had an average writing score of 56.3%. The difference between the writing proficiency levels of multigrade and monograde classes was 2.0%. Therefore the multigrade students in Grade 6 performed slightly better on average in writing than the monograde Grade 6 students. A one way Multivariate Analysis of Variance (MANOVA) revealed that there was a statistically significant difference in writing \( F(1, 394) = 4.22, p \)
= .041 at an alpha level of .050. However, while there was a statistically significant difference at \( p = .05 \) between multigrade and monograde classes, there was no statistical difference at an alpha level of .025. Moreover, using a Benferroni adjusted alpha significant level of .017, considering all three dependent variables, resulted in no statistical difference in writing when the three dependent variables were considered separately. As a result, there is insufficient evidence to reject the null hypothesis that there exists no significant difference between multigrade and monograde writing of 6th Grade students as measured on the provincial Writing CRT.

The difference between the two classroom groups of multigrade and monograde did reach statistical significance. The partial eta squared effect size statistic was 0.011. Therefore only 1.1% of the variance in writing scores was explained by class configuration of multigrade or monograde. The level of significance between multigrade and monograde classes in writing was \( p = .41 \) which does reach the statistical significant critical value of \( p = .05 \) but does not at \( p = .025 \) or when the results for the dependent variables were considered separately using the Bonferroni adjusted alpha level of .017 and thus any differences in writing may be attributable to chance. Therefore, the null hypothesis can be accepted that there is no statistical difference between multigrade and monograde and there is insufficient evidence to accept the alternate hypothesis. As a result the evidence suggests that there is no difference between multigrade and monograde student achievement in writing.
Research Question Three / Hypothesis Three

Q3. What is the difference in 6th graders’ achievement in mathematics between multigrade classes and monograde classes?

H3₀: There is no statistical difference in 6th graders’ achievement in mathematics between multigrade classes and monograde classes.

H3₁: There is a statistical difference in 6th graders’ achievement in mathematics between multigrade classes and monograde classes.

It was hypothesized that there would be no statistical difference in mathematics between multigrade and monograde classes. Firstly, a histogram was conducted of the mathematics scores for the multigrade and monograde Grade 6 students to visually evaluate the normality of the scores (Figures 10 and 11). The scores did not show normal distributions but rather showed a negative skewed distribution however the distribution of the reading scores for both groups do closely approximate each other with a value of -.21 for multigrade mathematics and -.36 for monograde mathematics. Additionally, a Kolmogrov-Smirnov test for normality was conducted using a level significance of significance value of 0.05. The significance value for multigrade mathematics was \( p = .200 \) and for monograde mathematics it was \( p = .007 \) which indicated the population was not normally distributed for monograde classes in mathematics.

The study used a large sample from the monograde population \( (n = 198) \) and the entire population from the multigrade students \( (n = 198) \) therefore the scores were then examined using a Normality Probability Q-Q Plot as small variations may have no practical effect on the results. The Q-Q Plots for Multigrade and Monograde classes did not show any significant deviation from the straight line or any significant outliers.
(Figures 12 and 13). As well, the Q-Q plots for multigrade and monograde classes showed a significant similarity to one another. There existed just one outlier score of 26.30 above the critical value of 16.27 for the Mahalanobis maximum value distance. Box’s Test of Equality of Covariance Matrices revealed a value of 0.30 which is larger than 0.001 and therefore there were no violations to the assumption of homogeneity of variance-covariance matrices. The Levene’s statistic for equality in variances was $(1, 394) = .32, p = .57$ for mathematics. This value is greater than the significant value of 0.05 so there was no violation of the assumption of equality of variance for mathematics. A scatterplot between each variable of reading, writing, and mathematics for multigrade and monograde did not show evidence of non-linearity and therefore the assumption of linearity was satisfied (Figure 5).
Figure 10. *Multigrade Mathematics Scores*

![Multigrade Mathematics Scores Graph]

- Mean = 63.16
- Std. Dev. = 15.3
- N = 198

Figure 11. *Monograde Mathematics Scores*

![Monograde Mathematics Scores Graph]

- Mean = 60.53
- Std. Dev. = 15.523
- N = 198
Figure 12. Normal Q-Q Plot of Multigrade Math

Figure 13. Normal Q-Q Plot of Monograde Math
The population size for the multigrade students and the sample size for monograde students \((n)\), the mean \((M)\), standard deviations \((SD)\), and confidence intervals \((CI)\) are compared in Table 4. The mean mathematics scores for the multigrade \((M = 63.2)\) were higher than the mean scores for the monograde students \((M = 60.9)\). This implies that the multigrade students performed better on mathematics tests than monograde students. The standard deviation for the multigrade student achievement in mathematics \((SD = 15.3)\) was lower than the monograde students \((SD = 15.6)\). This suggests that the variability in the mathematics test scores tended to be greater for monograde than the multigrade (Table 4).

Table 4

**Student Achievement in Mathematics for Grade 6 Students**

<table>
<thead>
<tr>
<th>CRT</th>
<th>Multigrade</th>
<th></th>
<th></th>
<th>Monograde</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>M(SD)</td>
<td>95% CI</td>
<td>n</td>
<td>M(SD)</td>
<td>95% CI</td>
</tr>
<tr>
<td>Mathematics</td>
<td>198</td>
<td>63.2(15.3)</td>
<td>[.47, .68]</td>
<td>198</td>
<td>60.9(15.6)</td>
<td>[-.70, 4.7]</td>
</tr>
</tbody>
</table>

*Note. CI = confidence interval*

There is a difference in mathematics performance between multigrade and monograde classes. The multigrade classes revealed an average mathematics score of 63.2% and the monograde classes had an average reading score of 60.9%. The difference between the mathematics levels of multigrade and monograde classes was 2.3%.

Therefore the multigrade students in Grade 6 performed slightly better on average in mathematics than the monograde Grade 6 students. A one way Multivariate Analysis of Variance (MANOVA) revealed that there was no statistically significant difference
between multigrade and monograde classes in mathematics $F (1, 394) = 2.11, p = .148$ at an alpha level of .050. As a result, there is insufficient evidence to reject the null hypothesis that there exists no significant difference between multigrade and monograde mathematics of 6th Grade students as measured on the provincial mathematics CRT.

The difference between the two classroom groups of multigrade and monograde did not reach statistical significance. The partial eta squared effect size statistic was 0.005. Therefore only 0.5% of the variance in mathematics scores was explained by class configuration of multigrade or monograde. The level of significance between multigrade and monograde classes in mathematics was $p = .148$ which does not reach the statistical significant critical value of $p = .05$ and thus any differences in mathematics may be attributable to chance. Therefore, the null hypothesis can be accepted that there is no statistical difference between multigrade and monograde mathematics and there is insufficient evidence to accept the alternate hypothesis. As a result the evidence suggests that there is no difference between multigrade and monograde student achievement in mathematics.
Evaluation of Findings

The concept of multigrade education is predicated on the educational theory of differentiated instruction (Tomlinson, 2005) and the opportunity for student peer collaboration (Fawcett & Garton, 2005) to maximize educational opportunities. The educational theory of learning through social interaction continues to guide the basic philosophy of classroom organizations (Cornish, 2009) as found in the multigrade classroom. Peer collaboration, such as the multigrade classroom, is an effective classroom organization for teaching and learning (Gnadinger, 2008) which maximizes student learning (Chick, 2006; Swenson & Strough, 2008). However, with respect to the effects of multigrade education on the specific issue of student achievement, research is mixed (Kappler & Roellke, 2002), inconsistent (Kinsey, 2001), inconclusive (Brinegar, 2010; Little, 1995; Little, 2008) and controversial (Cornish, 2009; Fosco, Schleser, & Andal, 2004).

It is documented in research that socio-demographic variables affect student achievement (Hacieminoğlu, Yılmaz-Tüzün, & Ertepinar, 2009). It is established that the factors of rural and urban education (Song, 2006), parental education levels (Myrberg & Rosén, 2008), and socio-economic income (Evans & Rosenbaum, 2008) have an effect on student achievement. These factors served as a control for this study. Demographic factors for rural versus urban schools, parental education, and socio-economic status were controlled to match students and control for those factors that affect student learning external to classroom organization.
What is the difference in 6th graders’ achievement in reading comprehension between multigrade classes and monograde classes? (Q1)

Multigrade classes are an alternative to monograde classes. The research on the differences between multigrade and monograde with respect to student achievement reports inconclusive findings (Brinegar, 2010; Little, 1995; Little, 2008). The current research found that no significant difference existed between multigrade and monograde classes in reading comprehension of 6th graders. Multigrade students performed an average of 1.4% higher on reading comprehension than the monograde students. The difference between the two classroom organizations was not statistically significant ($p = .183$). This suggests that despite research reporting differences in learning between multigrade and monograde classers as controversial (Cornish, 2009; Fosco, Schleser, & Andal, 2004) that conclusion is not supported in this study. There was no statistical difference in student achievement in reading for the entire Grade 6 multigrade population when studied with an equal controlled sample from the monograde population.

Social interaction is an important part of the cognitive growth process in educational organization (Vygotsky, 1978). The theoretical framework of the multigrade classroom consists of learning through social interaction (Cornish, 2009). Furthermore, effective learning occurs through instruction that is individualized and differentiated for each learner (Tomlinson, 2005) as in the multigrade classroom. Within the theoretical concept of peer collaboration, student achievement is maximized when students learn from more knowledgeable peers (Wood & Frid, 2005) which is the guiding principle for the multigrade classroom. This research fits within that theoretical framework and student achievement is not adversely affected in the multigrade classroom.
Research in multigrade student achievement has resulted in mixed findings (Kappler & Roellke, 2002). This study found that there existed no significant difference in reading comprehension between multigrade and monograde classes ($p = .183$). This finding is consistent with other research which reported no difference in student achievement between multigrade and monograde classes (Cornish, 2009; Gerard, 2005; Little, 2004; Pratt, 1986; Veenman, 1995). Seminal studies such as Pratt (1986) and Veenman (1995) examined student achievement levels of multigrade classrooms and found no significant difference from the monograde classrooms. Later research by Cornish (2009), Gerard (2005) and Little (2004) supported the historical findings by also reporting that there existed no difference in levels of student learning in multigrade classrooms.

The fact there is no significant difference in reading comprehension adds to the theoretical field of social interaction, peer collaboration, and differentiated instruction in the multigrade classroom. The continuing decrease in student enrollment and population decline has placed significant pressures on the educational system in rural areas of Newfoundland and Labrador to meet the educational needs of students (Govt. NL, 2009). However, the evidence suggests that there is no difference in reading comprehension between the multigrade and monograde classroom. As a result, fears of about multigrade education as an inferior education system are unfounded (Gerard 2005). Therefore, the current study provides support for the continued implementation of multigrade education.
What is the difference in 6th graders’ achievement in writing between multigrade classes and monograde classes? (Q2)

Research has produced controversial findings on the effects of multigrade education on student achievement (Cornish, 2009; Fosco, Schleser, & Andal, 2004). The current research found that a significant difference existed between multigrade and monograde classes in writing proficiency of 6th graders ($p = .42$). Multigrade students performed an average of 2.0% higher on writing than the monograde students. However, while the difference between the two classroom organizations was statistically significant ($p = .42$), it was not statistically significant when considering all three variables of mathematics, reading and writing separately using a Benferroni adjusted alpha significant level of .017. Therefore, despite research reporting that differences between multigrade and monograde student achievement are inconclusive (Brinegar, 2010; Little, 1995; Little, 2008), this study suggests that there is no difference between both classrooms. In sum, there was no statistical difference in student achievement in writing for the entire Grade 6 multigrade population when studied with an equal sample from the monograde population.

Classrooms organized on a philosophy of differentiated instruction are sensitive to individual student variance and learning styles (Tomlinson, 2005). The concept of multigrade education is aligned with the same educational theory as differentiated instruction and the more traditional graded classrooms should be avoided and nongraded classrooms implemented in their place (Anderson & Pavan, 1993). Theories on student learning suggest differentiated instruction (Tomlinson, 2005) and the opportunity for student peer collaboration (Fawcett & Garton, 2005) maximizes educational opportunities
as opposed to the more traditional fixed-grade configuration. The current research falls within that conceptual framework and student achievement is not affected in the multigrade classroom when compared to the monograde classroom.

Significant amounts of research into the differences between multigrade and monograde classes have reported both inconclusive findings (Brinegar, 2010; Little, 1995; Little, 2008) and no significant differences (Cornish, 2009; Gerard, 2005; Little, 2004). This study found that there existed no significant difference in writing between multigrade and monograde classes. This finding is consistent with other historical and recent research that reported no difference in student achievement between multigrade and monograde classes (Cornish, 2009; Gerard, 2005; Little, 2004; Pratt, 1986; Veenman, 1995).

Population decline and a corresponding loss of student enrollment is a present challenge to the educational system in Newfoundland and Labrador (Govt. NL, 2011). Multigrade education has continually increased in the province (Govt. NL, 2009) and is projected to increase further both in the province and around the world (Mulryan-Kyne, 2007). However, within the theory of peer collaboration and differentiated instruction as necessary facets in the learning process, multigrade education is a viable alternative to the monograde classroom. This research is congruent with other research which has reported no significant differences between multigrade and monograde classes (Cornish, 2009; Gerard, 2005; Little, 2004) and also provides evidence that multigrade classes can be implemented as a reasonable alternative to the traditional monograde classroom (Anderson & Pavan, 1993).
What is the difference in 6th graders’ achievement in mathematics between multigrade classes and monograde classes? (Q3)

Research on multigrade student achievement when compared to monograde student achievement has reported inconclusive findings (Brinegar, 2010; Little, 1995; Little, 2008). The current research found that no significant difference existed between multigrade and monograde classes in mathematics of 6th graders ($p = .148$). Multigrade students performed an average of 2.3% higher on mathematics than the monograde students. The difference between the two classroom organizations was not statistically significant ($p = .148$). This suggests that despite research reporting differences in learning between multigrade and monograde classers as controversial (Cornish, 2009; Fosco, Schleser, & Andal, 2004) that conclusion is not supported in this study. There was no statistical difference in student achievement in mathematics for the entire Grade 6 multigrade population when studied with an equal controlled sample from the monograde population.

This research fits within the theory of learning is maximized through differentiated instruction (Tomlinson, 2005) and student peer collaboration (Fawcett & Garton, 2005). The multigrade classroom is organized around differentiated instruction to meet the needs of a range of abilities and the theoretical precept that students learn from more knowledgeable peers (Wood & Frid, 2005). The results of this study suggest that student learning is maintained in the multigrade classroom and is a viable alternative to the monograde classroom.

In historical and current research findings on multigrade student achievement it has been found that the multigrade classroom provides both positive effects on student
achievement (Gutierrez and Slavin, 1992; McEwan, 2008; Lloyd, 2002) but also no effects (Cornish, 2009; Gerard, 2005; Little, 2004; Pratt, 1986; Veenman, 1995). Given the varied findings, research on multigrade student achievement has been characterized as inconclusive (Brinegar, 2010; Little, 1995; Little, 2008), inconsistent (Kinsey, 2001), and controversial (Cornish, 2009; Fosco, Schleser, & Andal, 2004). The results of this study are consistent with research that has found no significant difference in student achievement between the multigrade and the monograde class.

The conclusions of the research can be added to findings that report no differences in student achievement between multigrade and monograde classes (Gerard, 2005; Little, 2004; Pratt, 1986; Veenman, 1995). The conclusions are also consistent with the theoretical concept that students learn through peer collaboration and differentiated instruction found in the multigrade classroom (Fawcett & Garton, 2005; Tomlinson, 2005). Student learning is realized in the multigrade classroom. The findings of this research study suggest that continued implementation of multigrade education can be offered as a viable alternate learning environment to that of the monograde classroom.

Summary

This research involved a study of student achievement in reading, writing, and mathematics for the entire 2009 Grade 6 multigrade population of 198 students in Newfoundland and Labrador, Canada. A random sample of 198 students from the monograde population was selected with controls for parental education levels, rural versus urban, and parental education. Additionally, the same students’ achievement scores from 2006 while in the third grade served as an added control. This study
provides no evidence that students in multigrade classrooms received a substandard education when compared to the traditional monograde classroom in the core subject areas of reading, writing, or mathematics.

In this study it was found that students in the multigrade classroom performed slightly better in reading, writing, and mathematics than students in the monograde classroom. However, none of these differences reached the level of statistical significance. Research has reported that differences in student achievement between multigrade and monograde classes are both inconclusive (Brinegar, 2010; Little, 1995; Little, 2008) and controversial (Cornish, 2009; Fosco, Schleser, & Andal, 2004). However, the current research supports other findings that there exists no difference in student achievement between the multigrade and monograde classes (Gerard, 2005; Little, 2004; Mulryan-Kyne, 2005). Therefore, the overall result from the study concludes that students in the multigrade classroom receive the same level of education as students in the monograde classroom and multigrade education has no effect on student achievement in reading, writing, and mathematics.
Chapter 5: Implications, Recommendations, and Conclusions

Research on the effects of multigrade education on student achievement has revealed mixed findings (Kappler & Roellke, 2002). Some research has found multigrade education has a positive effect on student achievement (Gutierrez & Slavin, 1992; Lloyd, 2002; McEwan, 2008; Ong, Allison, & Haladyna, 2000). Other research has reported that there is no difference in student learning between multigrade and monograde classes (Gerard, 2005; Little, 2004; Mulryan-Kyne, 2005; Pratt, 1986; Veenman, 1995). As a result, some research has concluded that the effects of multigrade education on student achievement is inconclusive and controversial (Brinegar, 2010; Cornish, 2009; Fosco, Schleser, & Andal, 2004; Little, 2008). Despite inconsistent findings in research the Canadian province of Newfoundland and Labrador continues to implement and increase multigrade education in areas that face significant population decline (Govt. NL 2011). The specific problem this study addressed was if there was a difference in sixth grade students’ achievement in multigrade classes.

The purpose of this quantitative study with a causal-comparative ex post facto research design was to examine existing test results to determine if there existed a difference in sixth grade students’ achievement in reading, writing, and mathematics between multigrade and monograde classes. The study examined the student achievement results for entire 198 students in the Grade 6 2009 multigrade population and random sample of 198 students from the monograde population. The monograde students were matched to the multigrade students based on similar parental socio-economic status, rural school attendance, and parental education levels. Additionally, a further control for prior learning was used by examining test results for the same students
while in the third grade in 2006. Differences between multigrade and monograde student achievement was examined using a MANOVA.

There were some limitations to the study. While there were controls for socio-economic status, parental education, and rural/urban factors, academic performance between differing ethnic groups and gender were not considered. Also, the study involved one cohort of students in one grade. Additionally, the study was limited to three core subject areas; reading, writing, and mathematics and did not examine other academic disciplines or social and personal affect domains in learning. Furthermore, a causal comparative research design has a limitation of not using an experimental design (Black, 1999). Students could not be randomly assigned to one of a monograde or multigrade classes as students could only attend their neighborhood school that consisted of the classroom organization implemented by the school administrator.

This study was in compliance with all ethical standards conducting research. Any ethical concerns were minimal in terms of privacy and confidentiality. There was no risk to students as all students were required to write the provincial CRT as part of their educational programming and the study analyzed this archival data. The researcher was not involved in the actual administration of the CRT. Student achievement results were identified by student name. The student names were removed by the researcher to ensure privacy, anonymity, and confidentiality and assigned a number. All students in the multigrade Grade 6 population were studied with no discrimination or exclusion. A random sample from the monograde population was selected with no bias to gender, ethnicity, religion, or disability. No students, teachers, schools, or school districts were
identified in the study. The study utilized a quantitative causal-comparative *ex post facto* design therefore there was no personal bias or influence on the study results.

Within the implications section, the research questions and hypotheses will be discussed and examined. The quantitative data will be presented and recommendations and conclusions will be offered. Recommendations regarding the study’s findings and applications will be presented. Possible limitations on research design and results will be examined. Additionally, suggestions for future research will be provided prior to chapter conclusion.

**Implications**

Research on differences between monograde and multigrade student achievement has been reported as inconclusive, controversial, and inconsistent (Brinegar, 2010; Fosco, Schleser, & Andal, 2004; Little, 2008). The specific problem which guided this research was if there was a difference in sixth grade students’ achievement in reading, writing, and mathematics between multigrade and monograde classes. This study offers evidence that there is no significant difference in the levels of student achievement for multigrade students in the subject areas or reading, writing, and mathematics when compared to student achievement in the monograde classroom.

**Q1.** What is the difference in 6\(^{th}\) graders’ achievement in reading comprehension between multigrade classes and monograde classes?

**H1\(_{0}\):** There is no statistical difference in 6\(^{th}\) graders’ achievement in reading comprehension between multigrade classes and monograde classes.

**H1\(_{a}\):** There is a statistical difference in 6\(^{th}\) graders’ achievement in reading comprehension between multigrade classes and monograde classes.
The question was specifically designed to determine if there existed a difference in reading comprehension between multigrade and monograde classes. The empirical data showed that there was no statistical difference in reading between multigrade and monograde student achievement and therefore the null hypothesis could not be rejected. The results show that students in the multigrade classes do not receive a different level of education than students in the monograde class.

There were some limitations to the study. This data reflect one cohort of students in one grade. The entire multigrade Grade 6 population was studied and compared to a sample of the monograde population but there were no closer selections or examinations of data based on race or gender. Additionally, the research was limited to the area of reading comprehension as measured on one test written by all students. The researcher did not administer the CRT but rather the assessment was administered by classroom teachers following provincial guidelines for test administration. Each teacher is provided an administration guide which outlines test policy administration and a standardized script to be read in the classroom. Finally, the students were not assigned to either multigrade or monograde classes as part of an experimental design because classroom organizations were predetermined by the local school administration.

The purpose of this study was to determine if learning in the multigrade classroom through the use of differentiated instruction and social interaction had any effect on student achievement. Furthermore, the purpose of the research was to determine if the multigrade classroom is a viable alternative to the traditional monograde classroom. The current study found that students in the multigrade classroom receive the same level of education in reading as students in the monograde classroom. There are
significant implications of this finding. Multigrade education is a prevalent educational organization and projected to increase into the future (Mulryan-Kyne, 2007). This has implications for policymakers and educational decision makers when determining the viability of implementing multigrade education. This evidence should also provide support to educational stakeholders, including parents, that students in multigrade classrooms receive a comparable education to students in monograde classrooms. These findings are also supported in other research (Gerard, 2005; Little, 2004; Mulryan-Kyne, 2005; Pratt, 1986; Veenman, 1995).

The findings of this research suggest there is no difference in reading student achievement between multigrade and monograde classrooms. Previous research has also reported that there exists no difference between the two classroom organizations (Gerard, 2005; Little, 2004; Mulryan-Kyne, 2005; Pratt, 1986; Veenman, 1995). This research supports previous research whereby claims that students in a multigrade classroom receive a substandard education are unfounded (Gerard, 2005). The implication and significance of this study supports the conclusion that there are no differences in student learning between multigrade and monograde classrooms and the continued implementation of the multigrade classroom is a viable alternative to the monograde classroom.

**Q2.** What is the difference in 6th graders’ achievement in writing between multigrade classes and monograde classes?

**H2a:** There is no statistical difference in 6th graders’ achievement in writing between multigrade classes and monograde classes.
\textbf{H2a}: There is a statistical difference in 6\textsuperscript{th} graders’ achievement in writing between multigrade classes and monograde classes.

The question was specifically designed to determine if there existed a difference in writing between multigrade and monograde classes. The study showed that there was no statistical difference between multigrade and monograde in writing student achievement and therefore the null hypothesis could not be rejected. The results show that students in the multigrade classes do not receive a different level of education than students in the monograde class.

There were some limitations to the study. This data reflect a single group of students in the sixth grade. The entire 198 students in the multigrade Grade 6 population were studied and compared to a sample of 198 students in the monograde population but selection in the monograde population was not based on race or gender. Additionally, the research focused on writing proficiency as measured on the 2009 provincial Criterion Referenced Test. The CRT was administered by the classroom teacher following provincial guidelines and not the researcher which may result in dissimilar test administration practices. The research did not follow an experimental design because students must attend the neighborhood school irrespective of classroom organization of multigrade or monograde.

The purpose of this study was to determine if learning in the multigrade classroom through the use of differentiated instruction and social interaction had any effect on student achievement and to determine if the multigrade classroom is a viable alternative to the traditional monograde classroom. This study found that students in the multigrade classroom receive the same level of education in writing as students in the
monograde classroom. There are significant implications of this finding. Multigrade education is a common organizational structure in Newfoundland and Labrador (Govt. NL, 2009) and is likely to increase (Mulryan-Kyne, 2007). This research has implications for educational administrators when evaluating decisions concerning multigrade education implementation. The findings of this research can be used to inform parents that students in multigrade classrooms receive a comparable education to students in monograde classrooms. These findings are also supported in research (Gerard, 2005; Little, 2004; Mulryan-Kyne, 2005; Pratt, 1986; Veenman, 1995).

The findings of this research suggest there is no difference in writing student achievement levels between multigrade and monograde classrooms. Previous historical and recent research has reported that there is no difference between the two classroom organizations (Gerard, 2005; Little, 2004; Mulryan-Kyne, 2005; Pratt, 1986; Veenman, 1995). This research is congruent with other research that any fears about students receiving a less quality education in the multigrade classroom are without merit (Gerard, 2005). The implication and significance of this study supports the conclusion that there are no differences in student learning between multigrade and monograde classrooms and the continued implementation of the multigrade classroom is a viable alternative to the monograde classroom.

**Q3.** What is the difference in 6th graders’ achievement in mathematics between multigrade classes and monograde classes?

**H3:** There is no statistical difference in 6th graders’ achievement in mathematics between multigrade classes and monograde classes.
**H3a:** There is a statistical difference in 6th graders’ achievement in mathematics between multigrade classes and monograde classes.

The question was designed to determine if there existed a difference in mathematics between multigrade and monograde classes. The data from this research showed that there was no statistical difference between multigrade and monograde student achievement in mathematics and therefore the null hypothesis could not be rejected. The results show that students in the multigrade classes do not receive a different level of education than students in the monograde class.

There were limitations to the study. This study examined one set of students in Grade 6 in 2009. The entire multigrade Grade 6 population was studied and compared to a sample of the monograde population but random sampling did not involve considerations based on race or gender. As well, the research focused on mathematics for this group of students. The researcher did not administer the CRT and instead the test was administered by the students’ classroom teachers following provincial guidelines. The research did not follow an experimental design because students could not be randomly assigned to either a multigrade or monograde classroom.

The purpose of this study was to determine if learning in the multigrade classroom through the use of differentiated instruction and social interaction had any effect on student achievement and also to determine if the multigrade classroom is a viable alternative to the traditional monograde classroom. The findings of this research suggest that students in the multigrade classroom receive the same level of education in mathematics as students in the monograde classroom. There are significant implications of this finding. Multigrade education is a prevalent classroom organization in
Newfoundland and Labrador (Govt. NL, 2009) and will continue to increase in the future (Mulryan-Kyne, 2007). This has implications for educational administrators when determining the implementation of multigrade classrooms. The findings of this research can also be presented to parents with concerns that their children in a multigrade classroom will receive an education that is not equal to that of a monograde classroom. These findings are also supported in other research (Gerard, 2005; Little, 2004; Mulryan-Kyne, 2005; Pratt, 1986; Veenman, 1995).

This research is supported by other research in which there is no difference in mathematics student achievement between multigrade and monograde classrooms. Previous research has also reported that there exists no difference between the two classroom organizations (Gerard, 2005; Little, 2004; Mulryan-Kyne, 2005; Pratt, 1986; Veenman, 1995). This research supports previous research in which fears about receiving a substandard education in a multigrade classroom are unsubstantiated (Gerard, 2005). The implication and significance of this study supports the conclusion that there are no differences in student learning between multigrade and monograde classrooms and the continued implementation of the multigrade classroom is a viable alternative to the monograde classroom.

The present study used an *ex post facto* research design to examine archival student achievement data. Therefore, the grouping of students into multigrade or monograde classrooms did not follow an experimental design for random selection into experimental and control groups. Additionally, other limitations include studying one cohort of students in a single elementary grade in the province of Newfoundland and Labrador, Canada. Also, student achievement was studied in the three subject areas of
reading, writing, and mathematics in rural schools with no sampling from urban schools. Future research could examine student achievement results in urban areas using an experimental design in other grades, subject areas, and educational jurisdictions.

**Recommendations**

Population decline and student enrollment loss in rural communities in Newfoundland and Labrador (Govt. NL, 2009) presents significant challenges to educational administrators. Multigrade education is a field of research that is often devoid of evidence based on student achievement data (Tomlinson, 2000). Multigrade education continues to be implemented in Newfoundland and Labrador schools as an alternative to monograde education without study on its effect on student achievement and further implementation may continue into the future (Mulryan-Kyne, 2007). The current study offers evidence to balance research that reported the effects on multigrade student achievement is inconclusive (Brinegar, 2010; Little, 2008). The current research found that there is no difference in student achievement between multigrade and monograde classes in reading, writing, and mathematics.

**Recommendations for Practice**

It is recommended that multigrade education continue in Newfoundland and Labrador, Canada. The current study is limited to the core subject areas of reading, writing, and mathematics. However, with respect to these core subject areas, multigrade students, on average, performed stronger than monograde students. While these students performed stronger in reading, writing, mathematics, it was not statistically significant. Therefore, there is no statistical difference in student achievement between multigrade and monograde classes on levels of student achievement in reading, writing, and
mathematics. This finding is supported in previous research (Gerard, 2005; Little, 2004; Mulryan-Kyne, 2005; Pratt, 1986; Veenman, 1995). In a social environment of reduced population and declining student enrollment, and therefore a loss of teacher allocations to schools, it is prudent for educational administrators to continue offering multigrade education for rural schools given that there exists no difference in levels of student achievement between the multigrade classroom and the monograde classroom.

Student enrollment decline is a continuing trend in Newfoundland and Labrador. In an effort to maintain schools and educational programming, while experiencing student loss and teacher reductions, multigrade education is offered as an alternative to monograde education. Another recommendation is that when school population is in decline, multigrade education can be presented as a viable alternative to monograde education and as a result, parental concerns about their children receiving a substandard education in a multigrade education are unfounded (Gerard, 2005; Goodlad & Anderson, 1959). Students in the multigrade classroom do not receive a less than equal education than students in the monograde classroom in the core academic areas of reading, writing, and mathematics. It is recommended that educational stakeholders in communities facing a transformation from monograde to multigrade implementation model be informed that students in the multigrade classroom will not receive a substandard education.

**Recommendations for Future Research**

The current study offers evidence to support multigrade implementation as a viable learning organization to the traditional monograde classroom. It supports other seminal and recent research which suggests there is no difference between multigrade and monograde classes (Gerard, 2005; Little, 2004; Mulryan-Kyne, 2005; Pratt, 1986;
Veenman, 1995). It is recommended that future research be conducted using the similar controls for parental education, socio-economics, rural schools, and prior learning, but extended to other grade levels. The current study was limited to a provincial cohort of students in the sixth grade for the 2009 school year. Future research is recommended to extend to other grade levels in both the primary and middle school grades. Additionally, future research should be extended to other subject disciplines other than reading, writing, and mathematics. Future research may include a longitudinal study tracking student achievement through a period of time in multigrade and monograde classes following a cohort of students through their educational lives.

Another recommendation is to conduct research in other jurisdictions outside the province of Newfoundland and Labrador, such as other provinces in Canada which also have many rural communities and multigrade schools. Research may also be considered in urban areas. The current study utilized a quantitative causal-comparative *ex post facto* research design. This study failed to reject the null hypotheses. Future research may implement a quantitative experimental design in an urban setting where students can be randomly assigned to either multigrade or monograde classes where educational jurisdictions in larger centers may implement multigrade education by choice.

**Conclusion**

The purpose of this quantitative study was to determine if there existed a difference in student achievement levels between multigrade and monograde classrooms in reading, writing, and mathematics and if that difference was significant. The results of the study revealed that despite research that has concluded differences between multigrade and monograde classrooms are inconclusive (Brinegar, 2010; Little, 1995;
Little, 2008), the current study reported that there did not exist a significant difference in student achievement between multigrade and monograde classes. The recommendation, based on the findings, is to continue with multigrade implementation as a viable learning classroom to the traditional monograde classroom. The research conclusions of the study are not aligned with previous research that finds the differences between multigrade and monograde classes inconclusive and controversial (Brinegar, 2010; Cornish, 2009; Fosco, Schleser, & Andal, 2004; Little, 1995; Little, 2008). Instead the current study supports previous research, with the added introduction of strict controls on the demographic factors of school location (rural/urban), parental socio-economic status, and parental education levels known to affect student learning, (Haciemişoğlu, Yılmaz-Tüzün, & Ertepınar, 2009; Haifeng & Cowen, 2009; Rpuse & Barrow, 2006; Shin & Chung, 2009), that reports no significant difference between multigrade and monograde education (Gerard, 2005; Little, 2004; Mulryan-Kyne, 2005; Pratt, 1986; Veenman, 1995). The study will contribute to research and educational theories on differentiated instruction and social interaction (Fawcett & Garton, 2005; Tomlinson, 2005) integral to learning in the multigrade classroom. Additionally, knowledge gained from the current study offers educational organizations, such as school boards and the Department of Education, evidence that multigrade education is a viable alternative to monograde education.
References


Appendix A:

2006 Grade 3 CRT: Reading, Writing, Mathematics

**Check the appropriate boxes:**

**Pathway(s) ELA**

1  2  3  4

**Exemption(s)**

Informational Reading
Poetic Reading
Demand Writing

**Adaptation(s)**

Alternate Setting
Verbatim scribing of reading and/or responses
Transcribing of Demand Writing
Voice-to-Text software

**Pathway(s) of Mathematics**

1  2  3  4

**Adaptation(s)**

Alternate Setting
Verbatim reading of questions
Verbatim scribing of responses
Voice-to-Text software

**Exemption(s)**

Mental Math
Tips For Answering Multiple-Choice Questions

1. Reread parts of the reading passage, if necessary.

2. Reread the questions, if necessary.

3. For the Math questions, if you need to work out answers, show this work next to the question.

4. Choose the best answer for each question.

5. Fill in only circle for each question.

6. Go on to the next question if you get stuck on an answer. You should come back to the question at the end.

7. Answer every question, even if you're not sure.

8. Use an extra time to check your answers.
Tips for Answering Open-Response Questions

1. Reread parts of the reading passage, if necessary.
2. Reread the question, if necessary.
3. Print or write as neatly as you can.
4. Answer in complete sentences.
5. Include as much information as you can when you are asked to explain your thinking or solve a problem.
7. Write what you think and why you think that. There are not always right or wrong answers.
8. Go on to the next question if you get stuck on an answer. You should come back to the question at the end.
9. Answer every question, even if you are not sure.
10. Use any extra time to check your answers.

☼ Do they say what you mean?
☼ Do they make sense?
☼ Are your spelling, punctuation, and capitalization appropriate?
The Secret Place / This Is My Rock

1. In the poem The Secret Place, where is the secret place?

(A) in a tree
(B) in the sky
(C) on a rock
(D) on the grass

2. In the poem, This Is My Rock, what time of day is it?

(A) evening
(B) morning
(C) night
(D) noon

3. Why did the illustrator choose the colours shown for the background of the two poems?

(A) because it is the autumn season
(B) because these are the illustrator’s favourite colours
(C) to make the boy and girl stand out
(D) to show the peacefulness of being alone in nature

4. Why is The Secret Place an appropriate title for the poem?

(A) No grown-ups can get to where the boy is.
(B) No one can steal the secret of the sun.
(C) The boy likes sitting in the tree.
(D) The boy tells a secret to his friend.
1. Both poems have messages that are alike. What is one message you could get from both poems? Use information from each poem to support your answer.

2. Reread both poems again. Which one do you like better? Use two examples from the poem you chose to support your answer.
3. Imagine that you could have a secret place of your very own. Draw this place and give it a title. Write why it would be special to you.
Number Operations

5. Solve: \( 6 \times 3 = \) 

(A) 2  
(B) 9  
(C) 18  
(D) 21

6. What is the sum of 689 and 502? 

(A) 187  
(B) 1181  
(C) 1191  
(D) 11811

7. Solve: \( 36 \div 4 = \) 

(A) 8  
(B) 9  
(C) 32  
(D) 40

8. What is 153 subtracted from 301? 

(A) 148  
(B) 158  
(C) 252  
(D) 454
9. Which would be a correct multiplication sentence that is related to $28 \div 4 = 7$?

(A) $4 \times 7 = 28$
(B) $4 \times 28 = 7$
(C) $28 \times 4 = 7$

10. The Cubs and Scouts want to plant 350 seedlings this spring. They have planted 263 so far. How many more do they need to plant?

(A) 87
(B) 97
(C) 113
(D) 613

11. Mary had a sheet of stickers. There are 6 rows with 4 stickers in each row. Which calculation should you use to find the total number of stickers?

(A) $6 + 4$
(B) $6 - 4$
(C) $6 \times 4$
(D) $6 \div 4$
12. In Mary’s school there are 25 students Grade One, 42 students in Grade Two, and 58 students in Grade Three. How many students are there in total?

(A) 115
(B) 125
(C) 131
(D) 1115
1. The boy in the poem **The Secret Place** wants to build a treehouse. He found these materials:

<table>
<thead>
<tr>
<th>Material</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>long nails</td>
<td>202</td>
</tr>
<tr>
<td>short nails</td>
<td>185</td>
</tr>
<tr>
<td>hammer</td>
<td>1</td>
</tr>
<tr>
<td>long boards</td>
<td>56</td>
</tr>
<tr>
<td>short boards</td>
<td>30</td>
</tr>
<tr>
<td>measuring tape</td>
<td>1</td>
</tr>
<tr>
<td>silver screws</td>
<td>100</td>
</tr>
<tr>
<td>gold screws</td>
<td>126</td>
</tr>
<tr>
<td>screwdrivers</td>
<td>4</td>
</tr>
<tr>
<td>pieces of rope</td>
<td>2</td>
</tr>
<tr>
<td>pieces of rope</td>
<td>2</td>
</tr>
<tr>
<td>hinges</td>
<td>4</td>
</tr>
</tbody>
</table>

Choose some of these materials to build part of a treehouse. How would you use addition in this situation? Use words, pictures, and numbers to explain your answer.
2. **What is one way the boy can use subtraction as he builds his treehouse? Use words, pictures, and numbers to explain your answer.**
3. Think of things you do during the summer. Where would you use addition and subtraction? Complete the chart using pictures and words.

<table>
<thead>
<tr>
<th>Here are pictures of me in the summer using addition and subtraction.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A time I would use</strong></td>
<td><strong>A time I would use</strong></td>
</tr>
<tr>
<td><strong>addition</strong></td>
<td><strong>subtraction</strong></td>
</tr>
<tr>
<td><strong>Why I would use addition at this time</strong></td>
<td><strong>Why I would use subtraction at this time</strong></td>
</tr>
</tbody>
</table>
Demand Writing

In the poems The Secret Place and This Is My Rock, the children each had special places of their own. Think of a special place you have or would like to have. Write about it, including lots of details.
Horses

13. How many kinds of horses does the article say are in the world?

(A) 13 to 15
(B) 25 or 30
(C) less than 150
(D) more than 150

14. According to the article, why do zebras have stripes?

(A) to help them hide from enemies
(B) to keep them warm in cold weather
(C) to make them strong enough to pull wagons
(D) to protect them from rain and snow

15. According to the article, how many years did the oldest horse live?

(A) 15
(B) 25
(C) 30
(D) 62

16. In the article, what does the word tack mean?

(A) a small nail
(B) a wild horse
(C) equipment for horses
(D) the horse’s shoulder
17. In the section “Horse Play”, what is the purpose of the legend?

(A) to explain what equipment horses use  
(B) to give the meaning of the words in the labels  
(C) to make the labels easy for the reader to understand  
(D) to show the names of the girl and the horse

18. Using a scale, what is the height of the Exmoor Pony?

(A) 100 cm  
(B) 120 cm  
(C) 130 cm  
(D) 150 cm

19. What types of illustrations are used in this article?

(A) cartoons and photographs  
(B) chalk and plasticine  
(C) drawings and paintings  
(D) playdough and torn paper

20. In the section “Did Ya Know . . . .”, why are the words tallest and longest larger and in colour?

(A) to indicate they are sub-headings  
(B) to point out the most important features of the horse  
(C) to show that all horses are tall and long  
(D) to show the meanings of the words
1. Use your own words to describe two of Alex's safety tips and explain why each one is important.

1. 

2. 

2(a) Complete the chart by filling in the kinds of horses.

| Domestic Horses | Wild Horses |
2(b) What is the difference between domestic and wild horses?

________________________________________________________________________

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________________________________________________________________________

3. Reread the “Did Ya Know . . .” section. How do the illustrations help the reader understand the words?

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4. If you had a choice, would you want to own a horse after reading this article? Use two examples from the text to support your answer.

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5. In the section “Horse Play” look at the legend. It had two parts.

Look at how the legend matches the picture and labels of Alex and Angel.

5(a) Choose an animal to draw. It cannot be a horse.

Fill in the missing part of this legend to match the picture you will draw. You may choose equipment, toys, grooming supplies, or your own ideas.
5(b) Draw and label a picture of your animal to match your legend. Make three labels for each part of the legend.

________________________
Animal
Number Concepts

21. Angel likes to eat baby carrots. Using the centimetre ruler, how long is this carrot?

(A) 0.8 cm
(B) 0.3 cm
(C) 2.8 cm
(D) 3.2 cm

22. There are 10 animals in the field. If four tenths of the animals are horses, how many horses are there?

(A) 4
(B) 6
(C) 10
(D) 14

23. To share apples equally among 3 horses, Alex finds \( \frac{1}{3} \) of 12. How many apples would each horse get?

(A) 2
(B) 3
(C) 4
(D) 6
24. Which decimal shows the part of this group of apples that has been eaten?

(A) 0.3  
(B) 0.7  
(C) 3.7  
(D) 7.0

25. How many tens are in the number 206?

(A) 0  
(B) 2  
(C) 20  
(D) 26

26. A number has 4 digits. It has an even number in the tens place. It has a 5 in the hundreds place. What is the number?

(A) 2536  
(B) 2563  
(C) 5263  
(D) 5236
1. Place 325 on the number line. Make a mark on the number line to show where 325 should be. Explain how you decided where to place 325 on the number line.

2. Sometimes we use base 10 blocks to represent 325. Choose a different way to represent your understanding of 325. Do not use base 10 blocks.
3. Explain how your way shows what 325 means.

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4. There are many times when Alex would use estimation with Angel. Think of one situation where estimating would be helpful and tell why?

________________________________________________________________________

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5. There are other times when Alex would not use estimation with Angel but would need to be exact. Think of one situation where being exact would be important and tell why.
Let's Continue...
27. Alex arrives at school at 8:25 A.M. The bell will ring 15 minutes later. Which clock shows when the bell will ring?
28. Alex wants a long piece of rope to tie her horse to the fence. Which piece of rope is the longest?

(A) 2 m  
(B) 5 m  
(C) 70 cm  
(D) 300 cm

29. A nail has the same mass as 2 multi-link cubes. A screw has the same mass as 3 multi-link cubes. How many nails and screws are needed on the left side to balance the cubes on the right side?

(A) 1 nail and 1 screw  
(B) 1 nail and 2 screws  
(C) 2 nails and 1 screw  
(D) 2 nails and 2 screws
30. Which three-dimensional (3D) shape can be made from these faces?

(A) 
(B) 
(C) 
(D) 

31. What is the area of this shape?

(A) 6 cm²
(B) 7 cm²
(C) 8 cm²
(D) 9 cm²
1. Look at the three flags. Two of the flags have symmetry. One does not. Draw the lines of symmetry on the two flags.

(a) How are the lines of symmetry different on the two flags?

(b) Give one way how you know the other flag does not have a line of symmetry.
2. Look at the flags and find 2 different types of polygons.  
Circle one polygon in green and the second polygon in orange.  

   Name them and give one way they are alike and one way they are different.

   Name of Polygon 1  __________________________________________

   Name of Polygon 2  __________________________________________

   How they are alike  __________________________________________

   __________________________________________

   __________________________________________

   How they are different  _________________________________________

   __________________________________________

   __________________________________________

3. You need to measure your friend in centimetres. Why would you use a metre stick?

   __________________________________________

   __________________________________________

   __________________________________________

   __________________________________________
4. In mathematics, what does the word **area** mean?

5. Explain how you would figure out the area of this field.
6. Think of something in your own life where area might be important to you. Explain why.

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________________________________________________________________________
Demand Writing

Why do you think you learn about Language Arts and Math? Be sure to include examples of when you use Language Arts and Math when you are not in school.
Data Management and Probability

32. You close your eyes and put your hand in the jar. Which word best describes the chance of taking a cube from the jar?

(A) certain
(B) impossible
(C) likely
(D) unlikely

33. Use the pictograph to find out how many apples Alex and Angel ate altogether.

(A) 7.5
(B) 8
(C) 15
(D) 30
34. What is the chance of the bee flying into a red part of the beehive?

(A) 2 out of 15
(B) 3 out of 15
(C) 4 out of 15
(D) 6 out of 15

35. For which of these would you do a survey?

(A) You want to find out how many raisins are in your snack bag.
(B) You want to find out how many hockey cards you own.
(C) You want to find out the most popular snacks in your class.
(D) You want to find out when your music lesson starts.
1. What information does this graph show you?

2. What survey question could have been asked to get his information?

3. What is one way you could collect the information for your survey question?
4. Give the graph an appropriate title.

5. Why do all the pictures of food begin at the bottom of the graph?

6. Why is a graph a good way to organize information?

7. How could the information in this graph be useful?
36. Which illustration represents $6 \times 3$?

(A) 

(B) 

(C) 

(D) 

37. Which repeated addition sentence represents this illustration?

(A) $4 + 4 + 4 + 4$
(B) $4 + 4 + 4 + 4 + 4 + 4$
(C) $6 + 6 + 6 + 6$
(D) $6 + 6 + 6 + 6 + 6 + 6$
38. Which number best completes the T-chart?

<table>
<thead>
<tr>
<th>Number of Car</th>
<th>Number of wheels</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

(A) 14  
(B) 16  
(C) 20  
(D) 24

39. What is the missing addend?

(A) 3  
(B) 4  
(C) 5  
(D) 6  

\[
5 + 3 + \_ + 3 = 16
\]
1. Continue the pattern:

   2, 7, 12, 17, 22, ____, ____, ____.

2. What is the pattern rule?

3. Is this a repeating pattern or a growing pattern?

4. Is the 8\textsuperscript{th} number in the pattern odd or even?

5. How do you know whether the 8\textsuperscript{th} number is odd or even?
6. Use circles and triangles to create a growing pattern.

7. What is the pattern rule for your growing pattern?
Appendix B:
2009 Grade 6 Reading and Writing Criterion-Referenced Test

Check the appropriate box(es):

Pathway(s) for Language Arts:  □ 1    □ 2    □ 3    □ 4

Exemption(s)  □ Informational Reading  □ Poetic Reading  □ Demand Writing

Adaptation(s)  □ Alternate Setting  □ Verbatim scribing of reading and/or listening responses  □ Transcribing of Demand Writing  □ Voice-to-Text software
Language Arts
Tips For Answering Multiple-Choice Questions

1. Reread parts of the reading passage, if necessary.
2. Reread the question, if necessary.
3. Choose the best answer for each question.
4. Fill in only one circle for each question.
5. Go to the next question if you get stuck on an answer.
   
   You should come back to the question at the end.
6. Answer every question, even if you’re not sure.
7. Use any extra time to check your answers.
Tips For Answering Open-Response Questions

1. Reread parts of the reading passage, if necessary.
2. Reread the question, if necessary.
3. Print or write as neatly as you can.
4. Answer in complete sentences.
5. Include as much information as you can when you are asked to explain your thinking.
7. Write what you think and why you think that. There are not always right or wrong answers.
8. Go to the next question if you get stuck on an answer. You should come back to the question at the end.
9. Answer every question, even if you are not sure.
10. Use any extra time to check your answers.
   q Do they say what you mean?
   q Do they make sense?
   q Are your spelling, punctuation, and capitalization appropriate?
1. In the poem *Tree House*, where would the speaker prefer to live?

   (A) neat house  
   (B) street house  
   (C) tree house  
   (D) wipe your feet house

2. In the poem *Tree House*, what does the poet mean by stating “A tree house, a free house”?

   (A) do not enter  
   (B) empty  
   (C) given as a gift  
   (D) no rules

3. Imagery appeals to the five senses. The line “A stairway that creaks” appeals to what sense?

   (A) hearing  
   (B) seeing  
   (C) tasting  
   (D) touching

4. In the poem *The Housing Specialist*, what does the word “evicted” mean in the lines “He never pays rent, But he can’t be evicted”?

   (A) grounded  
   (B) jailed  
   (C) rewarded  
   (D) thrown out
5. What does the phrase “too tight-lipped” mean in the poem The Housing Specialist?

(A) does not reveal secrets
(B) gossips
(C) has a closed mouth
(D) whispers

6. What is a common message in both poems?

(A) homes are for human beings
(B) homes are unique and special
(C) turtles cannot choose their homes
(D) turtles do not like their homes
1. Using the Venn Diagram, show the similarities and differences of the **houses** in both poems.

- *tree house*
- *turtle’s house*
2. “A house is not always a home.” There is more to a home than the building itself. With reference to the poems and your own ideas explain what makes a house a home.
3. The poems focus on the advantages of some houses. What do you think are the *disadvantages* of a tree house and a turtle’s house?

**Tree house:** ____________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________


**Turtle’s house:** ________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________
4. If you could give either poem a new title, what would it be? Support your choice using the text and your own ideas.

POEM: ____________________________________________________________

NEW TITLE: _______________________________________________________

SUPPORT: _________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________
5. Provide a detailed illustration of your perfect home. Include a caption or thought balloons. (*Feel free to colour your work*).
DEMAND 1

You have just been told that you may spend a day with ANYONE in the world you choose. Describe all the details of this special event. Be creative and descriptive.

________________________________________________________________________

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________________________________________________________________________
Glaciers and Icebergs

7. What percentage of the land on Earth is still covered by glaciers?

(A) 10%
(B) 32%
(C) 50%
(D) 75%

8. What are “growlers”?

(A) deep cracks in glaciers
(B) front ends of glaciers
(C) small icebergs
(D) tips of icebergs

9. Where is Iceberg Alley?

(A) Antarctic
(B) British Columbia
(C) Greenland
(D) Newfoundland

10. According to the text, why are glaciers retreating?

(A) glacier skiers
(B) severe storms
(C) soil erosion
(D) warm temperatures

11. Why did the author include the world map in this text?

(A) highlight where Greenland is located
(B) identify glacial ski resorts
(C) indicate the location of glaciers around the world
(D) show regions of the world
12. Why are words, such as **global warming**, in bold print?

(A) emphasize important terms  
(B) highlight spelling  
(C) make the text easier to read  
(D) provide an example

13. Approximately, how long does it take for an iceberg to travel from Greenland to Iceberg Alley?

(A) a day  
(B) a year  
(C) 5000 years  
(D) 15 000 years

14. In this text, which is an example of a heading?

(A) Article by Wendy O’Malley  
(B) Glaciers and Icebergs  
(C) Glaciers Around the World  
(D) What is a Glacier
1. After reading this text, complete the chart to list three facts you have learned about glaciers and icebergs. Use the text to support your answer.

<table>
<thead>
<tr>
<th>Facts I Have Learned</th>
<th>Support From the Text</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. A. How does global warming affect glaciers? Use information from the text to support your answer.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

2 B. What can you do to help fight the global warming that is affecting our glaciers? Support your answer with something you have experienced, read, or seen.

________________________________________________________________________

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________________________________________________________________________
3. Explain the phrase “The Tip of the Iceberg” using the two examples from the text and your own ideas.

1.)

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

2.)

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
4. Look at the title “Glaciers and Icebergs.” Explain how any two design features (for example; use of colour, font, size, spacing) make the title effective.

1.)

2.)
5. Choose **two** visuals from the text and explain how each visual helped you understand the information presented.

1.) ________________________________________________________________

2.) ________________________________________________________________
6. Why did the author present a valley glacier in two visual forms: a photograph of Robson Glacier and the diagram “A Valley Glacier”?
7. Design a poster to attract tourists to visit glaciers and icebergs. Include a slogan in your illustration. (*Feel free to colour your work*).
Language Arts

Reading is the best!
DEMAND 2

Look at the visual. Write a story based on this illustration. Include lots of details.
Appendix C:

2009 Grade 6 Mathematics Criterion-Referenced Test

Check the appropriate boxes:

Pathway(s) for Mathematics  1  2  3  4

Exemption(s)

Mathematics

Adaptation(s)

Alternate setting
Verbatim reading of questions
Verbatim scribing of responses
Voice-to-Text software
Tips for Answering Multiple-Choice Questions

1. Reread parts of the reading passage, if necessary.

2. Reread the question, if necessary.

3. If you need to work out answers, show this work next to the question.

4. Choose the best answer for each question.

5. Fill in only one circle for each question.

6. Go to the next question if you get stuck on an answer. You should come back to the question at the end.

7. Answer every question, even if you’re not sure.

8. Use any extra time to check your answers.
Tips for Answering Open-Response Questions

1. Reread parts of the reading passage, if necessary.
2. Reread the question, if necessary.
3. Print or write as neatly as you can.
4. Answer in complete sentences.
5. Include as much information as you can when you are asked to explain your thinking or solve a problem.
7. Write what you think and why you think that. There are not always right or wrong answers.
8. Go to the next question if you get stuck on an answer.
9. You should come back to the question at the end.
10. Answer every question, even if you are not sure.
11. Use any extra time to check your answers.
Number Operations

1. What is the product of 5.263 and 3?

   (A) 15.689
   (B) 15.789
   (C) 156.89
   (D) 157.89

2. What is 9.66 divided by 7?

   (A) 0.138
   (B) 1.38
   (C) 13.8
   (D) 138.0

3. Calculate:

   \[
   \begin{array}{c}
   6)2.466 \\
   \end{array}
   \]

   (A) 0.0411
   (B) 0.411
   (C) 4.11
   (D) 41.1
4. The number 8 was put in the function machine below. The output was 8. What is the function?

\[
\begin{align*}
(A) & \quad \div 2 + 4 \\
(B) & \quad x 2 + 1 \\
(C) & \quad \div 2 + 3 \\
(D) & \quad x 2 - 7
\end{align*}
\]

5. A bottle of water costs $1.79. How much would it cost to purchase 6 bottles of water?

\[
\begin{align*}
(A) & \quad $6.24 \\
(B) & \quad $6.74 \\
(C) & \quad $10.74 \\
(D) & \quad $10.80
\end{align*}
\]
6. Calculate.

$69.9 \div 0.3$

(A) 0.23
(B) 2.33
(C) 23.3
(D) 233

7. Which shaded regions represent $\frac{1}{3} + \frac{1}{2}$?

(A) \[ \begin{align*}
\text{\includegraphics{image1.jpg}} & + \quad \text{\includegraphics{image2.jpg}}
\end{align*} \]

(B) \[ \begin{align*}
\text{\includegraphics{image3.jpg}} & + \quad \text{\includegraphics{image4.jpg}}
\end{align*} \]

(C) \[ \begin{align*}
\text{\includegraphics{image5.jpg}} & + \quad \text{\includegraphics{image6.jpg}}
\end{align*} \]

(D) \[ \begin{align*}
\text{\includegraphics{image7.jpg}} & + \quad \text{\includegraphics{image8.jpg}}
\end{align*} \]
8. Which is equivalent to $1.23 \times 10$?

(A) $1.23 \div 0.001$
(B) $1.23 \div 0.01$
(C) $1.23 \div 0.1$
(D) $1.23 \div 1$

9. Lisa purchased 2 containers of orange juice, 1 milk and 2 bottles of water. What was the total cost of her drinks?

(A) $5.10$
(B) $6.65$
(C) $6.95$
(D) $7.95$
10. Calculate.

\[1.92 \times 1.4\]

(A) 0.960
(B) 2.688
(C) 9.600
(D) 26.88
1. The table shows the prices of items at a music store on Tax-Free Day.

<table>
<thead>
<tr>
<th>Items</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD</td>
<td>$12.25</td>
</tr>
<tr>
<td>MP3 Player</td>
<td>$23.95</td>
</tr>
<tr>
<td>DVD</td>
<td>$22.75</td>
</tr>
<tr>
<td>Headphones</td>
<td>$9.95</td>
</tr>
</tbody>
</table>

Pat was charged over $50.00 for a CD, MP3 Player and headphones. How did he immediately know the clerk charged the wrong amount?

Explain your answer using words and numbers.
b) Explain the position of the decimal in the product.

________________________________________________________________________________
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________________________________________________________________________________

3a) Write a story problem you can solve by dividing 18.30 by 6.

________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________

b) Solve your problem.

________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
4. Andrew said the answer to $1 \frac{1}{2} - \frac{1}{3}$ is less than 1.

Is he correct?______________________________

Use words, pictures and numbers to explain your answer.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Let's Continue...
11. The chart shows the area of four countries. Order the countries from least to greatest area.

<table>
<thead>
<tr>
<th>Country</th>
<th>Area (km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>9 984 670</td>
</tr>
<tr>
<td>China</td>
<td>9 596 960</td>
</tr>
<tr>
<td>Egypt</td>
<td>1 001 450</td>
</tr>
<tr>
<td>Russia</td>
<td>17 075 200</td>
</tr>
</tbody>
</table>

least.................greatest

(A) Egypt, Canada, China, Russia
(B) Egypt, China, Canada, Russia
(C) Russia, China, Canada, Egypt
(D) Russia, Canada, China, Egypt

12. Which decimal number is the same as 34 750 000?

(A) 0.3475 million
(B) 3.475 million
(C) 34.75 million
(D) 347.5 million
13. Which number is closest to the fraction $\frac{16}{3}$?

(A) 5  
(B) 6  
(C) 13  
(D) 14

14. The ratio of boys to girls in a choir is 1:5. If there are 5 boys, what is the total number of students in the choir?

(A) 10  
(B) 25  
(C) 26  
(D) 30

15. In a grade 6 class 75% of the students have brown hair. What is the ratio of brown-haired students to the whole class?

(A) 1 : 75  
(B) 1 : 4  
(C) 3 : 4  
(D) 7 : 5
16. What is $40,000,000 + 5,000,000 + 20,000 + 8,000 + 60$ in standard form?

(A) 45 286
(B) 452 860
(C) 40 528 060
(D) 45 028 060

17. What are two common factors for 12 and 30?

(A) 3 and 5
(B) 3 and 6
(C) 4 and 5
(D) 4 and 6
1a) Place each number in the appropriate place on the number line.

\[ 3 \frac{3}{4} \text{ million} \quad 5 \, 500 \, 000 \quad 6 \frac{1}{4} \text{ million} \quad 4.2 \text{ million} \]

b) Choose two of these numbers and explain how you decided where to place them.

<table>
<thead>
<tr>
<th>Number</th>
<th>My explanation</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
</tbody>
</table>
2. There are 20 students in a grade 6 class. Six of the students are girls.

a) What is the ratio of girls to boys? ______________

b) Write an equivalent ratio for your answer in a).

My equivalent ratio: __________

Use words, pictures and numbers to explain why these two ratios are equivalent.

My explanation:

__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________
3. Morgan read the number forty-two million three hundred five thousand three. He then recorded it as 42 353.

a) Is he correct? ______________________________

b) Explain your answer.

__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________
Let's Continue...
18. A Grade 6 student grew 29 millimetres (mm) in a year. How many centimetres (cm) did the student grow?

(A) 0.29
(B) 2.9
(C) 29
(D) 290

19. The area of a whiteboard is 6 square metres (m$^2$). What is the area in square centimetres (cm$^2$)?

(A) 0.0006
(B) 0.06
(C) 600
(D) 60 000

20. An elephant has a mass of 6300 kilograms (kg). How many tonnes (t) does it weigh?

(A) 0.63
(B) 6.3
(C) 630 000
(D) 6 300 000
21. Which three angles can form a triangle?

(A) $30^\circ, 40^\circ, 120^\circ$
(B) $45^\circ, 45^\circ, 90^\circ$
(C) $90^\circ, 90^\circ, 60^\circ$
(D) $60^\circ, 60^\circ, 70^\circ$

22. The length of a rectangle is 10 cm. Its area is 50 cm$^2$. What is the perimeter of the rectangle?

(A) 30 cm
(B) 40 cm
(C) 60 cm
(D) 500 cm

23. What is the order of rotational symmetry of this figure?

(A) 2
(B) 3
(C) 4
(D) 5
24. The volume of a yogurt tube is 145 cm\(^3\). What is the capacity of the tube in millilitres (mL)?

(A) 1.45  
(B) 14.5  
(C) 145  
(D) 1450
1a) Draw a reflected image of Triangle A across the mirror line. Label the new triangle B.

b) On the same dot paper, translate triangle B two units right and three units down. Label the new triangle C.
2a) Draw an angle which measures $80^\circ$ using a ruler and a protractor.

b) Use your protractor to measure this angle.

My Answer: ____°
3. Draw **two** different quadrilaterals that each have an area of 16 square units.
Appendix D:
Elementary Holistic Writing Rubric – 2002

Level 5 – Outstanding

- Outstanding content which is clear and strongly focussed
- Compelling and seamless organization
- Easy flow and rhythm with complex and varied sentence construction
- Expressive, sincere, engaging voice which always brings the subject to life
- Consistent use of words and expressions that are powerful, vivid, and precise
- Outstanding grasp of standard writing convention

Level 4 – Strong

- Strong content which is clear and focused
- Purposeful and coherent organization
- Consistent flow and rhythm with varied sentence construction
- Expressive, sincere, engaging voice which often brings the subject to life
- Frequent use of words and expressions that are often vivid and precise
- Strong grasp of standard writing conventions

Level 3 – Adequate

- Adequate content which is generally clear and focused
- Predictable organization which is generally coherent and purposeful
- Some flow, rhythm, and variation in sentence construction which tends to be mechanical
- A sincere voice which occasionally brings the subject to life
- Predominant use of words and expressions that are general and functional
- Good grasp of standard writing conventions, with few errors that do not affect readability

Level 2 – Limited

- Limited content which somewhat unclear, but does have a discernible focus
- Weak and inconsistent organization
- Little flow, rhythm, and variation in sentence construction
- Limited ability to use an expression voice that brings the subject to life
- Use of words that are rarely clear and precise
- Frequent errors in standard writing conventions which are beginning to affect readability
Level 1 – Very Limited

- Very limited content which lacks clarity and focus
- Awkward and disjointed organization
- Lack of flow and rhythm with awkward, incomplete sentences which makes the writing difficult to follow
- Lack of an apparent voice to bring the subject to life
- Words and expression that lack clarity and are ineffective
- Frequent errors in standard writing that seriously affect readability
Elementary Holistic Reading / Viewing Rubric – 2002

Level 5 – Outstanding

- Outstanding ability to understand text critically, comments insightful and always supported from the text
- Outstanding ability to analyse and evaluate text
- Outstanding ability to connect personally with and among texts, with responses that extend on text
- Outstanding ability to detect purpose and point of view (i.e., bias, stereotyping, prejudice, propaganda)
- Outstanding ability to interpret figurative language (e.g., similes, metaphors, personification)
- Outstanding ability to identify features of text (e.g., punctuation, capitalization, titles, subheadings, glossary, index) and types of text (e.g., literature genres)
- Outstanding ability to read orally (i.e., with phrasing, fluency, and expression)

Level 4 – Strong

- Strong ability to understand text critically, comments often insightful and usually supported from the text
- Strong ability to analyse and evaluate text
- Strong ability to connect personally with and among texts, with responses that extend on text
- Strong ability to detect purpose and point of view (i.e., bias, stereotyping, prejudice, propaganda)
- Strong ability to interpret figurative language (e.g., similes, metaphors, personification)
- Strong ability to identify features of text (e.g., punctuation, capitalization, titles, subheadings, glossary, index) and types of text (e.g., literature genres)
- Strong ability to read orally (i.e., with phrasing, fluency, and expression), Miscues do not affect meaning.
Level 3 – Adequate

- Good ability to understand text critically, comments predictable and sometimes supported from the text
- Good ability to analyse and evaluate text
- Adequate ability to connect personally with and among texts, with responses that extend on text
- Fair ability to detect purpose and point of view (i.e., bias stereotyping, prejudice, propaganda)
- Adequate ability to interpret figurative language (e.g., similes, metaphors, personification)
- Good ability to identify features of text (e.g., punctuation, capitalization, titles, subheadings, glossary, index) and types of text (e.g., literature genres)
- Good ability to read orally (i.e., with phrasing, fluency, and expression), Miscues occasionally affect meaning.

Level 2 – Limited

- Insufficient ability to understand text critically, comments rarely supported from the text
- Limited ability to analyse and evaluate text
- Insufficient ability to connect personally with and among texts, with responses that rarely extend on text
- Limited ability to detect purpose and point of view (i.e., bias stereotyping, prejudice, propaganda)
- Limited ability to interpret figurative language (e.g., similes, metaphors, personification)
- Limited ability to identify features of text (e.g., punctuation, capitalization, titles, subheadings, glossary, index) and types of text (e.g., literature genres)
- Limited ability to read orally (i.e., with phrasing, fluency, and expression), Miscues frequently affect meaning.
Level 1 – Very Limited

- No demonstrated ability to understand text critically, comments not supported from the text
- Very limited ability to analyse and evaluate text
- No demonstrated ability to connect personally with and among texts, with responses that do not extend on text
- Very limited ability to detect purpose and point of view (i.e., bias stereotyping, prejudice, propaganda)
- Very limited ability to interpret figurative language (e.g., similes, metaphors, personification)
- Very limited ability to identify features of text (e.g., punctuation, capitalization, titles, subheadings, glossary, index) and types of text (e.g., literature genres)
- Very limited ability to read orally (i.e., with phrasing, fluency, and expression not evident), Miscues significantly affect meaning.
Appendix E:
Elementary Analytic Math Rubric - 2003

REASONING

Level 5 – Outstanding
An outstanding response offers a convincing mathematical argument with conclusions that lead to mathematical generalizations
• Offers conclusions that are consistently accurate and logical
• Constructs a mathematical argument that extends sufficient justification for answers and solutions.
• Consistently uses a pattern or regularity to make a logical mathematical generalization

Level 4 – Strong
A strong response offers a sound mathematical argument to support an accurate conclusion
• Offers conclusions that are usually accurate and logical
• Constructs a convincing argument which sufficiently justifies the solution
• Usually uses a pattern or regularity to explain the mathematical situation

Level 3 – Adequate
An adequate response offers an appropriate mathematical argument to support a logical conclusion
• Shows some deduction which leads to a logical conclusion
• Constructs an appropriate mathematical argument with some justification
• Sometimes uses a pattern or regularity to explain the mathematical situation

Level 2 – Limited
A limited response offers a partially appropriate mathematical argument but may have a logical conclusion
• Shows limited reasoning which may lead to a logical conclusion
• Attempts a mathematical argument and attempts to justify the solution
• Shows some evidence of recognizing that a pattern or regularity is present but does not use it to explain the mathematical situation

Level 1 – Very Limited
A very limited response offers an inappropriate mathematical argument or no mathematical argument
• Shows very little mathematical reasoning
• Makes minimal or no attempt to offer a mathematical argument to justify the solution
• Shows very little evidence of recognizing that a pattern or regularity is present
COMMUNICATION

Level 5 – Outstanding
An outstanding response consistently presents sound mathematical arguments and/or rationales in a comprehensible manner with consolidation of thinking.
- Consistently communicates mathematical ideas with clarity, precision and accuracy
- Consistently organizes mathematical details with precision and demonstrates consolidation of thinking
- Consistently uses appropriate mathematical language to express ideas; possesses a strong sense of crafting the response of a reader

Level 4 – Strong
A strong response usually presents sound mathematical arguments and/or rationales in a comprehensible manner.
- Communicates mathematical ideas with clarity and accuracy
- Organizes mathematical details with coherence and precision
- Usually uses appropriate mathematical language to express ideas precisely

Level 3 – Adequate
An adequate response presents some mathematical arguments and/or rationales in a comprehensible manner.
- Sometimes communicates mathematical ideas with clarity and accuracy
- Generally organizes mathematical details in a coherent manner
- Generally uses appropriate mathematical language to express ideas precisely

Level 2 – Limited
A limited response has some mathematical soundness; lacks sufficient comprehensibility and organization.
- Shows some communication of mathematical ideas, with minimal clarity and/or accuracy
- Shows some organization, but not always mathematically coherent
- Shows limited use of appropriate mathematical language; not often precise

Level 1 – Very Limited
A very limited response shows little or no communication of mathematical thinking
- Shows very little communication of mathematical ideas (i.e. minimal words or representations)
- Shows haphazard organization; may have irrelevant ideas
- Does not use appropriate mathematical language in context
CONNECTIONS and REPRESENTATIONS

Level 5 – Outstanding
An outstanding response consistently demonstrates understanding of the interrelatedness of mathematical ideas with sustained understanding and consolidation of thinking

- Consistently demonstrates understanding of how mathematical concepts interconnect
- Consistently demonstrates an understanding of the process of integrating mathematical knowledge (i.e. conceptual and procedural) to produce a coherent whole (new and accurate product)
- Consistently interprets, chooses effectively, and translates among mathematical models to solve problems
- Translates among appropriate and accurate representations to solve problems and enhance critical communication of mathematical ideas

Level 4 – Strong
A strong response usually demonstrates understanding of the interrelatedness of mathematical ideas with consolidation of thinking

- Usually demonstrates understanding of how mathematical concepts interconnect
- Usually uses previous mathematical knowledge (i.e. conceptual and procedural) to demonstrate understanding of how mathematical ideas build on each other to produce a coherent whole (new product, e.g. “I know that 50% equals one half, so if I want to know how much 50% of 30 pencils is I can think one-half, which is 15.”)
- Usually applies mathematics in contexts outside of mathematics (real life experiences)
- Usually interprets and chooses effectively among mathematical models to aid problem solving
- Consistently uses appropriate and accurate representations to aid problem solving

Level 3 – Adequate
An adequate response shows some understanding of the interrelatedness of mathematical ideas and some consolidation of thinking

- Sometimes demonstrates understanding of how mathematical concepts interconnect
- Shows some evidence that mathematical ideas build on each other (process) to produce a coherent whole (product)
- Sometimes applies mathematics in contexts outside of mathematics (real life experiences)
- Generally interprets mathematical models appropriately
- Usually uses appropriate and accurate representations to aid problem solving
Level 2 – Limited
A limited response has rote use of algorithms or rote re-organization of a statement
• Makes connections among mathematical concepts in simple contexts
• Shows mathematical ideas (i.e. conceptual or procedural) in isolation of each other; may not recognize that mathematical ideas build on each other to form a product
• Recognizes that mathematical concepts model everyday life experiences
• Recognizes that mathematical models play a role but may not be able to use them to aid problem solving
• Sometimes uses appropriate representations; representations may lack accuracy or contain misconceptions

Level 1 – Very Limited
A very limited response uses previous mathematical knowledge inappropriately, demonstrating lack of understanding of conceptual and/or procedural knowledge
• Recognizes that some simple mathematical concepts are interconnected
• Shows little evidence of conceptual and/or procedural knowledge
• Does not usually recognize that mathematical concepts are connected to everyday experiences
• Does not demonstrate an understanding that mathematical models help solve problems
• Uses representations that are mainly inappropriate or inaccurate
PROBLEM SOLVING

Level 5 – Outstanding
An outstanding response insightfully solves the problem with no errors
• Consistently uses appropriate problem solving strategies, adapting and inventing strategies where necessary
• Consistently monitors and reflects upon strategies and/or solutions; corrects all errors to successfully solve the problem
• Consistently analyzes and/or adapts the problem for efficient and accurate problem solving
• Consistently solves problems that arise in mathematics and other contexts (e.g. real life and other subjects)

Level 4 – Strong
A strong response successfully solves the problem, may have minimal errors or inefficiencies.
• Consistently uses appropriate problem solving strategies; although minimal errors or inefficiencies may be evident
• Usually monitors and reflects upon strategies and/or solutions; corrects most errors to successfully solve the problem
• Usually analyzes and/or adapts the problem for efficient problem solving (e.g. uses or creates patterns, solves a simpler problem first, makes a table or diagram, works backward)
• Usually solves problems that arise in mathematics and other contexts (e.g. real life and other subjects)

Level 3 – Adequate
An adequate response makes reasonable progress toward solving the problem amidst minor errors or inefficiencies
• Generally uses appropriate problem solving strategies, although minor errors or inefficiencies may be evident
• Shows some evidence of monitoring and reflecting upon strategies and/or solutions; is successful or at least partially successful at solving the problem
• Shows some evidence of analyzing or adapting the problem for efficient problem solving (e.g. uses patterns, solves a simpler problem first, makes a table, works backward)
• Sometimes solves problems that arise in mathematics and other contexts (real life and other subjects)
Level 2 – Limited
A limited response makes marginal progress toward solving the problem, showing lack of understanding or frequent errors, or frequent inefficiencies

- Chooses partially appropriate strategies to solve a task
- Shows minimal evidence of monitoring and reflecting upon strategies and/or solutions; should be partially successful at solving the problem
- Shows little or no evidence of analyzing or adapting the problem for efficient problem solving
- Sometimes solves problems that arise in mathematics, but rarely in other contexts (real life and other subjects)

Level 1 – Very Limited
A very limited response shows little or no strategy to attempt to solve the problem.

- Shows little or no evidence of applying strategies (i.e. chooses an inappropriate strategy to solve the task)
- Recognizes some information, but shows no understanding of how to solve the problem
- Makes significant omissions that indicate lack of understanding of the problem or the strategies needed to solve the problem
Appendix F:
Elementary Holistic Writing Rubric – 2002

Level 5 – Outstanding

• Outstanding content which is clear and strongly focused
• Compelling and seamless organization
• Easy flow and rhythm with complex and varied sentence construction
• Expressive, sincere, engaging voice which always bring the subject to life
• Consistent use of words and expressions that are powerful, vivid, and precise
• Outstanding grasp of standard writing convention

Level 4 – Strong

• Strong content which is clear and focused
• Purposeful and coherent organization
• Consistent flow and rhythm with varied sentence construction
• Expressive, sincere, engaging voice which often brings the subject to life
• Frequent use of words and expressions that are often vivid and precise
• Strong grasp of standard writing conventions

Level 3 – Adequate

• Adequate content which is generally clear and focused
• Predictable organization which is generally coherent and purposeful
• Some flow, rhythm, and variation in sentence construction which tends to be mechanical
• A sincere voice which occasionally brings the subject to life
• Predominant use of words and expressions that are general and functional
• Good grasp of standard writing conventions, with few errors that do not affect readability

Level 2 – Limited

• Limited content which somewhat unclear, but does have a discernible focus
• Weak and inconsistent organization
• Little flow, rhythm, and variation in sentence construction
• Limited ability to use an expression voice that brings the subject to life
• Use of words that are rarely clear and precise
• Frequent errors in standard writing conventions which are beginning to affect readability
Level 1 – Very Limited

- Very limited content which lacks clarity and focus
- Awkward and disjointed organization
- Lack of flow and rhythm with awkward, incomplete sentences which makes the writing difficult to follow
- Lack of an apparent voice to bring the subject to life
- Words and expression that lack clarity and are ineffective
- Frequent errors in standard writing that seriously affect readability