



A comparison of the academic achievement of students in multigrade elementary classrooms and students in self-contained single-grade elementary classrooms  
by Stephen Theophil Pawluk

A thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Education  
Montana State University  
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**Abstract:**

This study compared the academic achievement of 288 students in grades 5-8, examining test data to see whether a difference in academic achievement exists between those enrolled in multigrade classrooms and those enrolled in single grade classrooms. Standardized test scores for reading, math, social studies, and science were statistically analyzed using a multifactor analysis of covariance, with the covariate being the students' Cognitive Abilities Test scores. Along with the statistical data, a number of supplemental observations were made. The data indicate that there is no significant difference at the .05 level, between the academic achievement of students in multigrade classrooms and those in single grade classrooms. Thus, the configuration of the classroom, in and of itself, becomes an inconsequential variable when structuring or choosing schools or classrooms. The data further indicated that no statistically significant differences existed between the achievement scores of the students in multigrade classrooms and those of students in single grade classrooms, even when analyzed according to the gender of the student or the content area.

A COMPARISON OF THE ACADEMIC ACHIEVEMENT OF STUDENTS IN  
MULTIGRADE ELEMENTARY CLASSROOMS AND STUDENTS IN  
SELF-CONTAINED SINGLE-GRADE ELEMENTARY CLASSROOMS

by

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APPROVAL

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This thesis has been read by each member of the graduate committee and has been found to be satisfactory regarding content, English usage, format, citations, bibliographic style, and consistency, and is ready for submission to the College of Graduate Studies.

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## ABSTRACT

This study compared the academic achievement of 288 students in grades 5-8, examining test data to see whether a difference in academic achievement exists between those enrolled in multigrade classrooms and those enrolled in single grade classrooms. Standardized test scores for reading, math, social studies, and science were statistically analyzed using a multifactor analysis of covariance, with the covariate being the students' Cognitive Abilities Test scores. Along with the statistical data, a number of supplemental observations were made. The data indicate that there is no significant difference at the .05 level, between the academic achievement of students in multigrade classrooms and those in single grade classrooms. Thus, the configuration of the classroom, in and of itself, becomes an inconsequential variable when structuring or choosing schools or classrooms. The data further indicated that no statistically significant differences existed between the achievement scores of the students in multigrade classrooms and those of students in single grade classrooms, even when analyzed according to the gender of the student or the content area.

## CHAPTER 1

### INTRODUCTION

#### Background of the Problem

Although the one-room multigrade schoolhouse is part and parcel of American history and tradition, trends in education since the early 1800s have tended toward, and centered around, the single grade self-contained classroom (Goodlad & Anderson, 1963; Lincoln, 1981). These trends included such considerations as ease of management and the organization of increasing numbers of students, the introduction of graded textbooks, organizational approaches that functioned easily in light of increased state support for education, and the demand for professional and trained teachers. Dodendorf (1983) also cites population shifts, improved transportation (vehicles and roads), and school consolidation for financial reasons as forces leading to a decline in the number of rural multigrade schools. Barker (1986, p. 148) indicates that the "Indian Summer of one-teacher schools was the time between the turn of the century and World War I." He cites information that in 1900 some 200,000 one-teacher schools were in existence in the United States. By late 1959, the number had dropped to 23,695. He then states that, "Improved transportation and communication systems since the 1920s and

consolidation of public school districts during the 1950s and 1960s have now virtually eliminated any remnants of the "little red schoolhouse" (p. 148).

Excluding "specialty, continuation, alternative, or private schools" Barker estimated that 840 one-teacher schools are still in operation, the greatest number being in Nebraska (385), Montana (99), South Dakota (87), California (41), Alaska (28), Wyoming (31), North Dakota (25), and Idaho (21), with an average student/teacher ratio of 11.2 to 1 (p. 148). Kindley suggests that while one-room schools "are an endangered species," nevertheless, "They face a variation of Mark Twain's famous remark. . . . Reports of their demise are premature" (1985, p. 119).

Additionally, a common perception, according to Craig and McLellan (1987), seems to be that single grade classrooms provide the student with greater learning opportunity because of the more specifically focused instruction that the teacher can provide and because students of a similar age or achievement level are in the same classes as their peers. It is also felt, according to Craig and McLellan, that teachers in self-contained single grade classrooms can focus on the needs of the one grade level and thus the teacher can be more of an expert in the curriculum and teaching methods appropriate to that grade. There are, however, a few dissenting voices such as that of John Gatto (1992, p. 223) who states that

It is absurd and anti-life to be part of a system that compels you to sit in confinement with people of exactly the same age and social class. The system effectively cuts you off from the immense diversity of life and the synergy of variety. It cuts you off from your own past and future, sealing you in continuous present much the same way that television does.

Dodendorf indicates that a perception that rural multigrade schools provide an inferior education seems to exist and cites a number of studies from the 1960s and 1970s that suggest that such inferior education results from "poor teachers, inadequate supplies, lack of resources, and out-dated texts and materials." She also states that an additional disadvantage of rural schools often mentioned is the "inbred group of students; that is, no or few changes in the student group from kindergarten to eighth grade" (1983, p. 99).

The general belief that it is easier to teach a single grade has most probably influenced the configuration of schools as well. Pietila reports that, in Finland at least, "The instructional problems in these (one-teacher) schools have been so great that we have almost entirely got rid of them" (1978, p. 9). Referring to elementary schools with 1-3 teachers for all six grades, Pietila continues,

Age groups in a combined grade can be of different size. This restricts the use of different teaching methods to a certain extent. Also the total number of pupils in a combined grade sets limits to the selection of teaching methods. (p. 9)

The assumption that "better" teachers can be attracted by good job descriptions (e.g. single grade classrooms) is undocumented and largely unspoken, but pervasive nevertheless. Likewise, a common conception alluded to by Finley and Thompson (1963) is that the single grade classroom is generally associated with the larger school districts that can, by virtue of their size, offer higher salaries and thus recruit better teachers.

While at least some of these allegations are assumed without adequate empirical evidence, it does seem to be true that multigrade elementary classroom teachers do require a special adeptness at time and classroom management (Miller, 1989). As indicated in the study by Craig and McLellan (1987), implementation of some of the recent educational innovations is indeed difficult in multigrade classrooms where any given grade may have only one or two or three students and where the presence of two or more grade levels in the classroom places certain time constraints upon the amount of time a teacher can spend per subject per grade level.

There are indicators, however, that in some cases the level of academic achievement in multigrade classrooms is higher than might be expected when compared to single grade classrooms (Reck, 1988; Miller, 1989). By way of illustration, an informal survey of school norms of the 14 Seventh-day Adventist elementary schools in Montana, all of them one- and two-teacher K-8 schools, indicates that each of them is in or above the 13th percentile point for national school norms on the Iowa Test of Basic Skills (Pawluk, 1989). Sufficient anecdotal evidence is available that at least some educators are prompted to raise questions regarding the possibility of the superior academic performance of students in multigrade schools. Finley and Thompson (1963, p. 471) state that

. . . with current interest in the ungraded primary class or multi-graded grouping in larger schools, the question arises as to whether the one- and two-room schoolhouse may not have been forced into a desirable curriculum grouping years ahead of its time.

Van Til (1971) suggests, via a fictional conversation between an anthropologist and an educator, that trends such as the non-graded school, cross-age tutoring, independent study, individualized instruction, a small school atmosphere, decentralization, and the greening of America are all trends that could easily be extrapolated into a call for the return to the one-room schoolhouse as the most effective method of educating children.

Miller's 1989 handbook points out that since at least 1899 some have felt that "it is absurd to expect children to be at the same stage of development in a given grade" (p. ix) and that such a point seems no less valid at the present time than it was in the 1800s. Conversely, he indicates that in multigrade classrooms, widely varying ages, abilities, interests, backgrounds and experiences are drawn together. Miller hastens to add that

Despite the constraints, there are special advantages to multigrade classrooms. Flexible schedules can be implemented and unique programs developed to meet students' individual and/or group interests and needs. Combined classrooms also offer ample opportunity for students to become resourceful and independent learners. (p. xii)

Miller also cites a 1978 study by Pietila which reports that teachers in Finland who teach in combined or multigrade classrooms think that there are significant advantages to multigrade education.

The small size of combined grades compensates many instructional difficulties. Age-wise heterogeneous groups are natural bodies where the members educate each other. The older pupils in a combined grade may function as instructors to younger ones. (Miller, 1989, p. 19)

It was partly because of these factors that the present study was undertaken.

A second reason for this project was the fact that the Seventh-day Adventist school system has a large percentage of schools with multigrade classrooms in it. The Seventh-day Adventist denomination operates the second largest parochial school system in North America, being surpassed only by the Catholic school system. Approximately 96% (137 out of 141) of the Seventh-day Adventist elementary schools in the Pacific Northwest are schools with multigrade classroom configurations for all or some of the grades K-8. Forty-six percent (65 out of 141) of schools have a 1-8 grade spread with one teacher. Twenty-two percent (32 out of 141) schools have a four grade spread with one teacher per grades 5-8 (NPUC, *Education Directory*, 1991).

This balance of schools with single grade and multigrade classroom configurations has presented little problem in the past, but recent increases in parent involvement in their children's education, the constantly rising costs of operating private multigrade schools, and the good educational quality of nearby public schools has caused many parents to question the worth of spending tuition dollars, in addition to their taxes for public education, to enroll their child(ren) in parochial schools with multigrade classrooms (cf Veenman, Lem, & Voeten, 1988). Student enrollments in parts of the North Pacific Union Conference of Seventh-day Adventists have declined, and nine schools have closed during the years between 1984 and 1990. All nine of the school closures resulted from lower enrollments in the schools with multigrade classrooms (NPUC, 1990).

Rule (1983) indicates that the multigrade classroom has had an up-and-down existence during the history of this country. She states that until the early 1800s, the one-room school was considered standard and was not seriously challenged until 1848 with the establishment of the single grade classroom. She further asserts that by the 1860s "the graded school had replaced the multigraded school except in rural areas" (p. 20).

However, multigrade classrooms seem to have experienced a resurgence in popularity between the 1930s and the 1970s and Rule cites a number of sources and reasons for this development. She summarizes the data by stating that "Multigrading has the advantage of providing an organization that tends to emphasize individual differences while the use of grade labels provides a nomenclature familiar to parents" (1983, p. 21). On the other hand, current trends seem to indicate that familiar nomenclature alone may not be satisfactory at this time in the history of education.

A. D. Marzoff's unpublished dissertation (1978) may be instructive in this regard. Marzoff found that only 35% of parents surveyed in the Edmonton study indicated that they were satisfied with the fact that their children were placed in a multigrade classroom environment.

While a parent's decision of whether or not to send his or her child(ren) to a Seventh-day Adventist or public school with multigrade classrooms is likely influenced by a combination of a number of factors, this study has been limited to only one, student achievement. While questions such as those regarding finances,

transportation, socialization, curricular and co-curricular offerings, and school size would seem to have merit for discussion, it was the purpose of this study to determine whether or not students enrolled in schools with multigrade classrooms tend to have achievement levels that are higher, the same as, or lower than students in the same grade levels in single grade, self-contained classrooms. As Lincoln (1981) points out in his dissertation, the decline, or at least fluctuation, that is being seen in student enrollments in many locales, makes the possibility of flexibility in classroom configuration seem desirable, and the question of student achievement in the multigrade classroom becomes even more compelling.

A third reason for this study was based on a need for such a project. While there are some studies on instructional grouping and peer teaching, Miller (1989) states that, "Research literature on the rural one or two-room school is quite limited, primarily consisting of descriptive, survey and self-report/opinion types of information" (p. 6). He later added that "empirical studies of these (multigrade) classrooms is quite scarce. . ." (p. 31).

This study was designed to compare the academic achievement levels of students in single grade self-contained classrooms with the achievement levels of students in multigrade classrooms having a four grade level spread (grades 5-8) and with achievement levels of students in multigrade classrooms having an eight grade level spread (grades 1-8). The classrooms with an eight grade spread served as an extreme population of multigradedness in that the student grouping included the entire span of the elementary grades in a classroom that was under the direction of

one teacher. Multigrade classrooms with a four grade spread (5-8) would have been a less extreme case of multigradedness in that one teacher is responsible for half as many grade levels and lesson plans as the teacher with eight grades. One of the questions indicated later in this paper is whether there are differences in levels of student achievement not only between students in multigrade and single grade classrooms but also between students in four grade classrooms and in eight grade classrooms.

This study focused on Seventh-day Adventist parochial schools. However, the fact that a significant number of public school districts in the Pacific Northwest also have multigrade classroom configurations may cause the results of this study to have some advisory implications regarding the classroom configurations and student achievement in these schools as well.

It is interesting to note that John Goodlad (1971), in the last chapter of his book *Facing the Future*, dreams about what he would like to see in the educational process of the future. His futuristic dreams for better education sound, in part, very familiar to one who has experienced multigrade schools.

I want my school organized into phases -- not grades -- of three to four years each to permit family grouping. Perhaps this organization could be made to coincide with Erik Erikson's eight ages of man. One reason for multiage grouping is that every child should have the experience of being both the youngest and the oldest in a group. This is a very important developmental opportunity and one that we have ignored in our traditional graded schools. . . . My phases are organized around three to four-year groupings because it takes time to achieve any important function in life. It takes time to diagnose the individual's achievement, potentialities, problems, and to decide

how we can help. In the usual September to June rat race, there simply is not time for this diagnosis.

In the school I envision, everybody is a teacher --- even the children.

How will the children in my school be grouped? Rather than trying to achieve homogeneity . . . why don't we just turn the coin over and strive for heterogeneity? Let's put the children together because they are different . . . in each case grouping children who will indeed learn to work together and understand each other. The future depends heavily on that understanding.

How will the children be taught in my school? Mostly by peers. . . . The older children can teach the younger ones, and the younger ones can teach the older ones. The younger child will see what subsequent periods of development are like by living daily with older children. (1971, pp. 264-265)

#### Statement of Problem

The general question investigated in this study was this: Does a student's enrollment in a school with single grade self-contained classrooms, in a school with multigrade classrooms having a four grade spread, or in a school with a multigrade classroom having an eight grade spread result in a statistically significant difference in the student's achievement in various content areas?

#### Purpose of the Study

The purpose of this study was to determine whether or not students in multigrade classrooms attain levels of academic achievement in the areas of math, reading, science, and social studies that are significantly different than those of students in single grade classrooms. Additionally, this study attempted to determine

whether student achievement in four grade classrooms differs from student achievement in eight grade classrooms.

It was considered to be possible that if students in multigrade classrooms were shown to exhibit higher levels of academic achievement than students in self-contained, single grade classrooms, the difference could be explained by the possible presence of an "eavesdropping effect." This is to say that students in multigrade classrooms may benefit from overhearing the lessons and discussions that are occurring at grade levels above and below their grade level.

The possibility of an eavesdropping effect is indicated by the research report of Milburn (1981) but not suggested by the researcher himself. Milburn's study of two schools with an enrollment of approximately 350 suggests that while "little difference" seems to exist between the basic skills levels of students in multi-age and traditional grade level groups, students in multi-age classes scored "significantly higher" on the vocabulary section of the reading test and younger students in multigrade classrooms "scored higher on the basic skills tests than did age-mates in the control (single grade) school" even though the older students did not evidence such differences (pp. 513-514). Milburn does not provide specifics regarding the amount of the differences or of the significance level that he chose, and thus interpretation of his report is difficult. However, while he attributes the higher language scores to a possibly greater emphasis on oral language or, alternatively, to teacher use of vocabulary geared to the older students, and while he suggests that the higher achievement levels of the younger students may be due to emulation of

the older students, it seems equally plausible that these levels of achievement could be the result of an eavesdropping effect.

Conversely, it was considered possible that if students in single grade classrooms were shown to exhibit higher levels of academic achievement than students in multigrade classrooms, the difference could be explained by the presence of "student distraction" as a result of the various activities taking place for the different grades in the multigrade classroom as opposed to the focus of learning that is presumed to exist in a single grade, self-contained classroom.

It was also considered to be a possibility that both effects are taking place simultaneously in any given multigrade classroom, and that these effects would, perhaps, cancel each other out. Thus, in addition to a statistical analysis of student achievement test scores, supplemental data was gathered via classroom observations to determine whether the eavesdropping effect or the distractions of multigrade activity, or both, were reasonable explanations for the differences or lack of differences found in the achievement of students in the different classroom types.

#### Research Question

Do differences in student achievement exist between students in single grade, four grade, and eight grade classrooms, and do these differences exist in various content areas regardless of student gender or student grade level?

More specifically, this study attempted to answer the following questions:

1. Do students attain higher standardized achievement test scores in math, reading, science, and/or social studies when they are in an eight grade, a four grade, or a single grade classroom?
2. Do differences, if any exist, vary according to student gender?
3. If students do not attain the same levels of academic achievement regardless of classroom configuration, grade level, gender, or subject area, can student eavesdropping or student distraction, or both, be determined to provide a reasonable explanation, at least in part, for the differences?

### Hypotheses

The null hypotheses for this study are that:

1. No statistically significant difference exists between the adjusted achievement scores of students in one grade, four grade, or eight grade classrooms, regardless of content area (reading, math, social studies, or science).
2. The classroom configuration in which the student is enrolled and the gender of the student do not interact on adjusted achievement scores.

### Definitions

Single grade: A classroom situation where students of one grade level participate in all of their classes in the same classroom under the direction of one teacher.

Multigrade: A classroom situation where students of more than one grade level are taught by one teacher. For the purposes of this study, multigrade classrooms will be defined in two ways: as classrooms consisting of all or most of grades 1-8, and as classrooms consisting of all or most of grades 5-8. In either case, the students would be taught by one teacher. In these multigrade classrooms, students of each grade level are taught their respective subjects according to their grade level. The teacher rotates classroom instruction through the various grade levels for subjects such as math and reading, teaching one grade level of students while the others do independent or group work. In some subject areas such as science and social studies, the teacher combines grade levels, e.g. 5-6, 7-8, and teaches the curriculum on an alternating year basis.

#### Assumptions

While a study of this nature could easily be conducted in either public, private, or parochial schools, one of the reasons that only Seventh-day Adventist schools were selected for this study was that a number of extraneous variables could be minimized.

1. The curriculum in all of the schools involved in this study was essentially identical, having been determined at the regional office in Portland, Oregon and the national office in Silver Springs, Maryland.

2. Schools that consisted of grades 1-8 but had less than four teachers utilized the Small Schools Curriculum outlined by the North Pacific Union Conference of Seventh-day Adventists. Thus the curriculum was designed for the multigrade configuration and there was a degree of curricular uniformity among schools with multigrade classrooms. The curriculum framework was the same for all schools, multigrade or single grade, regardless of classroom configuration.
3. Since only teachers who were certified by the denomination and who were practicing members of the Seventh-day Adventist church were employed to teach in the schools as certificated instructional staff (NPUC Education Code 4006, p. 88), it was assumed that teacher training and philosophical framework among teachers were similar. While there were undoubtedly some variances due to teacher personality and experience, it was assumed that the denomination's continuing education requirements and the certification process, as well as the use of a large number of individual student scores, minimized any limitations caused by teacher differences. Additionally, the fact that all teachers in the Seventh-day Adventist school system are on the same salary scale regardless of location of their school, the size of their school, or the configuration of their classrooms minimized the possible argument that teachers of a superior teaching ability might be recruited by a particular type of school. Additionally, a study carried out by Irene in 1971 and cited by Lincoln (1981, p. 13) suggests that "no significant

differences in intermediate multi-grade versus single grade classrooms with respect to teacher methodology, values, and concepts of good teaching, and pupil attendance" exist.

4. Since similar tuition fees were charged by all of the schools included in this study, and since the schools in the study were all located in the coastal region of the Pacific Northwest, it was assumed that the socioeconomic levels of the students were similar as well. Additionally, the use of three covariates for student cognitive aptitude minimized any differences in achievement levels due to the socioeconomic backgrounds of the students.
5. All schools used in this study utilized the Iowa Test of Basic Skills in grade levels 3-8 and the Cognitive Abilities Test in grades 5 and 8. In addition to having only one method of evaluation to work with, as opposed to attempting to compare data from schools using a variety of testing formats, in all cases students in the Seventh-day Adventist school system are tested on a yearly basis from the third grade on. It was therefore assumed that the students' test-taking skills were comparable and that the scores of all students were somewhat equivalent in their effectiveness in quantifying student academic achievement.
6. The 1991-1992 enrollment data for the Oregon and Washington Conferences (NPUC, 1991) indicated that the K-10 enrollment according to gender was 1236 males and 1196 females in the Oregon Conference and 642 males and 635 females in the Washington Conference. In the combined conferences

there were 1878 male students and 1831 female students. It was assumed that a random sample of students consisting of an equal number of male and female students considered in this study was representative of any gender differences that may have existed.

7. Enrollment figures for the Oregon and Washington Conferences (NPUC, 1991) indicated that the K-10 enrollment according to ethnicity was as follows:

Asian	146	3.9%
Black	116	3.1%
Hispanic	157	4.2%
Native American	38	1.0%
White	3252	87.6%

Since any particular minority group representation was a relatively small portion of the total population, and since the forms providing student test scores do not indicate the ethnicity of the student, ethnicity was not considered as a variable to be examined in this study.

8. Since the various schools included in this study have been in existence for many years, and since their classroom configurations have generally remained stable with no shifts between multigrade and single grade modes, the potential of seeing results occurring because of the Hawthorne effect, as might be the case in a short-term study where grade levels are combined for the duration of the study, was virtually negated. Additionally, Goodlad theorizes that any educational innovation needs to become institutionalized, generally over a period of 3-5 years, before it can adequately be evaluated (Goodlad & Anderson, 1963). The classroom configurations used in this

study have been in place for a number of decades, thus fulfilling that particular theoretical requirement.

## CHAPTER 2

### REVIEW OF THE LITERATURE

The review of the literature pertinent to the questions being investigated includes studies in the areas of multigrade schools, peer tutoring, cross-age tutoring, and some limited data regarding school size. The data reported in this chapter are summarized in Appendix A.

#### Multigrade Schools

Finley and Thompson (1963) devised a study that compared the academic achievement of rural school students that attended schools with a multigrade classroom setting with the academic achievement of rural school students that attended schools having single grade classrooms. Students were selected from grades 3 and 5 and were matched according to gender, I.Q. (within 5 points), age (within 3 months), and their participation in the countywide testing program. The sample consisted of 53 pairs of third grade boys and 51 pairs of third grade girls as well as 62 pairs of fifth grade boys and 46 pairs of fifth grade girls. For purposes of this study, multigrade schools were defined as having four teachers or less, and fully graded or single grade schools were defined as having one teacher per grade level.

The California Short Form Test of Mental Maturity and the California Achievement Battery, Form W were used as indicators of student learning. Mean differences were computed for student scores in reading, math, language arts, and battery scores. T values were computed, and no significant differences were found at the .05 level, except for some scores in math. However, the math score results were inconsistent, so Finley and Thompson retained their null hypothesis that no difference existed between the academic achievement of students in multigrade or single grade classrooms. The report of the study was rather brief (five pages) and it was difficult to make a determination as to the applicability or validity of this research in regard to the questions raised in this project.

Marie Yerry and Edward Henderson (1964), in a study of elementary students in the Plainedge Public School District #18, sought to discover whether students placed in a multi-age group would attain higher levels of achievement in reading, arithmetic, and mechanics of English. The study also examined the students emotional security and classroom climate. The students in this study were between 6 and 11 years of age and were grouped "for any number of reasons" (p. 4). The experimental group consisted of 500 students placed in three classes with grades 1, 2, and 3, and 19 classes with two combined grades, i.e. 1/2, 2/3, 4/5, 5/6. The control group was a second school in the same district of similar enrollment. The experiment was conducted for one year and the California Achievement Tests were used to measure academic achievement of students in both

the experimental and the control groups. The overall outcome of the study was that

The analysis of total school achievement patterns for the interage and control school classes revealed no statistically significant differences. It may be noted that the means and standard deviations of the interage children are slightly but consistently higher (p. 10).

E. L. Edmonds (1981) conducted a descriptive survey of 56 one- and two-room schools in Prince Edward Island, Canada. While much of the survey focused on the physical environment of the schools, other sections of the study examined teacher qualifications, interpersonal relationships, and classroom discipline in the small schools. Edmonds asserts that the results of the survey disprove many of the arguments made by the provincial Department of Education that were used in order to close the schools and consolidate districts. His study indicated that teachers considered small schools to be superior to larger schools in terms of student learning, interpersonal relationships, and classroom discipline. Conversely, they felt that small schools suffered in regard to adequacy of instructional resources such as audio-visual aids and reference materials, sports, and other extracurricular activities. When students were surveyed, they tended to rate the small school classrooms as higher in social cohesiveness, competition, and satisfaction. Statistical particulars were not supplied in the study, hence it is difficult to know to what extent the reported differences occurred.

The possibility of the existence of an "eavesdropping effect" is suggested in Edmonds' study (1981, p. 13) when he reports that "A very large majority of the

teachers rated the small school superior from the point of view . . . of students having opportunities to learn by observing lessons in grades above their own. . . ."

In a study that might be contrasted to the above possibility of an eavesdropping effect, Ed Edmonds and Lyle Smith (1984) studied the effects of classroom noise on student performance. While their study did not target multigrade classrooms specifically, it may nevertheless provide some information that might be applied to the suggestion that the variety of activities in a multigrade classroom cause, in some cases at least, a distraction that has a negative effect on student achievement. Edmonds and Smith found, in their study of 289 sixth grade students, that there was a significant difference in student performance in relation to noise levels at the .01 level. Students with above average intelligence scores performed better on various tests in a low noise condition (40 dbA) than in a high noise condition (79 dbA). However, students with below average scores performed better in the high noise conditions than in the low noise conditions.

Judy Rule (1983), in a study of the Mesa Public Schools in Arizona examined the effects of multigrade grouping on elementary student achievement in reading and mathematics. Using the 1981 and 1982 California Achievement Test results, it was found that placing students in multigrade classes had no detrimental effects on reading or mathematics achievement except in the case of the mathematics achievement of average students. Rule recommends that only average/high students should be taught in a multigrade setting and then only in cases where appropriate instructional techniques were identified and used. While

Rule's sample size was a sufficient  $N$  of 8,000, and while the paper did receive the 1984 American Educational Research Association Division H award for Best Report of Instructional Research, there were a number of built-in limitations that affect one's ability to apply the conclusions to the Seventh-day Adventist school system.

These are:

1. Students were assigned to multigrade classes for only the 1981-1982 school year, thus minimizing any cumulative effect that might be noticed among students who spent more than one year in a multigrade classroom.
2. The students in the multigrade classrooms were not a purely random sample of students, but were selected on the basis of their achievement records with only those classified as middle and high achievers being placed in a multigrade setting.
3. The multigrade setting in the study consisted of classrooms that combined only two adjacent grades, again minimizing any possible cumulative effect of students overhearing instruction intended for more than one grade ahead or behind them.

Cheryl Craig and Jim McLellan (1987) studied what they termed "split grade classrooms." The researchers defined split grade classrooms as those which include students of two or more grade levels in the same classroom, mainly under the supervision of one teacher. This configuration, they stated, is planned on a short-term basis in response to imbalances in pupil-teacher ratios, enrollment fluctuations, and budgetary considerations. They claim that "Split grade classes are

an administrative necessity, rather than a philosophical preference" (p. 5). Part of their concern stems from the tendency that they found in Alberta, Edmonton and Saskatchewan schools to not teach all of the curriculum that is required for any given grade to those students when they were in a split grade classroom. The study postulated that "gaps in student learning in provincial achievement exams will eventually emerge" (p. 7). The researchers concluded that while schools with split grade classrooms are somewhat common in elementary settings in both rural and urban areas, teachers in these situations are forced to compromise curriculum in order to teach all levels simultaneously.

The implication of this report is that student achievement suffers when the student is placed in a split grade classroom. The report did not, however, offer any statistical data to support this contention. While it did present curricular concerns voiced by teachers and administrators, the supposition that student achievement would suffer seemed to be based solely on the assumption that gaps in instruction existed when teachers were teaching in a typical split grade classroom and that these gaps would result in lower student achievement. No discussion was presented to validate the assertion that the gaps were indeed existent or substantial, or that the present curriculum consisted of a necessary body of knowledge that all students needed to master in order to show satisfactory academic achievement. Because of these limitations, it is not clear that the concerns raised in Craig and McLellan's study will help in the comparison of the academic achievement of students in single grade and multigrade classrooms. However, it is possible that this study will

partially address the contention that gaps exist in the knowledge of students taught in split grade classrooms. If no differences are shown to exist when comparing the achievement of students in eight grade, four grade, and single grade classrooms, or if a difference exists and a cumulative effect is seen, this information could aid in the assessment of Craig and McLellan's conclusions about the existence of gaps in students' knowledge base.

Muse, Smith, and Barker (1987) produced a descriptive study of one-teacher schools and their students that, while not comparing student achievement directly with students in other types of school configuration, still present some helpful data. When surveying 204 students in 13 high schools in Nebraska, South Dakota, and Montana (the states with the largest numbers of one-teacher schools), they found that 55% of those students had attended schools enrolling fewer than 13 students, 75% had brothers and/or sisters attending elementary school with them, and 59% of the students polled indicated that they planned to attend college following high school graduation, a favorable indicator when compared to the national average of 30% who plan to attend college.

When Muse et al. specifically examined the performance of these 204 students on standardized tests, they found that the results were not consistent when different tests, grade levels, and states were compared. Upon analysis of the data, the researchers concluded "that students who completed their early years of schooling in one-teacher schools were neither better nor less prepared for secondary schools than were students from larger elementary schools (1987, p. 19).

Results from interviews conducted in 1985 also yielded some data that is indirectly related to the questions of this study. Among the information gathered were the following (p. 20):

1. Students tend to encounter difficulty in adjusting to the first year in the secondary school; thereafter, there is no difference in their behavior from other students.
2. The drop-out rate among students from one-teacher schools is less than that found among other students in the secondary school.
3. Students tend to be less disruptive; their behavior is good.
4. Teachers and principals alike were of the opinion that students from one-teacher schools were as successful and well-adjusted as other students in the school.

The above findings might be indicators that the hypothesis regarding distractors in the multigrade classroom may have little consequence and that students have learned to compensate for the possible confusion of having several grade levels taught simultaneously by developing more effective concentration and self-application skills. If this supposition were true, it might affect the likelihood of the presence of an eavesdropping effect. The presence, or lack thereof, of distraction and/or the eavesdropping effect is one of the corollary questions that this research attempted to answer.

Veenman et al. (1988) carried out an observational study of 12 mixed-age and 12 single-age Dutch primary reading/language and mathematics classes (grades 3 and 4) and discovered that time-on-task levels were lower for the mixed-age classes, but that no significant differences in achievement test scores were

found. Veenman et al. cite a survey by the Dutch Inspectors of Elementary Schools (1978, p. 14) to indicate the following problems in multi-age schools:

. . . more interruptions in the learning situation because of having different year groups; pupils receive less individual attention; it is harder for pupils to concentrate on their work; teaching in a mixed-age class is difficult and requires great managerial ability; there is less opportunity for oral instruction because this might hinder one of the year groups.

Veenman et al. also use the same study to point out that

. . . many parents are concerned about the achievement of their children. They think that pupils in mixed-age classes will not attain the same levels of academic achievement as pupils in single-age classes.

Their investigation was an attempt to discover whether or not there were time-on-task differences in multi-age classrooms and single-age classrooms that have a significant effect on student achievement. Their study showed that in mixed-age classes an average of 69% of student time is spent on task. In comparison, an average of 75% of student time in whole class settings was on task. This was found to be a statistically significant difference. However, when achievement was compared, no significant differences at the .01 level were found between the mixed-age and single-age classes.

It is important to note that the study was of mixed-age classes. While the study was akin to this one in spirit, it differs greatly in that the students were in mixed-age classes for two subjects and in their regular classes for all other subjects. The inferences that may be drawn from that study and applied to this one are extremely limited. However, it is interesting to note that in spite of differences in

time on task, and in spite of the concerns expressed about perceived handicaps of the multi-age classroom, the differences in achievement were not seen. It is also noteworthy to recall that Veenman et al. were concerned about "interruptions" and difficulty of concentration for students in a multigrade setting. This study will attempt to address those concerns as well by looking for supplementary information regarding the existence of an eavesdropping effect or the presence of distractors, or both, in multigrade classrooms.

Carleen Reck (1988) undertook a study of small Catholic elementary schools with enrollments under 100 students. The term "small" was used to denote any school that was under 100 students in size and had combined two or more grade levels in a given classroom. Reck's findings showed that 94% (144 of the 153 reported) of the composite class averages are on or above grade level when compared to national norms. Additionally, the study pointed to the concept that achievement improves the longer that the student remains in such a classroom setting, with the average eighth grade composite score being 1.8 years above national grade level norms. While this assertion was of interest, the manuscript did not support this with any statistics. It is one of the purposes of this study to determine whether or not such an assertion can be quantified and whether a cumulative effect can be shown to exist.

Reck points out that while the classrooms in her study were demographically distinctive in some respects, especially in terms of the absence of students having moderate to severe handicaps, the classrooms nevertheless did include a wide

variety of student ability levels. The project indicates that small schools with a multigrade classroom configuration may help students to attain higher levels of achievement because of the following factors:

1. Fewer students working on the same task allows the teacher to provide varied materials and tasks.
2. The variety of grade levels allows for high levels of thinking, "where questions are generally short and the answers are long."
3. Opportunities for participation.
4. Improved study habits since the students must learn to study with a minimum amount of teacher guidance for greater amounts of the school day than is the case in a single grade classroom.

While it is true that Reck's study combines the issues of school size and classroom configuration, and while it is the case that most schools that operate multigrade classrooms do so because of economic reasons related to small enrollments, research regarding school size seems to point to the conclusion that size is not the significant factor (Robinson, 1990; Alberta Dept. of Education, 1984). This would cause one to wonder whether the multigrade configuration is the significant variable in student achievement.

Kenneth Brown and Andrew Martin (1989), in a study of eight New Brunswick elementary schools, did not find a significant difference in student grade points or total achievement test scores when comparing single grade students in grades 1-5 with their peers in multigrade classes. Because of a drop in enrollment

in the New Brunswick schools, a number of the schools have chosen to combine grades. The study was an attempt to find out whether or not such action was academically defensible. The project involved 418 students in grades 1-5 in eight different schools. Using the Chi-square and  $t$ -tests, Brown and Martin determined that there were no overall significant differences between student achievement in single or multigrade classes. In each test the null hypothesis was retained.

There were, however, some aspects of the study that may have contributed to this finding. They are:

1. Children in multigrade classes were specially selected on the basis of maturity, cooperation, and willingness to work with minimal supervision. Thus, the populations do not necessarily seem to be comparable.
2. June report card grades were used as the basis of comparison for some students. The grades of "Excellent, Very Good, Good, Minimal/Fair, Not Satisfactory" were used in seven of the schools and Canadian Test of Basic Skills scores were used in one school. The weaknesses of this approach might include subjectivity of grading on the various teachers' parts. No mention was made in the study of attempts to help teachers use similar criteria for their grading systems. Thus, the lack of a standardized method of assessing student achievement seems to be a serious limitation of the study.

3. The achievement of classes was used rather than individual student achievement. While a comparison of averages is of some use, the inability of the study to assess variance within those averages may be misleading.
4. The term "multigrade" was used to denote a classroom with two combined grades. This configuration may suffer from some of the problems associated with increased teacher load, and thus, perhaps result in less effective instruction. On the other hand, with only two grades in a classroom, the students may not benefit from any of the possible advantage(s) that might result from having three or more grades in the same classroom. It is this latter possibility that Carleen Reck's study addressed and that this project is attempting to deal with.
5. It may also be important to note that only eight schools were used in this study. While the number of students (418) was probably a large enough number, it was average class scores that were compared, and thus the  $N$  on which the statistic was based might be a bit weak.

In summary, the majority of the literature on schools with multigrade classrooms seems to indicate that when grade levels are grouped together, at least in groupings of two, there does not seem to be any negative effect on achievement. Furthermore, there seems to be some indication that multigrade classroom configurations may have a positive benefit for the students' academic achievement. However, the limitations of the studies make it difficult to draw any clear conclusions regarding the academic achievement of students who have or are

spending more than one year in classrooms with three or more grades. Specifically, the following limitations are significant:

1. The time frames of the studies, combining grades for only one school year, seem to be too short.
2. Often the studies combined two grades but did not focus on classrooms with three or more grades in the one room.
3. Often the multigrade configuration was established for the purposes of the study and does not necessarily reflect the experience of the student who has attended school in a multigrade classroom for more than one year.
4. Often the variable of the training and curriculum of the teachers and their adaptability to a multigrade classroom was not addressed.
5. In at least one study, the cumulative effect of being in a multigrade classroom was alluded to but not statistically validated.

Because of the findings cited and because of the five factors listed above, the researcher supposed that there could be reason to believe that being a student in a multigrade classroom for more than one year could affect the student's achievement, but that additional information was needed before a valid conclusion can be drawn. It was also believed by the writer that this study contributes to the body of literature by filling in some of the gaps indicated earlier and is designed in such a way as to gather the data needed to draw reasonable conclusions regarding comparisons of student achievement in four grade, eight grade, and single grade classrooms.

### School Size

While school size was not considered to be a factor in this study, primarily because all of the schools in the study would probably be considered small schools by most readers, there are some who may conclude that the smallness of the schools with multigrade classrooms might be a factor contributing to any differences in student achievement that might be found through this study.

Robinson (1990), in his "Synthesis of Research on the Effects of Class Size," summarizes his findings by making the following statements:

- The most positive effects of small classes on pupil learning occur in grades K-3 in reading and mathematics, particularly in classes of 22 or fewer students. However, the first year's positive effects may not be sustained in subsequent years.
- Smaller classes can positively affect the academic achievement of economically disadvantaged and ethnic minority students.
- Within the midrange of 23 to 30 pupils, class size has little impact on the academic achievement of most pupils in most subjects above the primary grades.
- Little if any increase in pupil achievement can be expected from reducing class size if teachers continue to use the same instructional methods and procedures in the smaller classes that they used in the larger classes.
- Reductions in class size have small positive effects on achievement in comparison to many less costly learning interventions and strategies.

While research on class size may not have a direct bearing on the question of school size, it may be somewhat instructive to note Robinson's summary that

Although class size reductions are often proposed as a way to improve student learning, research does not support the expectation that smaller classes will of themselves result in greater academic gains for students. (p. 90)

Conversely, Glass, Cahen, Smith, and Filby (1982), in their meta analysis of 77 studies, indicate a rather dramatic benefit that results from smaller classes.

While their study did not differentiate between students placed in small classes and students placed in small learning groups for one or two subjects, they did conclude that

Instruction of more than 100 hours in a group of five pupils moves the average pupil from the 50th percentile at class size 40 to beyond the 80th percentile, a gain of over 30 percentile ranks. The comparable gain for fewer than 100 hours of instruction (size 40 versus size 5) is nearly 20 percentile ranks. The benefits grow as class size is reduced even further.

The relationship of class size to pupil achievement is remarkably strong. (p. 50)

Glass and his associates propose that a partial explanation for this is that small class sizes allow for better classroom control and, as a result, a greater amount of student attention to the work. While this is most likely true in single grade or single subject groups, there may be some question regarding whether or not such an effect is equally present in a multigrade classroom where students are expected to work independently while the teacher is working with other grade levels.

Research regarding school size (as opposed to class size) and its relationship to student achievement is scant. However, while not much is written on the topic, the following will give the reader a sense of the studies that have been done.

Muse et al. (1987) found that 204 students from one-teacher schools in Nebraska, South Dakota, and Montana, 55% of whom came from schools enrolling

fewer than 13 students, performed the same as students from other sized schools. They concluded that the "quality of the school program, not the size of the school, seems to determine achievement levels" (p. 5). In their concluding chapter, Muse et al. point out that both large and small schools provide advantages and disadvantages for their students. They then cite Andrew Gulliford's statement regarding small rural schools that says,

Out of necessity country schools have been practicing for more than a century what the most sophisticated education systems now encourage -- smaller classrooms, programs that allow students to progress at their own rate and students who help each other to learn (p. 49).

Muse et al. suggest that these qualities enable students in one-teacher schools to develop independence, individuality, and resourcefulness, qualities that most likely have a positive influence on their achievement levels. The question yet to be answered in this study is whether or not students like those described by Muse and his associates have significantly different levels of achievement than their peers in other types of classrooms.

Moracco (1978) studied 30 elementary schools from a midwest community to determine how school size influences student perceptions. In this study, enrollments ranged from 197 to 674 students. Moracco classified schools with more than 475 students as "large" and schools with less than 476 as "small." Using the Elementary School Environment Survey (ESES), he found that school size makes no apparent difference in the pupil's perception of the school in regards to three of the subscales on the ESES. These were:

Practicality - The practical usefulness of the environment.

Propriety - An environment that is polite and considerate and, conversely, having a lack of assertive, rebellious, risk taking, and inconsiderate behavior.

Scholarship - The academic environment, the rigorousness and vigor of scholastic pursuits.

On two of the scales, Awareness and Community, students from smaller schools rated their perceptions as somewhat higher than those from larger schools.

Moracco (1978, p. 454) summarized this portion of his findings by stating that

It could be that in smaller schools pupils feel more intimate. Smaller schools may promote the "we" feeling in its students where pupils identify with the school's program. The questions for the Community variable indicate that students from smaller schools feel that their schools are friendlier and warmer than students from larger schools.

Thus, in Moracco's study, it appears that school size, at least as he has defined it, has no significant effect on students' perceptions regarding scholarship, but small schools provide a certain warmth and communal feeling that seems less apparent in large schools. However, while Moracco's findings may be of some interest, it should be noted that for purposes of this research project, all of the schools being studied fall within Moracco's "small" category and any benefits that might be caused by small school sizes in the Washington and Oregon Conferences would presumably be somewhat equal in all of the schools being studied.

Diane Dodendorf (1983) reports an extremely insightful observational study of 34 children in grades 3-8 in a two-room school in Nebraska. The first part of

her report is a description of the routines of the students and teachers in the school that the researcher observed over an unspecified period of time. In her discussion she states

The interdependence among the children was the most striking quality in this school. The younger children often approached the older children for help with their school work. Urban schools artificially try to create this by setting up peer teaching programs. The younger children commented that one learns more this way because you get help from other kids. The older children learned by teaching others; this is often cited as the most effective way to learn. (p. 101)

Dodendorf also remarked about the "independence of the children (as) was evidenced by the work effort and self-discipline in solitary work at the desk" (p. 102).

In terms of academic achievement, Dodendorf suggests that there is little difference between that of students in rural schools and that of students in urban schools. She says,

The rural teachers believed there were no differences in general academic performance between urban and rural children. This belief was upheld in the data analyses, with one exception. The data . . . (regards) the Metropolitan Achievement Tests (rural) and the SRA (urban) Tests. There were no significant differences on the following subtests: Language, Math, and Science. The Social Studies portion of the Metropolitan Achievement Tests and the SRA showed the urban students to be superior to the rural students. (p. 103)



































































































































































