THE EFFECTS OF HORIZONTAL AND VERTICAL EXPANSION UPON GIFTED HIGH SCHOOL GEOMETRY STUDENTS

By

LORRAINE PROVINE

Bachelor of Science

University of Oklahoma

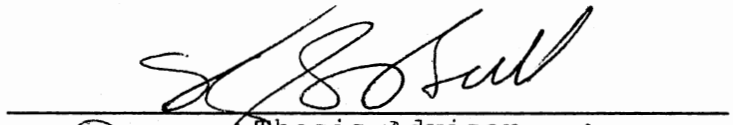
Norman, Oklahoma

1966

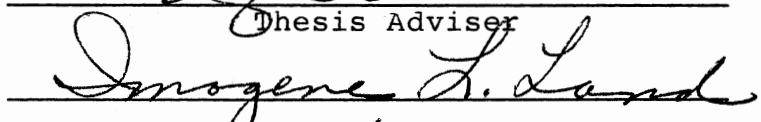
Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
MASTER OF SCIENCE
May, 1988

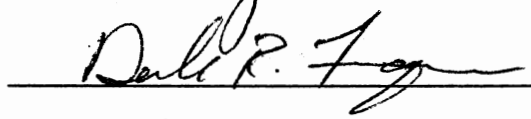
THE EFFECTS OF HORIZONTAL AND VERTICAL EXPANSION UPON GIFTED HIGH SCHOOL GEOMETRY STUDENTS

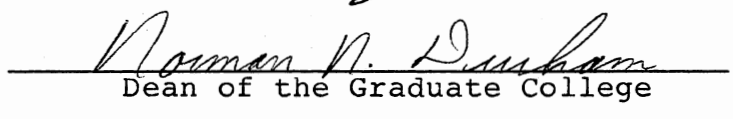
Thesis Approved:



Thesis Adviser







Dean of the Graduate College

ACKNOWLEDGMENTS

I wish to express my appreciation to Dr. K. S. Bull for his helpful assistance to me throughout my graduate school experience. I also wish to express my thanks to Dr. Imogene Land and Dr. Diana Newman for serving on my graduate committee. Their willingness to serve in that capacity and their moral support helped tremendously.

Mr. Bill Hicks, Mr. Paul Ingersol, and Mr. A. Lloyd Gelmers were helpful in allowing me to conduct this research in my classes. I extend my thanks to them, as well as to Mrs. Judith Rogers, Mrs. Roeann Gibson, and other friends who supported and encouraged me in this endeavor.

Finally, I thank my husband, Joe, and my children, Sharon and John, for allowing me time away from family responsibilities to pursue this degree. Their patience and understanding are much appreciated.

TABLE OF CONTENTS

Chapter		Page
I.	THE RESEARCH PROBLEM.	1
	Introduction	1
	Statement of the Problem.	2
	Purpose of the Study.	3
	Statement of the Hypothesis	4
II.	A REVIEW OF RELATED LITERATURE.	6
III.	METHODOLOGY	12
	Subjects	12
	Instruments.	13
	Research Design.	15
	Procedure.	17
	Limitations.	18
IV.	RESULTS	19
V.	SUMMARY, CONCLUSIONS, AND DISCUSSION.	26
	Summary.	26
	Conclusions and Discussion	27
BIBLIOGRAPHY		30
APPENDIX		34
	REGULAR AND DIFFERENTIATED CURRICULUM FOR GEOMETRY BY MOISE & DOWNS (1975).	34
	Section 1. Curriculum.	35
	Section 2. Bloom's Taxonomy Applied to Regular and Differentiated Curriculum.	44
	Section 3. Techniques Employed in Differentiation of Curriculum .	62

LIST OF TABLES

Table		Page
I.	Measures of Central Tendency & Variability: Every Pupil Scholarship Test.	20
II.	Measures of Central Tendency & Variability: Cooperative Mathematics Test: Geometry . .	23

LIST OF FIGURES

Figure		Page
1.	Research Design.	16
2.	Every Pupil Scholarship Test: Pretest	21
3.	Every Pupil Scholarship Test: Posttest.	22
4.	Cooperative Mathematics Test: Geometry, Form B. .	25

CHAPTER I

THE RESEARCH PROBLEM

Introduction

The Greeks, who over two thousand years ago discovered exact geometrical reasoning, were able to turn plausible guesses into concrete knowledge. Euclidean geometry, the first organized discipline of "pure mathematics", has been an integral part of the mathematics curriculum for centuries (Anderson, Garon, & Gremillion, 1966). Consequently, mathematicians have made many startling discoveries that no one would have believed without the benefit of solid proof that geometry provides.

Teaching Euclidean geometry to students gifted in mathematics requires much effort because even though these students may have demonstrated superior abilities in the classroom and elsewhere, they often express feelings of inadequacy. These gifted students often need encouragement and support in their pursuit of academic excellence. The teacher of these students needs to challenge them at the same time he/she enhances the learning opportunities and experiences. Although many studies have been completed involving the gifted and general mathematical ability, few studies have been conducted specifically with geometry

students. This lack of specific studies has lead to this paper.

The objective of this study was to investigate the difference in levels of achievement of gifted students when they are exposed to varied curriculum instructional methods. The purpose was to determine whether or not the varied curricula would make a significant difference in students' learning levels as measured on standardized tests.

Statement of the Problem

The problem to be addressed in this paper is the difference in the level of achievement (measured by standardized geometry test scores) of gifted students in mathematics who receive a differentiated geometry curriculum and those who receive a regular geometry curriculum. The regular curriculum generally consists of teacher explanation of the material covered, demonstration of problems, assignment and discussion of homework problems, and some classroom time for the students to work and receive individual attention. The following day the teacher and students discuss homework problems and perhaps past material is reviewed before the new material is presented. The differentiated curriculum, which consists of the same basic principles as the regular curriculum but with less repetition and incorporation of more difficult problems, allows students to work at a more rapid rate.

Less time is spent on fundamental concepts and more time is allowed for higher level thought processes. Since, theoretically, gifted students learn rapidly and need little or no repetition of subject matter, they become easily bored and distracted by the regular geometry curriculum while the differentiated geometry curriculum should allow these same students to achieve at a higher level of thought, reflected by higher scores on the standardized geometry tests.

Purpose of the Study

The purpose of the study was to explore the two options of classroom procedure and instruction. The second option would employ techniques that could not normally be used successfully in the average classroom. Among the techniques employed (see Appendix) included:

acceleration: going faster through the regular course curriculum

horizontal enrichment: exposure to experiences, material or information unrelated to the regular curriculum and not normally presented

horizontal expansion: provides opportunities to deal with a greater breadth of material related to the objectives or goals of the regular curriculum

vertical expansion: affords opportunities to elaborate upon the regular curriculum through additional allocation of working time, materials, experiences, etc., related to the goals and objectives of the curriculum.

Homework assignments reflected qualitative attributes rather than quantitative ones. Bloom's taxonomy (Bloom, Engelhart, & Furst, 1956), six hierarchical levels of thought processes or ways in which information can be utilized, was employed. The six levels of Bloom's taxonomy are: knowledge, comprehension, application, analysis, synthesis, and evaluation. More attention was directed toward the four upper levels, as indicated in the Appendix.

It was believed that there would be a definite relationship between the success of those students in the differentiated curriculum class and those in the regular class. Success was defined using a standardized geometry test. The need for this study arose due to a greater public awareness of the need to develop appropriate educational opportunities for those students who are gifted.

Statement of the Hypothesis

It is hypothesized that there will be a significant difference in the geometry achievement of those students who received the differentiated curriculum and those students who did not receive the differentiated curriculum.

Students receiving the differentiated curriculum will demonstrate higher scholastic achievement. Differences will be measured by means of a standardized instrument: Educational Testing Service Cooperative Mathematics Test - Geometry, together with the "Every Pupil Scholarship Test in Plane Geometry". It is further hypothesized that there will be no significant loss in the geometry achievement of those gifted students who received the differentiated curriculum.

CHAPTER II

A REVIEW OF RELATED LITERATURE

Though for centuries many cultures have established elaborate competitive examinations to identify their most outstanding citizens, the gifted movement in the United States began in 1868 with the acceleration of rapid learners in the St. Louis schools (Tannenbaum, 1983). In the summer of 1922, the Cleveland Board of Education approved the Major Work program, which became a successful feature in its educational system (Hall, 1956). However, it was not until the late 1950's that American educators really paid much attention to instructional programming for the gifted. This attention, initiated by the launching of the first Russian sputnik (Tidwell, 1980), caused an increase in attention to develop programs for mathematics, the one subject universally taught in education systems (Fehr, 1968).

Newland (1976) pointed out that sensitivity to educational needs of the gifted was at a disturbingly low level among educators in general. The matter of public education for the gifted students has puzzled educators; however, during several recent periods of United States history, programs for educating the gifted learner have been

encouraged (Clark, 1979). Nevertheless, Heid (1983) espouses the opinion that the students most neglected in terms of realizing their potential are students gifted in mathematics. Some hold that standard methods of teaching mathematics are inadequate and inappropriate for teaching gifted learners (Wavrick, 1980) because these learners have the ability to generalize quickly, eliminate intermediate steps in the thinking process (curtailment), and reverse the order of operations (Johnson, 1983). Another key to providing appropriate mathematics education for the gifted student involves limiting the amount of time spent on computation. These students not only comprehend faster; they also have greater retention of that knowledge (Wheatly, 1983). Special fast-paced mathematics classes have been under experimentation for several years, most notably the Study of Mathematically Precocious Youth at Johns Hopkins University (Stanley, Keating, & Fox, 1974). These ideas are used in creating a differentiated geometry curriculum.

Geometry, which has been an integral part of the liberal arts curriculum for thousands of years, was considered by Plato to be an essential part of one's education (Zucker, 1978). Its merits were praised by many famous Americans, among them most notably Abraham Lincoln. Despite this prominence in recent years, recurring questions about the exact role of geometry in the curriculum have been raised by mathematics educators. Substantial differences of opinion are prevalent among

geometry teachers and post-secondary faculties on what to include in a high school geometry course. Some educators even question its continuance as a separate course in the secondary school system. Others have no doubts about its importance, but they question its position in the curriculum sequence. The restructuring of the traditional Euclidean approach to contain other topics, such as coordinate geometry, transformations, and vectors, is also a matter of concern (Suydam and Dessart, 1983). Most of the secondary and post-secondary teachers surveyed (National Council of Teachers of Mathematics, 1981) were in relative agreement concerning the goals of geometry instruction; however, they differed on the specific content of the curriculum. Major course goals are:

To introduce the student to Euclidean geometry with its appropriate definitions, postulates, and theorems, as a mathematical system

To enable the student to read and write using geometry vocabulary

To allow the student to apply algebra to appropriate areas of geometry

To develop a student's intuition and creativity concerning plane and spatial areas of geometry

To empower the student with the ability to write synthetic proofs of exercises and theorems.

The differentiated geometry curriculum proposed by this author covers the same material plus added information of greater depth in the above areas. Some attention is also given to non-Euclidean geometries.

In addition to the concern among mathematics instructors about the content of their course, instructors are often plagued by the inadequacy of criterion measures available. Fehr (1972) advanced the one major goal, to foster intellectual formation, which is usually accepted. More recently, a study of twenty-one curriculum variables was instigated and consideration was given to weaknesses within curriculum theory (Keitel, 1982). In addition there has been much research conducted concerning the use of standardized tests as evaluation and ability level determinators. Whether or not the standardized instrument measures what it is supposed to measure depends upon the particular test and the specific objectives (Epstein, 1973). Teachers must not be so naive as to think that every important outcome in the mathematics classroom is measurable (Wilson, 1973). Although Fey (1969) noted that instructors need to realize that their success in the classroom cannot be tied to their students' achievement on any one standardized test, research into mathematics competency of elementary teachers shows that a correlation exists between teacher competency and their respective students' achievements (Moore, 1965).

Further, another concern which is often ignored is

that of educational acceleration. Mathematically precocious students work better when they are paced at a fast learning rate (Stanley and George, 1978). In the typical classroom, the learning potential of the student is decided before the classroom experience is initiated. The teacher knows exactly what material is to be covered and time is not allotted or allowed for original considerations (Borenson, 1983). Thus, creativity and acceleration, for the most part, are nonexistent. The usual method of instruction throughout the education system at all levels has been a lecture followed by drill and a homework assignment (Meconi, 1967). A textbook should be carefully chosen, as its importance cannot be overemphasized (Nelson, 1965). In general, regularly assigned homework has been found to improve mathematics achievement, although there have been relatively few studies that involve geometry classes (Austin, 1976). The Taylor study (1972) concerned the effects of achievement and attitude toward two different approaches to handling homework in algebra and geometry. The examiner found a negligible correlation between the time spent on homework and the students' attitude toward mathematics. Furthermore, there was a negligible correlation between the time spent on homework and the preference for compulsory or noncompulsory homework.

It is relatively easy to find fault with the traditional course of geometry; however, a remedy for these

difficulties continues to elude educators (Allendoerfer, 1969). Studies such as those conducted by Platt (1968), Sharlow (1971), Wood (1976), and Summa (1982) all have explored various techniques used in geometry education. Mars (1970) concluded that reading comprehension and general intelligence were major contributors to achievement in high school geometry. Later, Walker (1974), studying the value of enrichment material in stimulating achievement of superior high school geometry students, found no significant effect upon the geometry achievement of superior students. However, House (1983) determined ability grouping led to greater curriculum modification.

Payne (1981) espouses the concept that the top priority for many school districts should allow for the designing of a curriculum that would permit the development of potential and the exploration of knowledge. Generally speaking, examining the available studies involving gifted geometry students, one can conclude that the students have been given materials from one or more of the non-Euclidean geometries. Walker (1973) conducted one such study using hyperbolic geometry. He determined no significant difference occurred in the levels of achievement of the participating students. From this limited base of research, no conclusions can be drawn concerning the types of enrichment and/or expansion activities that should be implemented to provide opportunities for gifted learners to meet needs that cannot be addressed in a regular classroom program.

CHAPTER III

METHODOLOGY

Subjects

All students enrolled in Geometry for the 1983-84 academic school year at Ponca City High School were included in the study. The eighth grade Science Research Associates (SRA) mathematics achievement scores were recorded and anyone scoring at or above the 90th percentile was identified as mathematically gifted for the purpose of this study. Of the forty students selected by virtue of their mathematics scores, twenty-four of them were placed in a class which was to receive the geometry curriculum with some basic curricular modifications. The remainder of the students were scheduled into four other geometry classes. All classes were taught by the same instructor. Two of the forty did not actually enroll in geometry at all and two did not remain in geometry (one dropped to a basic geometry course and the other to a unified mathematics class). The remaining thirty-six students were included in the study.

Instruments

The instrument used for selection of students into the study was the Science Research Associates (SRA) Achievement Test in mathematics (Naslund, Thorpe, & Lefever, 1971). The test was administered to the students toward the end of their eighth grade academic school year.

The SRA mathematics achievement test consists of three levels: Grades 4-6, Grades 6-9, and Grades 9-12. The second level, Grades 6-9, was the one used in this study. The mathematics tests give subscores in reasoning, concepts, and computation, plus a total score. Mathematics concepts tested include: recognizing sets and patterns in number sequences, selecting correct operations (add, subtract, multiply, divide) in problem solving, measurement and geometry, place value, and problem solving. The test has many features that are commendable (Buros, 1972). Based upon studies of elementary school curricula, the test was judged to have content validity, as well as construct validity. On the whole, the test was concluded to be better than most available tests, and as reliable as other achievement batteries. The publishers emphasize that the test was constructed to maximize the short term prediction of academic success; therefore, item selection was based with less emphasis on internal consistency. The reliability of the test is in the middle or high .80's for

the total score. The validity studies show the test to be as good a predictive indicator as others in its class.

A plane geometry test, the "Every Pupil Scholarship Test" (1970), was administered to each student who enrolled in geometry for the 1983-84 school year. The test was given during the first week of classes in September, and again during the last week of classes in May. The test was given initially to measure students' previous overall knowledge of plane geometry. The test was determined to have construct validity for that purpose, and was also judged to have face validity and content validity. No reliability studies have been done.

Since the "Every Pupil Scholarship Test" only covered plane geometry, a second test was selected to also be administered as a posttest: Education Testing Service Cooperative Mathematics Test in Geometry (Epstein, Lambert, Myers, & Wilkinson, 1962). This test contains two forms, with Form B being the one used for the posttest. The material covered in the test was presented to all of the geometry classes, so the test was determined to have content validity. The intent of the test is to measure standard Euclidean geometry in terms of concepts, proofs, spatial reasoning, and advanced understandings. The test consists of two parts, each to be completed in a forty minute time period. All classes were administered the test on two consecutive days during the last week of the school year. Reliability was computed by hand using the Kuder-

Richardson Formula 20, with the value for Form B being .90. The test was deemed to be an adequate instrument for testing students in a traditional Euclidean geometry program (Buros, 1972).

Research Design

The design used in this study was the pretest-posttest, control group design (see Figure 1). Though a possible source of invalidity is the pretest-treatment interaction, it is felt that interaction would be minimal due to the duration of the treatment. At the conclusion of the study, students were administered the Education Testing Service Cooperative Mathematics Test in Geometry, which covered both plane and solid geometry. The Every Pupil Scholarship Test was given as a pretest and again as a posttest.

Group	Selection	Pretest	Treatment	Posttest
I	Computer Scheduling	EPST*	Modified Geometry Curriculum	EPST* CMT-G**
II	Computer Scheduling	EPST*	Regular Geometry Curriculum	EPST* CMT-G**

*Every Pupil Scholarship Test - Plane Geometry

**Cooperative Mathematics Test - Geometry

Figure 1. Research Design

Procedure

From the approximately 125 students enrolled in geometry, forty students who scored at the 90th percentile or above on the SRA Achievement Tests in Mathematics were chosen to participate in the study. They were scheduled into five geometry classes, with twenty-four of them being placed in one class, called Honors Geometry, that received differentiated instruction and homework assignments. The other students received the regular curriculum and assignments. The same teacher, who has had experience in teaching both sets of curricula, taught all five classes. Group I was taught the differentiated curriculum, with less homework and more in-depth study, while Group II received the regular curriculum, along with the other students enrolled in the classes.

At the beginning of the year, all students were administered the "Every Pupil Scholarship Test" in plane geometry. The treatment lasted for the school year, September through May. The last week of the school year the students were adminsitered the same test, in addition to the Education Testing Service Cooperative Mathematics Test - Geometry. The latter was administered on two consecutive days during the last week of May.

Limitations

The researcher acknowledged some sampling bias in that students, once identified, were placed in the experimental class via the computer scheduling processes. The Hawthorne effect (Gay, 1981) could have been in evidence because students were not given a choice in their selection for the class, but were informed of the differentiation on the first day of classes.

The researcher also acknowledged possible contamination due to the researcher's familiarity with the subjects, and the normal difficulties that come with working within an established system, thus giving limited or no generalizibility.

CHAPTER IV

RESULTS

The measures of central tendency and variability for the "Every Pupil Scholarship Test" were computed for both the pretest and the posttest (see Table I). As would be expected, the data for the pretest is positively skewed (see Figure 2), while the posttest is mostly negatively skewed (see Figure 3), though no norming data was available to the researcher.

The t test for independent samples was performed on both the pretest and the posttest scores of the "Every Pupil Scholarship Test". There was no significant difference found between the two groups for the pretest, where t_{34} was calculated to be .6; however, for the post-test, t_{33} was calculated to be 2.8, making the results significant at the .01 level.

The measures of central tendency and variability were also computed for the Education Testing Service Cooperative Mathematics Test in Geometry (see Table II). The results showed Group I (the experimental group) to have a mean of 161.5, a mode of 163, and a median of 161. Group II (the control group) had a mean of 158.9, a median of 157.5, and was bimodal, with the two values being 164 and 156. Thus,

TABLE I

MEASURES OF CENTRAL TENDENCY & VARIABILITY

	Every Pupil Scholarship Test		
	Statistic	Pretest	Posttest
Group I Modified Geometry Curriculum N = 22	Mean	13.6	56.6
	Mode	12.0	67.0
	Median	12.5	54.0
	Range	22-5=17	76-44=32
	Standard Deviation	4.3	8.7
Group II Regular Geometry Curriculum N = 12	Mean	12.8	48.4
	Mode	12 & 10	51.0
	Median	12.0	49.5
	Range	22-6=16	61-34=27
	Standard Deviation	4.4	6.5

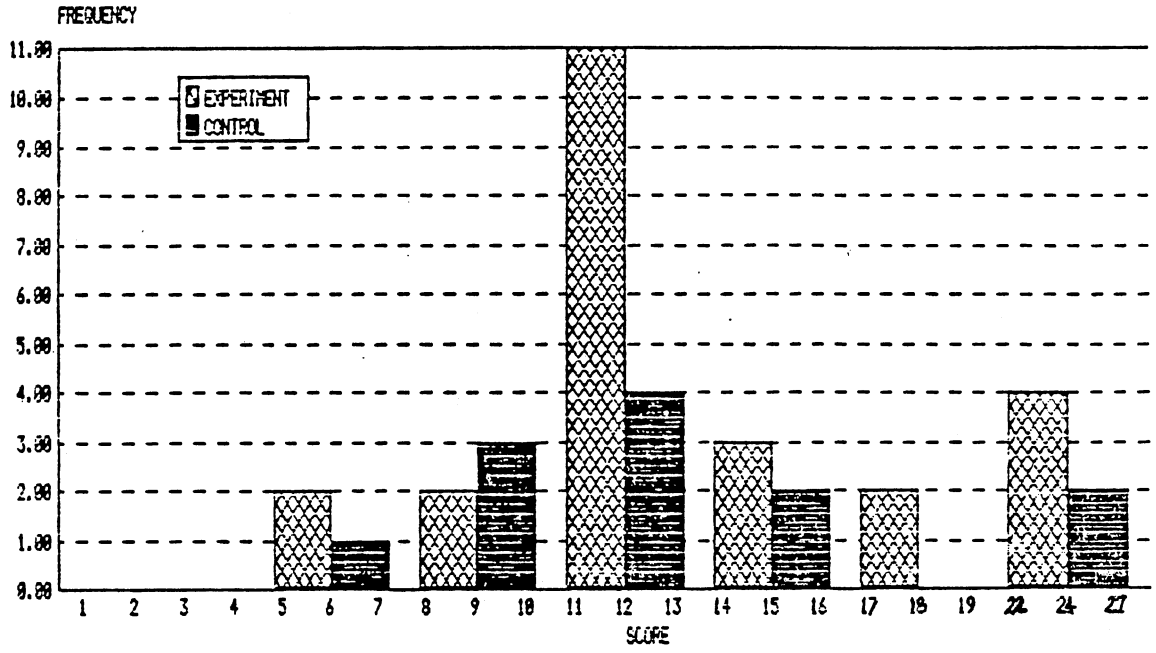


Figure 2. Every Pupil Scholarship Test: Pretest

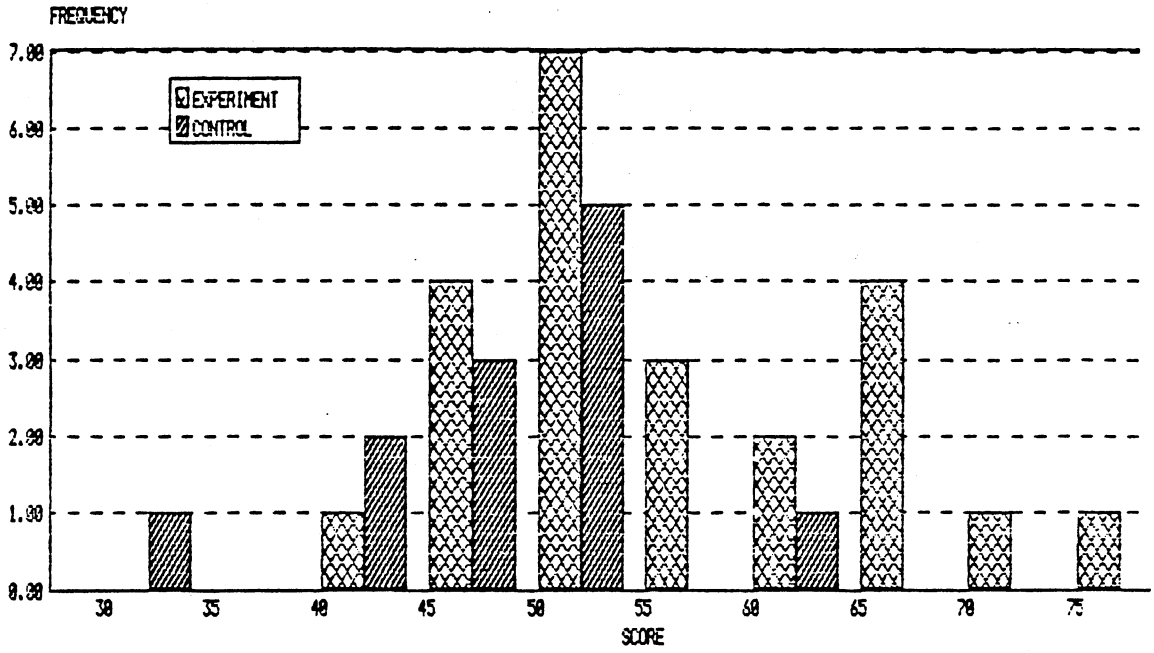


Figure 3. Every Pupil Scholarship Test: Posttest

TABLE II

MEASURES OF CENTRAL TENDENCY & VARIABILITY

Cooperative Mathematics Test: Geometry

	Statistic	Converted Scores
Group I Modified Geometry Curriculum N = 22	Mean	161.5
	Mode	163.0
	Median	161.0
	Range	174-152=22
	Standard Deviation	5.6
Group II Regular Geometry Curriculum N = 12	Mean	158.9
	Mode	164 & 156
	Median	157.5
	Range	170-151=19
	Standard Deviation	5.1
National Norms	Mean	150.0
	Mode	150.0
	Median	150.0
	Standard Deviation	10.0

the assumption of normality has been violated. The standard deviation for Group I was 5.6, and for Group II the standard deviation was 5.1. The national mean for the test is 150, with a standard deviation of 10.0; thus both groups scored higher than the national norms. Figure 4 shows a frequency distribution of the scores. In the experimental group, twenty of the twenty-four students scored in the upper quartile, while in the control group nine of the twelve scored in the upper quartile. All students in both groups scored above the national mean.

The t test applied showed no significant difference in the levels of achievement of the two groups. That conclusion was reached from a calculated value for t_{34} of 1.3.

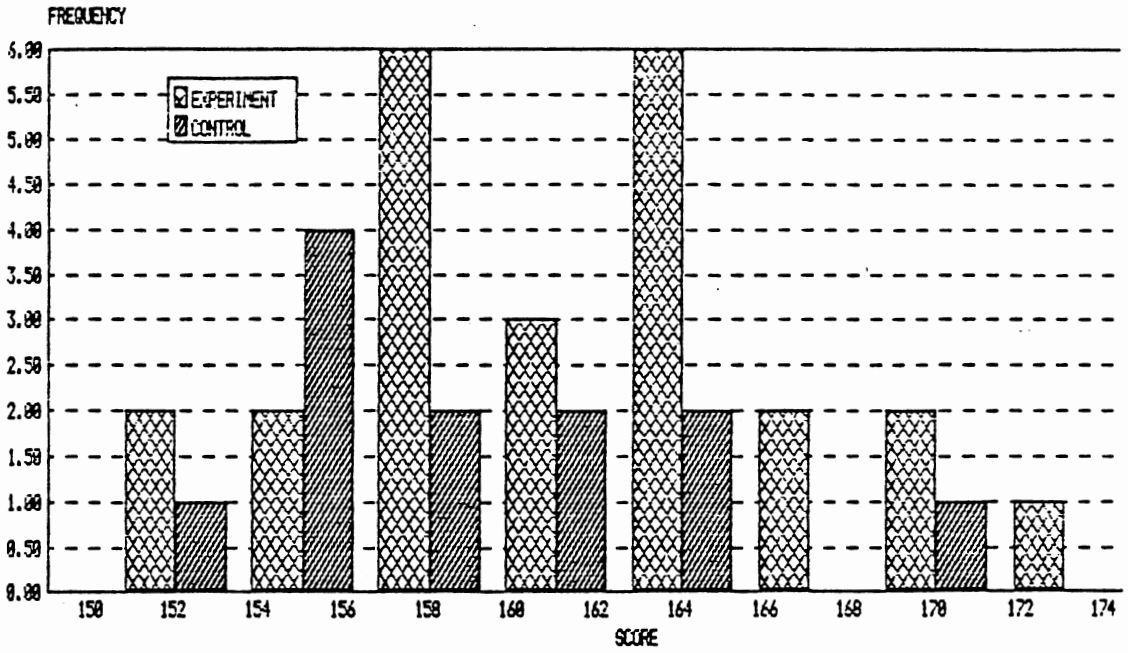


Figure 4. Cooperative Mathematics Test: Geometry, Form B

CHAPTER V

SUMMARY, CONCLUSIONS, AND DISCUSSION

Summary

The purpose of this study was to explore the options of classroom procedure and instruction that could not normally be used successfully in the average classroom. The techniques employed were vertical expansion, horizontal expansion, horizontal enrichment, and acceleration by means of less repetition and homework assignments that were more qualitative than quantitative.

Students were placed in one of five geometry classes via the scheduling process. One class was designated as an honors geometry class and received the differentiated curriculum, while the other four classes received the regular curriculum. All classes were taught by the same instructor.

At the beginning of the school year, all students were administered the "Every Pupil Scholarship Test" in plane geometry to determine how much knowledge the students already had acquired in the subject. Though the scores were low, as would be expected, at least one student had a correct answer for fifty-two of the eighty-nine questions on the test. The t test for significance was calculated,

and there was no significant difference found between the two groups in their levels of achievement on the test.

At the conclusion of the school year, students were once again administered the "Every Pupil Scholarship Test". Every question on the test was answered correctly by at least one student. The t test for significance was calculated for the posttest, and the results were found to be significant at the .01 level, with the experimental group having the greater gain (α = .05).

The Education Testing Service Cooperative Mathematics Test in Geometry, Form B, was also administered to all students at the conclusion of the school year. Employing the t test for significance, no differences were found in achievement levels of the two groups. All questions were once again answered correctly by at least one student, though no student answered all of the questions correctly. All of the information on the test was presented to all classes; however, many of the questions on the test required upper level thought processes to arrive at the correct response. A check of twenty-three such questions revealed that, overall, the experimental group answered correctly 48% of the time, while the control group answered correctly 43% of the time.

Conclusions and Discussion

While the achievement of the two groups on the Cooperative Mathematics Test in Geometry, Form B, showed no

significant difference in the levels of achievement of the two groups of students, the scores on the "Every Pupil Scholarship Test" in plane geometry showed a significant difference. The former test contained not only plane geometry, but also solid geometry. This would indicate that the students in the experimental group made greater gains in the area of plane geometry, while both groups performed equally well in the area of solid geometry. There was certainly no loss in geometry achievement of the experimental group, who received the differentiated curriculum, with less homework and less class repetition of important ideas, thus supporting the idea that gifted students need less repetition in learning basic ideas.

The one major problem that was not addressed in this study was the fact that some students who are gifted in mathematics simply do not like the formal study of mathematics. That fact was not taken into consideration when placing the students into classes where they were required to utilize higher level thought processes. On the other hand, geometry requires the use of upper level thought processes because of the nature of its curriculum, and is consequently required of all students who undertake the course. Both the experimental group and the control group contained approximately half of the students with positive attitudes and half with negative attitudes.

Another area not considered was that of extra-curricular activities which, for the gifted, are generally

multiple. Subsequent absences may occur, causing the students to sometimes fall behind in their classwork. This situation often causes an added burden for both the student and the teacher. Both groups contained several students with excessive absences (ten or more per semester).

Three of the students in the experimental group failed to perform at expected levels of achievement, while in the control group only one student experienced difficulty with the curriculum. In all four cases, poor attitudes toward the subject in general were observed by the teacher. All four were lax in completing homework assignments and did not use class time effectively. It was felt that the students would not have performed acceptably regardless of class placement. It would be advantageous to access mathematics attitudes preceding the study and eliminate those with poor attitudes from the study. Another consideration should be the involvement of the students in extra-curricular activities and their previous attendance records.

More studies are needed in the area of mathematical giftedness as related to geometry. This present study is inadequate as it has limited or no generalizability.

BIBLIOGRAPHY

Allendoerfer, C. B. (1969). The dilemma in geometry. Mathematics Teacher, 62, 165-169.

Anderson, R., Garon, J. & Gremillion, J. (1966). School mathematics geometry. Boston, MA: Houghton Mifflin.

Austin, J. D. (1976). Do comments on mathematics homework affect student achievement? School Science & Mathematics, 76, 159-164.

Bloom, B., Engelhart, M., & Furst, E. (1956). Taxonomy of Educational Objectives. N.Y.: Longmans, Green & Co.

Borenson, J. (1983). Mathematical research in the honors classroom. Mathematics Teacher, 76, 238-244.

Buros, O. K. (Ed.). (1972). The seventh mental measurements yearbook. Highland Park, NJ: Gryphon Press.

Clark, B. (1979). Growing up gifted. Columbus, OH: Charles E. Merrill.

Epstein, M. G. (1973). Standardized tests can measure the right things. Mathematics Teacher, 66, 294-366.

Epstein, M., Lambert, J., Myers, S. & Wilkinson, E. (1962). Education Testing Service Cooperative Mathematics Test in Geometry. Princeton, NJ: Educational Testing Service.

Every pupil scholarship test. (1970). (Available from Bureau of Educational Measurements, Kansas State Teachers College, Emporia, KS).

Fehr, H. (1968). Centers of mathematical pedagogy. Mathematics Teacher, 61, 538-542.

Fehr, H. F. (1972). The forum: What should become of the high school geometry course? The present yearlong course in Euclidean geometry must go. Mathematics Teacher, 65, 102, 151-154.

Fey, J. (1969). Classroom teaching of mathematics, Review of Educational Research, 39, 535-540.

Gay, L. R. (1981). Educational Research: Competencies for Analysis & Application, 2nd Ed. Columbus, OH: Charles E. Merrill.

Hall, T. (1956). Gifted Children. Cleveland, OH: The World Publishing Co.

Heid, J. K. (1983). Characteristics and special needs of the gifted student in mathematics. Mathematics Teacher, 76, 221-226.

House, P. A. (1983). Alternative educational programs for gifted students in mathematics. Mathematics Teacher, 76, 229-233.

Johnson, M. (1983). Too much computation in math for gifted. Gifted Children Newsletter, 4, 7.

Keitel, C. (1982). Curriculum variables, theory and goals: a comment on Begle's critical variables in mathematics education. Educational Studies in Mathematics, 13, 257-267.

Mars, P. (1970). High school geometry achievement as related to reading achievement, arithmetic achievement, and general intelligence in the public schools of Lincoln, Nebraska, 1970). Dissertation Abstracts International, 31A, 1691-92.

Meconi, L. J. (1967). The mathematically gifted student and discovery learning. Mathematics Teacher, 60, 862-865.

Moise, E. & Downs, F. (1975). Geometry. Phillippines: Addison-Wesley.

Moore, R. (1965). The mathematical understanding of the elementary school teacher as related to pupil achievement in intermediate-grade arithmetic (Doctoral dissertation, Stanford University, 1965). Dissertation Abstracts, 26, 213.

Naslund, R., Thorpe, L., & Lefever, D. (1971). SRA achievement series. Chicago, IL: Science Research Associations.

National Council of Teachers of Mathematics Priorities in School Mathematics: Executive Summary of the PRISM Project. (1981). Reston, VA: Author.

Nelson, L. D. (1965). Textbook difficulty and mathematics achievement in junior high school. Mathematics Teacher, 58, 724-729.

Newland, T. E. (1976). The gifted in socioeducational perspective. Englewood Cliffs, NJ: Prentice-Hall.

Payne, J. (1981). Planning mathematics curricula for talented students. Education Digest, 46, 47-49.

Platt, J. (1968). The effect of the use of mathematical logic in high school geometry: An experimental study (Doctoral dissertation, Colorado State College, 1967). Dissertation Abstracts International, 28A, 4544-45.

Sharlow, J. F. (1971). Retroactive and proactive effects of learning certain aspects of symbolic logic on ninth and tenth grade students' understanding of mathematical topics (Doctoral dissertation, State University of New York at Albany, 1971). Dissertation Abstracts International, 32A, 1841.

Stanley, J. C., & George, C. (1978). Now we are six: The ever-expanding SMPY. G/C/T, 1, 9-11, 43-44, 50-51.

Stanley, J., Keating, D., & Fox, L. (1974). Mathematical talent. Baltimore, MD: Johns Hopkins University Press.

Summa, D. J. (1982). The effects of proof format, problem structure, and the type of given information on achievement and efficiency in geometric proof (Doctoral dissertation, Pennsylvania State University, 1981). Dissertation Abstracts International, 42A, 3084.

Suydam, M., & Dessart, D. (1983). Classroom ideas from research on secondary school mathematics. Reston, VA: National Council of Teachers of Mathematics, Inc.

Tannenbaum, A. J. (1983). Gifted children. New York: Macmillan.

Taylor, H. (1972). A comparative study of compulsory homework versus non-compulsory homework in Algebra I and Geometry I at Hillsdale High School (Doctoral dissertation, University of Northern Colorado, 1971). Dissertation Abstracts International, 32A, 3876.

Tidwell, R. (1980). A psycho-educational profile of 1,593 gifted high school students. Gifted Child Quarterly, 24, 63-68.

Walker, J. (1974). The value of non-Euclidean geometries as enrichment for superior high school geometry students (Doctoral dissertation, George Peabody College for Teachers, 1973). Dissertation Abstracts International, 34A, 5002.

Wavrik, J. J. (1980). Mathematics education for the gifted elementary school student. Gifted Child Quarterly, 24, 169-173.

Wheatly, G. H. (1983). A mathematics curriculum for the gifted and talented. Gifted Child Quarterly, 27, 2.

Wilson, J. W. (1973). Standardized tests very often measure the wrong things. Mathematics Teacher, 66, 295-370.

Wood, W. (1976). An experimental study of two approaches to teaching high school geometry (Doctoral dissertation, Iowa State University, 1975). Dissertation Abstracts International, 36A, 6516.

Zucker, A. (1978). Laboratory activities and reading in high school geometry (Doctoral dissertation, Harvard University, 1978). Dissertation Abstracts International, 39A, 2804-2805.

APPENDIX

REGULAR AND DIFFERENTIATED CURRICULUM FOR GEOMETRY BY MOISE & DOWNS (1975)

Section 1. Curriculum

	Regular Curriculum	Differentiated Curriculum
	Chapter 1	
Ch1L1:	p.4: 1-5,7,9,10a,11 p.12: 1,4,5,8,9	p.4: 4-7,10,13 p.12: 9
	Chapter 2	
Ch2L1:	p.20: 1,3,4b,5,9,11, 12,14,15,16 p.26: 1,2,5,6,8,9,11,12	p.20: 3,7,11,15,16 p.26: 2,4,7,8,12
Ch2L2:	p.30: 1-8	p. 30: 3,4,10,11a,b
Ch2L3:	p.32: 1-10	p.35: 1,7,11 p.39: 2,3,5,6,14
Ch2L4:	p.35: 1-13	p.44: 1,4,8,11 p.49: 4,10,11,14
Ch2L5:	p.39: 1-3,5,6,8-15	p.52: 4,8,12 p.53: 4,7,8,10,14,15, 16,21,25,26,27
Ch2L6:	p.44: 1-11	
Ch2L7:	p.49: 1-17	
Ch2L8:	p.52: 1-12	
	Chapter 3	
Ch3L1:	p.60: 1-12	p.60: 3,4,5,7,10,11,12
Ch3L2:	p.63: 1-14	p.63: 1,4,5,10,14
Ch3L3:	p.67: 1-14	p.67: 1-14, omit 7
Ch3L4:	p.72: 1-23, omit 4-6, 15,17,20	p.72: 1,2,5,6,7,10,11, 12,17,19,20

	Regular Curriculum	Differentiated Curriculum
Ch3L5:	p.78: 1-7 p.80: 1-3	p.78: 1-7
Ch3L6:		p.80: 1-11
	Chapter 4	
Ch4L1:	p.86: 1,2,3,5,6,7,9,10, 12,13,15,17,18, 19,21,25,26,27,29	p.86: 2,3,5,7,11,13, 17,18,19,25,30 p.89: 3,4 p.92: 2,8,12,13,14b,h, 17
Ch4L2:	p.92: 1-5,6a,c,7b,g,8, 9(90,135),10(30, 135),11a,c,12b,d, 13,14b,d,15a,16-19,21	p.92: 23,25,Honors P.100: 3,5,7,12
Ch4L3:	p.99: 1-12	p.102: 2,5,6,9,10
Ch4L4:	p.101: 1-10	p.106: 4,7,9,10 p.110: 5,6,8,10
Ch4L5:	p.106: 1-10	p.116: 2,7,8,14
Ch4L6:	p.110: 1-9	p.118: 1-25,39,40
Ch4L7:	p.113: 1-2 p.116: 1-14 odd, omit 13	
Ch4L8:	p.118: 1-25,39	
	Chapter 5	
Ch5L1:	p.126: 1-12	p.126: 1,3,8,11,12
Ch5L2:	p.133: 1-13	p.133: 4,9,11(extra), 13,14 p.139: 1,3 orally p.144: 2,3,4,7,8,10
Ch5L3:	p.139: 1-3 p.143: 1-6	p.146: 11-14 p.148: 1-4
Ch5L4:	p.143: 7-13	p.149: 6,7,8,9,14,15, 18

Regular Curriculum	Differentiated Curriculum
Ch5L5: p.148: 1,5,7,9,11, 13,19	p.153: 3,4,8,9
Ch5L6: p.148: 4,8,10,16, 18,22	p.157: 1,3,5,7,8,10, 11,12
Ch5L7: p.153: 1-7	p.160: 1,4,5
Ch5L8: p.157: 1-12,17	p.158: 6,7,13,14 p.160: 7
Ch5L9: p.160: 1-8	p.164: 4,5,8,11,14, 16,18
Ch5L10: p.164: 1-11 odd (End of 1st nine weeks)	p.166: 15,17,20 p.168: 3,4,9,13
Ch5L11: p.164: 1-12 even	p.173: 8,20,22,23,24
Ch5L12: p.168: 1,3,4,7,10, 13,14	p.170: 7,13,16,18,20, 21,22,26,28
Ch5L13: p.165: 13-16 p.168: 8,9	
Ch5L14: p.170: 10,12,14,22 24,26	
Ch5L15: p.173: 15-18,22,23	
Ch5L16: p.170: 4,6,7,13,16,17 p.173: 8	

Chapter 6

(Skip Sections 1-3 now, and pick up at the end of Chapter 9)

Ch6L1: p.192: 1-14	p.192: 2,4,7,8,10,17
Ch6L2: p.198: 1-17 odd	p.198: 3,4,6,9,10,11, 12,18,19,20 (End of 1st nine weeks)
Ch6L3: p.198: 2-16 even	p.208: 4,5,11 p.200: 19,20
Ch6L4: p.207: 2-13, omit 8,10	p.209: 12,14

Regular Curriculum	Differentiated Curriculum
Chapter 7	
Ch7L1: p.212: 1-10	p.212: 3,6,7,10 p.215: 1,7
Ch7L2: p.215: 1-11,14	p.215: 4,11,14 p.220: 3,5,6,7,9,10, 12,13
Ch7L3: p.219: 1-4,7,9,11	p.224: 4,5,6,8,9,10
Ch7L4: p.219: 5,6,8,10,12,13	p.226: 8,10,11,14,15, 16,18
Ch7L5: p.223: 1-10	p.231: 3,6,8,9,12,13
Ch7L6: p.226: 1-12,16	p.234: 3,5,8,11,13,14
Ch7L7: p.230: 1-9	p.237: 2,6,10,11,12
Ch7L8: p.226: 13,14,15 p.234: 1-4,6,7	
Ch7L9: p.234: 2,3,5,8-10	
Ch7L10: p.237: 1-5	
Ch7L11: p.239: 1,4-8,10	
Chapter 8	
Ch8L1: p.244: 1-11	p.244: 1,6,10,13
Ch8L2: p.247: 1-11	p.247: 2,3,5,7,10
Ch8L3: p.251: 1-9	p.251: 3,4,8,9,10
Ch8L4: p.257: 1-14	p.257: 1,5-9,11,13,15, 16,Honors
Chapter 9	
Ch9L1: p.266: 1-13	p.266: 3,6,10,13,14
Ch9L2: p.271: 1-8	p.269: Honors p.271: 2,3,6,7,8

Regular Curriculum	Differentiated Curriculum
Ch9L3: p.275: 3,4,6-10,12	p.275: 1,5,6,8,11,13 15,16,17
Ch9L4: p.279: 1-15	p.279: 2-4,6,10,12,16, 17
Ch9L5: p.285: 1,3,6,10,11,13 15,16,21	p.285: 3,4,11,14,15,21
Ch9L6: p.285: 2,4,12,14 p.289: 4,5,7,8,9,10,12	p.289: 5,8,9,10,14
Ch9L7: p.292: 1-10	p.292: 4,8,9,12
Ch9L8: p.296: 1-9, omit 4	p.296: 2,3,6,7,10,11, Honors

Indirect Proof and Logic Problems; go back to Chapter 6:1-3
2 Handouts
p.180: 5-7,10,11
p.208: 10
End of first semester

Chapter 10

Ch10L1: p.311: 1-13 make a dihedral angle	p.311: 1,4,5,7,9,11,13
Ch10L2: p.317: 1-12	p.317: 2,5,6,8,10,11, 12
Ch10L3: p.323: 1-11, omit 9	p.323: 2,4-8,10,11
Ch10L4: p.325: 1-9, omit 7	p.325: 3,4,9,10 End of first semester

Chapter 11

Ch11L1: p.334: 1-8	p.334: 1,5,6,8,9,11, 14,15,16,17,20, 22
Ch11L2: p.335: 9-20, omit 18	p.341: 3-5,7,8c,9,10, 11c,12,13,15c,e
Ch11L3: p.341: 1-12	p.343: 17,18,20,23,24 p.347: 1,3-7,10

Regular Curriculum		Differentiated Curriculum	
Ch11L4:	p.342: 13-24	p.348:	11,12,15-18,20 22-27, Honors
Ch11L5:	p.347: 1-10, omit 7,8	p.352:	3-7,9,10
Ch11L6:	p.347: 11-22	p.352:	13,14,16,17,19-23,25,27
Ch11L7:	p.352: 1-12	p.356:	1,3,6-18,22,25
Ch11L8:	p.353: 13-24		

Chapter 12

Ch12L1:	p.365: 1-14	p.365:	2b,c,3d,4a,b,d, 6,7,9,11-14,17, 18,21
Ch12L2:	p.370: 1-9,14	p.370:	2,3,6,9,11,13, 14,16,17,19
Ch12L3:	p.370: 10-13,15-17	p.375:	1,3a,d,4d,7-12, 14,15,17,19-25
Ch12L4:	p.375: 1-8	p.382:	2-22,25,omit 3, 7,11,13,18
Ch12L5:	p.375: 9-19, omit 17	p.388:	2-5,8,11,12, Honors
Ch12L6:	p.382: 1,2,4,5,7-12, 14	p.392:	2-14, omit 7
Ch12L7:	p.388: 1-12	p.396:	1-3,4b,5c,6,8, 10-13,15,18,19, 21,23,24,Honors
Ch12L8:	p.392: 1-12, omit 10		
Ch12L9:	p.396: 1-3,4a,5b,8-10, 14,15,22		

Chapter 13

Ch13L1:	p.406: 1-15	p.406:	12-20
	p.411: 1-13	p.411:	3,5,7,10,13,14, 15,18
Ch13L2:	p.417: 1-16	p.417:	4,6,9,10,12,14, 15

Regular Curriculum	Differentiated Curriculum
Ch13L3: p.422: 1-15	p.422: 1,3,5,6,9,10, 11,14-16
Ch13L4: p.425: 1-12	p.425: 3,5,10,11,13-15,18
Ch13L5: p.429: 1-11	p.429: 3,4,6,9,11,12, 14,15
Ch13L6: p.435: 1-4	p.435: 2-4,6,7,10
Ch13L7: p.435: 5-8, handout	p.438: 2,6,7,9-13,15, 16
Ch13L8: p.438: 1-13	p.444: 2a,d,3b,e,f,5-17, omit 10
Ch13L9: p.444: 1-14	End of third nine weeks
Ch13L10: p.447: 1-15	

Chapter 14

Ch14L1: p.452: 1-12	p.452: 2,3,6,7,10
Ch14L2: p.455: 1-15	p.455: 4,8-10,13-17
Ch14L3: p.460: 1-5,8-10	p.460: 2,4,9,12,13
Ch14L4: p.465: 1-11	p.465: 4,5,8,11,12
Ch14L5: p.469: 1-10, omit 8	p.469: 3,6,8,9 p.474: 4,6,9,11,16,17, 20
Ch14L6: p.474: 1-6,9,17 End of third nine weeks	p.478: 3,4,6,7,11b,d, 13b,e,15,18,21-23
Ch14L7: p.478: 2-5,7,11,13, 15,18,22	p.484: 4,6-8,10,13,15-18,21,22
Ch14L8: p.484: 2-4,6,10,12, 15-17	p.492: 3,6,7,10,12,15, 17,18,21,13,25, 28,34
Ch14L9: p.492: 1,2,5,6,10-13, 18,23,24	

Regular Curriculum	Differentiated Curriculum
Chapter 15	
Ch15L1: p.502: 1-8 all, 9-22 odd	p.502: 1-25 odd p.506: 2,5,8,11,12
Ch15L2: p.506: 1-12	p.509: 1-3,6,7,9-11 p.512: 2,3,12
Ch15L3: p.509: 1-9	p.513: Honors p.515: 2-8
Ch15L4: p.512: 1-8,11	p.521: 1,2,4,6-8
Ch15L5: p.515: 1-8	p.524: 2-12
Ch15L6: p.521: 1-8, omit 6	p.524: 13-24
Ch15L7: p.524: 1-10	p.527: 1-14
Ch15L8: p.524: 11-19	p.531: 1-13,17,19
Ch15L9: p.527: 1-13	
Ch15L10: p.531: 1,2,4 p.532: 1,3,6,7,8,10, 11b,12,13a,14	
Chapter 16	
Ch16L1: p.537: 1-14	p.537: 9,10,14 p.540: 6,7,10-15,17,18
Ch16L2: p.540: 1-15	p.544: 5-14, omit 7,8
Ch16L3: p.544: 1-13, omit 8,9	p.547: 2,4,5,7-15, omit 10
Ch16L4: p.547: 1-10	p.552: 2,5,6,8,9,12, 13,15-18
Ch16L5: p.548: 11-15	
Ch16L6: p.552: 1-10	
Ch16L7: p.552: 11-18	
Ch16L8: p.554: 2,5-8,10-14, 17-19	

Regular Curriculum	Differentiated Curriculum
Chapter 19	
Ch19L1: p.629: 1-12, omit 5,9	p.629: 2,4,6,8,11
Ch19L2: p.634: 1-13, omit 3,11	p.634: 5-7,9,10,13,14, Honors p.629: 12-14
Ch19L3: p.641: 1-15	p.641: 3-16
Ch19L4: p.647: 1-12	p.647: 2,4,5,6,8,10
Ch19L5: p.652: 1-15	p.652: 2,4,6,9,11
Chapter 17	
Ch17L1:	p.559: 1-12,16,19, Honors
Ch17L2:	p.564: 1-5,8,9,12,13, 17-19
Ch17L3:	p.569: 1-5,9
Ch17L4:	p.572: 1-7

Section 2. Bloom's Taxonomy Applied to Regular (RC) and Differentiated (DC) Curriculum

			Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
CHAPTER 1:								
Ch1L1	RC	p.4	1-2-3a	3b	4a-7b-11	4b-5-7a-10a		7c-9a-d
	DC				4a-7b-10b	4b-5-6a-7a-10a-13		6b-7c-10c
	RC	p.12	1a-4		1b-e-8	5a-c-9		
	DC					9		
CHAPTER 2:								
Ch2L1	RC	p.20		4b-5	1-3-9-11-12-14-15a	15b-c		15d-16
	DC				3-7-11-15a	15b-c		15d-16
	RC	p.26		5-6-11	1-2-8-9a-c-12			
	DC				2-7-8-12		4	
Ch2L2	RC	p.30		1	2-3-4-5-6-7	8		
	DC				3-4	10	11a-b	
Ch2L3	RC	p.32		1-2	6-9-10	3-7	4	5-8
	*DC							
	DC	p.35			7	11		1
		p.39			2-3-5-6	14		
Ch2L4	RC	p.35			2-3-5-6-7-8-9-10	11-12-13		1-4
	DC	p.44			1	4	8	11
		p.49			10-11-14	4		

*Acceleration (Acc) begins with Ch2L3 and continues from that point on.

			Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
CHAPTER 2 (continued):								
Ch2L5	RC	p.39	1		2-3-5-6-8-9-11	10-12-14-15		
	DC	p.52			4-8			12
		p.53		7	4-8-10-14-15-16-21-25-26		27	
Ch2L6	RC	p.44			1-5-6-7	2-3-4-9-10	8	11
	DC	(Acc.)						
Ch2L7	RC	p.49	12		1-2-3-5-10-11-13-14	4-6-7-8-9-15-17		16
	DC	(Acc.)						
Ch2L8	RC	p.52			1-2-3-4-5-6-7-8-9-12	10		11
	DC	(Acc.)						
CHAPTER 3:								
Ch3L1	RC	p.60		5	1-2-3-4	6-7-8-11		9-10-12
	DC			5	3-4	7-11		10-12
Ch3L2	RC	p.63		3	1-2-7-9-10-11	4-5-6-14	8-12	13
	DC				1-10	4-5-14		
Ch3L3	RC	p.67		4-5-8-9-10	1-3-6-7	11-13		2-12-14
	DC			4-5-8-9-10	1-3-6	11-13		2-12-14
Ch3L4	RC	p.72	9	10	1-3-7-8-11-12-13-14-16-18	2-19-21-22		23
	DC				1-6-7-11-12-17	2-5-19-20		

			Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
CHAPTER 3 (continued):								
Ch3L5	RC	p.78				2-3-4-5-6-7		1
	DC					2-3-4-5-6-7		1
	RC	p.80	1	2-3				
Ch3L6	DC	p.80	1	2-3	9	4-5-6-7-8-11		10
CHAPTER 4:								
Ch4L1	RC	p.86	1-2	3-6-10	5-9-12-18-21-25-26	7-13-15-17-19-27-29		
	DC		2	3-11	5-18-25	7-13-17-19-30		
	DC	p.89	3	4				
	DC	p.92		2	12-13-14b-14h-17	8		
Ch4L2	RC	p.92	3-4	1-2-11a-11c	5-6a-6c-7b-7g-9-10-12b-12d-13-14b-14d-15a-16-17-18-19	8-21		
	DC				23-25	Honors		
	DC	p.100		3-5	7		12	
Ch4L3	RC	p.99		1-2-3-4-5-8	6-7-9-10-11		12	
	DC	p.102		2	5-6-9-10			
Ch4L4	RC	p.101		1-2-3	4-5-6-7-8-9-10			
	DC	p.106			4-9		7-10	

			Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
CHAPTER 4 (continued):								
Ch4L4	DC	p.110			5-8	6-10		
Ch4L5	RC	p.106			1-2-3-4-5-6-9	8	7-10	
	DC	p.116			2-7		8-14	
Ch4L6	RC	p.110		1-4	2-3-5-7-8-9	6		
	DC	p.118 (Acc.)	1-2-3-4-5-6-7-8-9-10-11-12-14	13-15-17-18-19-20-21-22-23-25	16-24		39-40	
Ch4L7	RC	p.113		1	2			
	RC DC	p.116 (Acc.)			1-7	3-5	9-11	
Ch4L8	RC	p.118	1-2-3-4-5-6-7-8-9-10-11-12-14	13-15-17-18-19-20-21-22-23-25	16-24		39	
	DC	(Acc.)						
CHAPTER 5:								
Ch5L1	RC	p.126		1	3-4-5-6-7-9-10	8-11-12		
	DC			1	3	8-11-12		
Ch5L2	RC	p.133	1	2-5	3-4-6-7-8-9-10-12		11-13	
	DC				4-9	14	11-13	
	DC	P.144			2	3	4-7-8-10	
Ch5L3	RC	p.139		1-2-3				
	RC	p.143			1-2-5	3	4-6	

			Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
CHAPTER 5 (continued):								
Ch5L3	DC	(Acc.) p.146					11-12-14	13
	DC	p.148			1-2-3		4	
Ch5L4	RC	p.143					7-8-9-10-11-12	13
	DC	(Acc.) p.149					8-9-14-15-18	6-7
Ch5L5	RC	p.148			1		5-9-13-19	7-11
	DC	(Acc.) p.153					3-4-8-9	
Ch5L6	RC	p.148					4-8-10-16-18-22	
	DC	(Acc.) p.157		1	11-12		3-7-10	5-8
Ch5L7	RC	p.153		1			2-3-4-5-6-7	
	DC	(Acc.) p.160		1-4-5				
Ch5L8	RC	p.157		1-4	11-12		2-3-6-7-9-10-17	5-8
	DC	(Acc.) p.158					6-7-13-14	
	DC	p.160			7			
Ch5L9	RC	p.160		1-2-4-5	6-7-8			3
	DC	(Acc.) p.164			4		5-8-11-14-16-18	
Ch5L10	RC	p.164			1		3-5-7-9-11 (End of first nine weeks)	
	DC	(Acc.) p.166					15-17	20
	DC	p.168					3-4-9-13	

			Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
CHAPTER 5 (continued):								
Ch5L11	RC	p.164			4		2-6-8-10-12	
	DC	(Acc.) p.173				20	8-22-23-24	
Ch5L12	RC	p.168		1			3-4-7-10-13-14	
	DC	(Acc.) p.170					7-13-18-20-21-22-26-28	16
Ch5L13	RC	p.165 p.168					13-14-15-16 8-9	
	DC	(Acc.)						
Ch5L14	RC	p.170					10-12-14-22-24-26	
	DC	(Acc.)						
Ch5L15	RC	p.173					15-16-17-18-22-23	
	DC	(Acc.)						
Ch5L16	RC	p.170 p.173					4-6-7-13-17 8	16
CHAPTER 6:								
Ch6L1	RC	p.192		6	1-2-3-8-9-11	4-5-7-13	10-12-14	
	DC				2-8	4-7	10-17	
Ch6L2	RC	p.198			1		3-7	5-9-11-13-15-17
	DC						3-4	5-6-9-10-11-12-18-19-20
						(End of 1st 9 weeks)		

			Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
CHAPTER 6 (continued):								
Ch6L3	RC	p.198			2-16		4-8	6-10-12-14
	DC	p.208			4	5		11
		p.200						19-20
Ch6L4	RC	p.207	2-3		4-6	5	7-9-13	11-12
	DC	p.209						12-14
CHAPTER 7:								
Ch7L1	RC	p.212			1-2-4	3-5-6-9		7-8-10
	DC					3-6		7-10
		p.215		1			7	
Ch7L2	RC	p.215		1-2-3			4-5-7-9-10-11-14	6-8
	DC						4-11-14	
		p.220		3			7-9-10-12-13	5-6
Ch7L3	RC	p.219	1	2-3			4-7-9-11	
	DC	p.224	4	5-6			8-9-10	
Ch7L4	RC	p.219				8	10-12-13	5-6
	DC	p.226			16	10-11	8-14-15-18	
Ch7L5	RC	p.223	1				2-3-4-5-6-7-8-9-10	
	DC	p.231			8	3-9	6-13	12
Ch7L6	RC	p.226			1-2-3-4-5-6-7-16	10-11-12	8-9	
	DC	p.234			3		5-11-13-14	8
Ch7L7	RC	p.230		1-2	7-8	3-4-9	5-6	
	DC	p.237			2		10-11-12	6

			Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
CHAPTER 7 (continued):								
Ch7L8	RC	p.226					13-14-15	
		p.234			1-2-3-4-		6-7	
	DC	(Acc.)						
Ch7L9	RC	p.234			2-3		5-9-10	8
	DC	(Acc.)						
Ch7L10	RC	p.237			2-3-4	1	5	
	DC	(Acc.)						
Ch7L11	RC	p.239		4	1-6		5-7-8-10	
	DC	(Acc.)						
CHAPTER 8:								
Ch8L1	RC	p.244	2	1-7-8-9		3-4-5	10-11	
	DC			1			10	6-13
Ch8L2	RC	p.247		1	3	6-7-8-9	2-4-10	5-11
	DC				3	7	2-10	5
Ch8L3	RC	p.251		1-2-3-6	4-5-8-9			7
	DC			3	4-8-9		10	
Ch8L4	RC	p.257	2-3-4			1-8	9-10-11-12-13	14
	DC					1-8	9-11-13 (15-16-Honors)	5-6-7
CHAPTER 9:								
Ch9L1	RC	p.266	1-2	3-5-8	4-7-9		6-10-12-13	11
	DC			3			6-10-13-14	
Ch9L2	RC	p.271	1		6-7		2-3-4-5-8	
	DC				6-7		2-3-8	
		p.269					Honors	

			Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
CHAPTER 9 (continued)								
Ch9L3	RC	p.275			6		3-4-7-8-9-10-12	
	DC				6-13		1-5-8-11-16-17	15
Ch9L4	RC	p.279			1-4-6-7	2-3-8	9-10-12-13-14	5-11-15
	DC				1-4-6	2-3	10-12-16-17	
Ch9L5	RC	p.285	1		3	15	6-10-11-13-16	21
	DC				3-4-14	15	11	21
Ch9L6	RC	p.285		2	4-12-14			
		p.289			4	5-9	7-8-12	10
	DC				5-9	8-14	10	
Ch9L7	RC	p.292			1-2-3-5-6-8	4	7-9-10	
	DC				8	4	9-12	
Ch9L8	RC	p.296			1-7	9	2-3-5-6-8	
	DC				7 (11-Honors)		2-3-6- (10-Honors)	
INDIRECT PROOF:								
	RC	All - Ap/S Handout 1		All - Ap/S Handout 2				
	DC			Handout 2				
	RC	p.180					5-6-7-10-11	
	DC						5-6-7-10-11	
	RC	p.208					10	
	DC						10	

RC Logic Problems -- Varying in Difficulty - E End of first semester

DC Logic Problems

			Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
CHAPTER 10:								
Ch10L1	RC	p.311		Make dihedral angle	1-2-4-5-8-9	3-11	6-7-10-13	12
	DC				1-4-5-9	11	7-13	
Ch10L2	RC	p.317	1-2-3		4-6-7	10-11	5-8-12	9
	DC		2		6	10-11	5-8-12	
Ch10L3	RC	p.323		1-2	3-6	4-5	7-10	8-11
	DC			2	6	4-5	7-10	8-11
Ch10L4	RC	p.325	1			3-4-5-6	2-8-9	
	DC			(End of first semester)		3-4	9	10
CHAPTER 11:								
Ch11L1	RC	p.334		1	2-7	4-5-6-8	3	
	DC			1	16-17	5-6-8-9-11-14-15		20-22
Ch11L2	RC	p.335			16-17	9-10-11-14-15	12-13-19	20
	DC	p.341			7-8c-9-10-11c-12-15c-15e		3-4-5-13	
Ch11L3	RC	p.341			1-2-6-7-8-9-10-11-12		3-4-5	
	DC	p.343			20		17-18-24	23
		p.347			1-3-4-5-7-10	6		
Ch11L4	RC	p.342			14-15-19-20-22		13-16-17-18-21-24	23
	DC	p.348			11-12-17	15-16-22-25-26-27	18-20-23-24-Honors	

			Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
CHAPTER 11 (continued):								
Ch11L5	RC	p.347			1-2-3-4-5-9-10	6		
	DC	p.352		4-5-6	3-7-10	9		
Ch11L6	RC	p.347			11-12-13-17-19-22	14-15-16-21	18-20	
	DC	p.352			13-16-21	20-23	14-17-19-22-27	25
Ch11L7	RC	p.352		1-2-4-5-6	3-7-8-10-11-12	9		
	DC	p.356	1		3-6-7-8-9-10-22	11-12-13-14-15-16-18-25		17
Ch11L8	RC	p.353			13-15-16-21	20-23-24	14-17-18-19-22	
	DC	(Acc.)						
CHAPTER 12:								
Ch12L1	RC	p.365		1-2a-c-3a-d-4a-d-5-6-7-8	9-10-12-13-14		11	
	DC			2b-c-3d-4a-4d-6-7	9-12-13-14-17-18	11-21		
Ch12L2	RC	p.370		1	2-3-4-5-6-7-8-9			14
	DC				2-3-6-9	11	13-16-17-19	14
Ch12L3	RC	p.370			11	10-12-13-15-16-17		
	DC	p.375		1	3-4-7-8-9-12-22	10	11-14-15-17-19-20-21-25	23-24
Ch12L4	RC	p.375		1-2	3-4-5-6-7-8			
	DC	p.382			5-8-12-17	9-10	2-4-6-14-15-16-19-20-21-25	22

			Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
CHAPTER 12 (continued):								
Ch12L5	RC	p.375			9-12-13-16	10-18	11-14-15-19	
	DC	p.388	2		4-Honors	11	3-5-8-12	
Ch12L6	RC	p.382			5-7-8-11-12	9-10	1-2-4-14	
	DC	p.392			2-3-4-5-11-13	14	6-8-9-10-12	
Ch12L7	RC	p.388	1-2		4-7	11	3-5-6-8-9-12	10
	DC	p.396		1	2-3-8-10-23	4b-5c-6-11-15-24	12-13-18-19-21-Honors	
Ch12L8	RC	p.392			1-2-3-4-5-11		6-7-8-9-12	
	DC	(Acc.)						
Ch12L9	RC	p.396		1	2-3-8-9-10-22	4a-5b-14-15		
CHAPTER 13:								
Ch13L1	RC	p.406	1-2	3-8-9	4-5-6-7	10-14-15	11-12-13	
	DC				17-18	14-15-19-20	12-13-16	
	RC	p.411	1		2-3-4-5-6-7-8-11	10-12	9	13
	DC				3-5-7	10-14-15	18	13
Ch13L2	RC	p.417	1-2	4-5	3-6-7-8-10-11	12-13-14-15-16		9
	DC			4	6-10	12-14-15		9
Ch13L3	RC	p.422	1	2	3-4	7-8-9-10-13-14-15	5-6-11-12	
	DC		1		3	9-10-14-15-16	5-6-11	

			Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
CHAPTER 13 (continued)								
Ch13L4	RC	p.425	1		2-3-4-6-9	10-11-12	5-7-8	
	DC				3-14	10-11-13-15	5-18	
Ch13L5	RC	p.429	1	2-3-4	5-6-8-9-10-11	7		
	DC			3-4	6-9-11-15	15	12	
Ch13L6	RC	p.435			1		2-3-4	
	DC						2-3-4-6-7-10	
Ch13L7	RC	p.435					5-6-7-8-Handout	
	DC	p.438		2	10-11-15-16	6-7-9	12-13	
Ch13L8	RC	p.438	1	2-3	4-5-10-11	6-7-8-9	12-13	
	DC	p.444	2-6	5	3-7-11-13-14-15-17	8-16	9-12	End of third nine weeks
Ch13L9	RC	p.444	2-6	1-5	3-7-11-13-14	4-8-10	9-12	
	DC	(Acc.)						
Ch13L10	RC	p.447		1	2-3-4-6-9-11	13-14-15	5-7-8-10-12	
	DC	(Acc.)						
CHAPTER 14:								
Ch14L1	RC	p.452	1-2-8		4	3-6-7-9	5-10-11-12	
	DC		2			3-6-7	10	
Ch14L2	RC	p.455	1	2-3		6-7-9-10	4-5-8-12-13-14-15	11
	DC					9-10	4-8-13-14-15-16-17	

			Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
CHAPTER 14 (continued):								
Ch14L3	RC	p.460			1-2-3-4-9-10	8	5	
	DC				2-4-9			12-13
Ch14L4	RC	p.465		1-2-3	4-5-8	6	7-11	9-10
	DC				4-5-8		11	12
Ch14L5	RC	p.469	1	2-6	3-4-9		5-7	10
	DC			6	3-9		8	
	DC	p.474			4		6-9-11-16-17-20	
Ch14L6	RC	p.474		1-2-3	4-5		6-9-17	End of third nine weeks
	DC	p.478			3-7-11b-11d-13b-13e-15	4-23	6-18-21-22	
Ch14L7	RC	p.478			3-7-11-13-15	4-5	2-18-22	
	DC	p.484			4-7-8-10-13-15-16-17-18	21-22		
Ch14L8	RC	p.484			2-4-10-12-15-16-17	3	6	
	DC	p.492		3	6-7-10	12-25-28	15-17-23-34	18-21
Ch14L9	RC	p.492	1-2-5		6-10	11-12	13-23-24	18
	DC	(Acc.)						
CHAPTER 15:								
Ch15L1	RC	p.502				1-2-3-4-5-6-7-8-9-11-13-15-17-19-21		
	DC					1-3-5-7-9-11-13-15-17-19-21-23-25		

			Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
CHAPTER 15 (continued):								
Ch15L1	DC	p.506		2		5-8-11-12		
Ch15L2	RC	p.506		1-2		3-4-5-6-7-8-11-12	10	9
	DC	p.509			1	2-3-6-7	9-10-11	
	DC	p.512				2-3	12	
Ch15L3	RC	p.509			1	2-3-5-6-7-8	9	4
	DC	p.513						Honors
	DC	p.515			4-5		2-3-6-7-8	
Ch15L4	RC	p.512				1-2-3-4-5-6-8-11		7
	DC	p.521		1-2	4	8	6	7
Ch15L5	RC	p.515		1	4-5		2-3-6-7-8	
	DC	p.524			9-11	2-3-4-5-6-7-8-10-12		
Ch15L6	RC	p.521		1-2-3	4-5	8		7
	DC	p.524				13-14-15-16-17-18-19-20-23	21-24	22
Ch15L7	RC	p.524			1-9	2-3-4-5-6-7-8-10		
	DC	p.527		1-2-3-4	5	6-8-9-10-11-12-13	14	7
Ch15L8	RC	p.524			11	12-13-14-15-16-17-18-19		
	DC	p.532			6-9	1-2-3-4-5-7-8-10	11-12-13-17-19	

			Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
CHAPTER 15 (continued);								
Ch15L9	RC	p.527		1-2-3-4	5	6-8-9-10-11-12-13		7
Ch15L10	RC	p.531				1	4	2
	DC	(Acc.)						
	RC	p.532			6	1-3-7-8-10	11b-12-13a	14
CHAPTER 16:								
Ch16L1	RC	p.537		1-2-5-6	3-7-9-10-14	12	8-11-13	4
	DC				9-10-14			
	DC	p.540			6-7-10-11-12-13-18	15	17	14
Ch16L2	RC	p.540		3	1-2-4-6-7-9-10-11-12-13	5-15	8	14
	DC	p.544			5-6	13	9-10-11-12-14	
Ch16L3	RC	p.544		1-4	2-3-6-7	5-13	10-11-12	
	DC	p.547			2-4-5-7-8-9-11-15			12-13-14
Ch16L4	RC	p.547			1-2-3-4-5-7-8-9-10		6	
	DC	p.552			2-5-6-8-9-13-15-16-17-18	12		
Ch16L5	RC	p.548			11-15			12-13-14
	DC	(Acc.)						
Ch16L6	RC	p.552		6	1-2-3-4-5-7-8-9-10			
	DC	(Acc.)						

			Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
CHAPTER 16 (continued):								
Ch16L7	RC DC	p.552 (Acc.)			11-13-14-15	12	16-17-18	
Ch16L8	RC	p.554		5	2-6-7-8-10-11-12-13-14		18-19	17
	DC	(Acc.)						
CHAPTER 19:								
Ch19L1	RC	p.629		1	2-3-4-6-8-10-11-12			7
	DC				2-4-6-8-11			
Ch19L2	RC	p.634	1-2		4-5-6-7-8-10		9-12-13	
	DC				5-6-7-10		9-13-14	Honors
	DC	p.629			12-13-14			
Ch19L3	RC	p.641			1-2-3-6-10-12-14-15	4-7-13	5-8-9-11	
	DC				3-6-10-12-14-15-16	4-13	5-8-9-11	
Ch19L4	RC	p.647			1-2-5-6-8-9-10	3-4-7-11-12		
	DC				2-5-6-8-10	4		
Ch19L5	RC	p.652			1-4-5-9-10-11-12-15	2-3-6-7	8-13-14	
	DC				4-9-11	2-6		
CHAPTER 17:								
Ch17L1	DC	p.559	2	3-4	1-5-12	6-7-8	9-11-16-19	10-Honors
Ch17L2	DC	p.564		1-2	3-4-13	5-17-18-19	8-9	12
Ch17L3	DC	p.569			1		2-3-4-5-9	

	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
CHAPTER 17 (continued):						
Ch17L4 DC p.572			1-3-4-5-6-7			2

Section 3. Techniques Employed in Differentiation of Curriculum

		Horizontal Enrichment	Horizontal Expansion	Vertical Expansion
CHAPTER 1:				
Ch1L1	p. 7		13	
CHAPTER 2:				
Ch2L1	p.21 p.27		7 4-7	
Ch2L2	p.31			10-11
Ch2L5	p.53		4-7-8-10-14-15-16 21-25-26	27
CHAPTER 3:				
Ch3L4	p.72		5-6	
Ch3L6	p.80	9-11		4-5-6-7-8-10
CHAPTER 4:				
Ch4L1	p.88			30
Ch4L2	p.95	23	25	Honors
Ch4L4	p.111			10
Ch4L5	p.117		8-14	
Ch4L6	p.121		40	

		Horizontal Enrichment	Horizontal Expansion	Vertical Expansion
CHAPTER 5:				
Ch5L2	p.135		14	
Ch5L3	p.146 p.148		2-3-4	14
Ch5L4	p.150			14-15
Ch5L5	p.154		9	8
Ch5L8	p.158		13-14	
Ch5L9	p.165		14-16-18	
Ch5L10	p.166		17	20
Ch5L11	p.175		24	
Ch5L12	p.171		18-21-28	20
CHAPTER 6:				
Ch6L1	p.193		17	
Ch6L2	p.200			18
Ch6L3	p.200			19-20
Ch6L4	p.209			12-14
CHAPTER 7:				
Ch7L4	p.229			18
Ch7L5	p.232			12-13
Ch7L6	p.235		11	13-14
Ch7L7	p.238		10	6-11-12

		Horizontal Enrichment	Horizontal Expansion	Vertical Expansion
CHAPTER 8:				
Ch8L1	p.245		13	
Ch8L3	p.252		10	
Ch8L4	p.259		15-16	Honors
CHAPTER 9:				
Ch9L1	p.268		14	
Ch9L2	p.269	Honors		
Ch9L3	p.276		16-17	11-13-15
Ch9L4	p.280		16	17
Ch9L6	p.290		14	
Ch9L7	p.293		12	
Ch9L8	p.298		10	11-Honors
CHAPTER 10:				
Ch10L4	p.326			10
CHAPTER 11:				
Ch11L1	p.336	22		
Ch11L3	p.347			7
Ch11L4	p.349			23-24-25-26-27 Honors
Ch11L6	p.355			25-27

		Horizontal Enrichment	Horizontal Expansion	Vertical Expansion
CHAPTER 11 (continued):				
Ch11L7	p.356		1-3-6-7-8-9-10-11-12-14	13-15-16-17-18-22-25
CHAPTER 12:				
Ch12L1	p.367		17-18	21
Ch12L2	p.372			19
Ch12L3	p.378	21-22-23-24-25		17-20
Ch12L4	p.382		6-15-16-17	19-20-21-22-25
Ch12L5	p.390			Honors
Ch12L6	p.394			10-13-14
Ch12L7	p.396		4b-5c-6-11-12-13-18-21	19-23-24-Honors
CHAPTER 13:				
Ch13L1	p.407 p.413	16-17-18-19-20-14-15-18		
Ch13L3	p.423			16
Ch13L4	p.426	13-14-15-18		
Ch13L5	p.431	14-15	12	
Ch13L6	p.436			10
Ch13L7	p.439	15-16		
Ch13L8	p.445	15-16-17		

		Horizontal Enrichment	Horizontal Expansion	Vertical Expansion
CHAPTER 14:				
Ch14L2	p.457			16-17
Ch14L3	p.462		12	13
Ch14L4	p.466		12	
Ch14L5	p.470 p.475		8 11-16-20	
Ch14L6	p.478		6-23	21
Ch14L7	p.485	21-22	7-8-13-18	
Ch14L8	p.492		3-7-15-17-25-28	21-34
CHAPTER 15:				
Ch15L1	p.504		23-25	
Ch15L2	p.510 p.513			10-11 12
Ch15L3	p.513			Honors
Ch15L4	p.521			6
Ch15L6	p.525			20-21-22-23-24
Ch15L7	p.527			14
Ch15L8	p.532		11a-13b	17-19
CHAPTER 16:				
Ch16L1	p.541			17-18
Ch16L2	p.545	8-9	14	

		Horizontal Enrichment	Horizontal Expansion	Vertical Expansion
CHAPTER 19:				
Ch19L2	p.636		14	Honors
	p.630		13	14
Ch19L3	p.643			16
CHAPTER 17:				
Ch17L1	p.559	1-2-3-4-5-6-7-8-9-10-11-12-16-19-Honors		
Ch17L2	p.564	1-2-3-4-5-8-9-12-13-17-18-19		
Ch17L3	p.569	1-2-3-4-5-9		
Ch17L4	p.572	1-2-3-4-5-6-7		

VITA 2

Lorraine Allmon Provine

Candidate for the Degree of

Master of Science

Thesis: THE EFFECTS OF HORIZONTAL AND VERTICAL EXPANSION UPON GIFTED HIGH SCHOOL GEOMETRY STUDENTS

Major Field: Applied Behavioral Studies

Area of Specialization: Gifted Education

Biographical:

Personal Data: Born in Altus, Oklahoma, October 6, 1944, the daughter of Claud E. and Emmie Allmon.

Education: Graduated from Altus Senior High School, Altus, Oklahoma, in May, 1962; received Bachelor of Science Degree in Mathematics from the University of Oklahoma at Norman, Oklahoma, in June, 1966; completed requirements for the Master of Science degree at Oklahoma State University in May, 1988.

Professional Experience: Mathematics teacher at U. S. Grant High School in Oklahoma City, Oklahoma, August, 1966 to May, 1969; East Junior High School in Ponca City, Oklahoma, August, 1969 to May, 1970; West Junior High School in Ponca City, Oklahoma, October, 1977 to December, 1977; Ponca City Senior High School in Ponca City, Oklahoma from March, 1978, to January, 1979, and from March, 1981, to Present.

Professional Organizations: National Education Association, Oklahoma Education Association, Ponca City Association of Classroom Teachers, National Council of Teachers of Mathematics, Oklahoma Council of Teachers of Mathematics, Oklahoma Association for Gifted/Talented Education, Mathematical Association of America, and Association for Supervision and Curriculum Development.