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Educational Experiences Of Rural Minnesota High-Ability Mathematics Learners

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EDUCATIONAL EXPERIENCES OF RURAL MINNESOTA HIGH-ABILITY MATHEMATICS LEARNERS

by

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This dissertation, submitted by Jodi Lynn Sandmeyer in partial fulfillment of the requirements for the Degree of Doctor of Education from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

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December 8, 2014
Date

PERMISSION

Title	Educational Experiences of Rural Minnesota High-Ability Mathematics Learners
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Jodi Sandmeyer
December 4, 2014

TABLE OF CONTENTS

LIST OF TABLES

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To my daughter Kristen

ABSTRACT

Meeting the educational needs of rural Minnesota high school high-ability learners in mathematics can be challenging for educators. This qualitative study involved interviewing high school graduates who scored between 30 and 36 on the mathematics subtest of the ACT and high school mathematics teachers who observed high-ability mathematics students. The graduates were from four different one-section or two-section schools from three counties in rural Minnesota. The purpose of this study was to use phenomenological qualitative research methods to identify educational experiences of high-ability mathematics learners from rural one-section and two-section high schools. There were two research questions guiding this study. First, what were the classroom experiences of high-ability learners in mathematics attending one-section and two-section high schools in rural Minnesota? Second, what classroom experiences have mathematics teachers of high-ability learners in mathematics observed while teaching students attending one-section and two-section high schools in rural Minnesota? The results of the study showed the high-ability students participated in a variety of activities in high-school, had parental support, and liked being challenged academically in mathematics. The high-ability students found math easy, preferred to work independently on projects, did not see a need for technology in the mathematics classroom other than calculators, were highly motivated to learn and do well, and enjoyed being with their peers. Furthermore, the students did not feel they were behind academically in college, when compared to their peers, even though they did not have the opportunity to participate in any special programming for high-ability students while in elementary school or high school. The teachers' observations supported the students' experiences except the teachers said technology in the mathematics classroom was important and the students can be challenging in the classroom.

Keywords: gifted and talented, mathematics, education

CHAPTER I

INTRODUCTION

Most states have definitions and guidelines regarding the identification of and programming for students who are high-ability. However, in the state of Minnesota, there is no legislative definition, identification procedures, or programming requirements for students who are high-ability. As a result, high-ability learners in mathematics have often been educated with their peers in a regular education classroom, especially in small rural schools where funding and staffing limitations exist (Kordosky, 2010; United States Department of Education, 1993). Therefore, this phenomenological qualitative study focused on educational experiences of high-ability learners in mathematics who graduated from rural Minnesota one-section or two-section high schools and were never identified as gifted and talented in their respective schools.

Statement of the Problem

The No Child Left Behind (NCLB) Act of 2001 put a renewed emphasis on reading and mathematics in American schools. In addition, there has been a renewed interest in science, technology, engineering, and math (STEM) in schools (Chen & Weko, 2009). As a result, additional time is being devoted to teaching mathematics so that students can pass standardized tests and be encouraged to enter a STEM career field (McMurrer, 2008).

At the time of this report, there were legislatively defined definitions of high-ability learners in 46 states (see Appendix A for a complete list of legislative definitions of gifted and talented by state). However, in 2013, in the state of Minnesota, there was no legislative definition for gifted and talented. In addition, there were 38 states which did not require high-ability students to be identified, and 35 states where special programming was not mandated (see Appendix B). Minnesota was one of 12 states where students were not mandated to be identified as high-ability learners and one of 15 states where special programming for gifted and talented students was not required. As a result, individual school districts in Minnesota were not required to identify students as gifted and talented. Therefore, some Minnesota school districts identified high-ability learners in mathematics as gifted and talented and offered special programming for those students, but other school districts did not. As a result, some high-ability Minnesota learners who excelled in mathematics were educated in a regular education classroom with their peers; these students were the focus of this study.

By examining national test results, it could be seen that students in Minnesota were consistently scoring in the top 10 states (ACT, Inc., 2013; Minnesota Office of Higher Education [MOHE], 2012; National Center for Education Statistics, 2011c). From 2006-2013, Minnesota students earned the highest ACT composite score, when compared to students in other states that test 50% or more of their students (MOHE, 2012). When comparing all states, Minnesota students were ranked 6th in the nation on the 2013 ACT with a composite score of 23.0. When comparing mathematics test scores for 2013, Minnesota students ranked 7th overall and first when compared to states testing over 50% of their graduating students (ACT, Inc., 2013).

On the National Assessment of Educational Progress (NAEP), Minnesota students scored well compared to students from other states. For example, on the 2011 NAEP fourth grade test, Minnesota students' scores were ranked third in the nation (National Center for Education Statistics [NCES], 2011b). And, on the 2011 NAEP eighth grade test, Minnesota's students' scores were ranked second in the nation (NCES, 2011c).

Research has been conducted involving students identified as gifted and talented that finds the students have special social-emotional needs (Cross, 2005; Silverman, 1990). Also, books have been written about the social and emotional needs of gifted and talented students (Cross, 2005; Delisle & Galbraith, 2002). In addition, some research has found students identified as gifted and talented need special programming and teaching practices to effectively meet their learning needs (Renzulli, 2012). However, up to the time of this study, Minnesota did not require identification of students as gifted and talented or provide programming for them, and some students were still excelling.

Due to the fact that some high-ability Minnesota learners in mathematics were not identified as gifted and talented and did not receive any special programming, but were still excelling, it was important to understand why these students were excelling on the mathematics portion of standardized tests. Educators and policymakers should be evaluating the value of gifted and talented programming and the practice of identifying students as gifted and talented. Teachers from across the nation should be trying to learn about Minnesota students' experiences in the classroom, allowing them to help their own students be as successful as the students from Minnesota. Therefore, the problem was to obtain a deeper understanding of the educational experiences of high-ability learners in four rural Minnesota school districts that did not provide gifted and talented programming for the students. Due to a lack of research into high-ability students in rural communities, some high ability students may not be receiving the services they need.

Purpose of the Study

The purpose of this study was to obtain a deeper understanding of educational experiences of high-ability mathematics learners from rural Minnesota one-section and two-section high schools. The study contributes to a growing body of knowledge and research involving gifted and talented students in mathematics and provides educators with perspectives of high-ability students' experiences in mathematics classrooms. Educators may be able to use the information in this study to guide their classroom practices in supporting their most capable students in the areas of STEM.

School districts may use this study when making decisions regarding programming options for high-ability learners in mathematics. The options of online classes, post secondary enrollment options (PSEO), concurrent enrollment classes, and advanced placement (AP) classes exist for students in Minnesota to select elective classes while in high school (Minnesota Department of Education, 2014a). Finally, school counselors could use information provided in this study to help high-ability learners in mathematics make scheduling decisions. School counselors might also use this study when counseling a student who excels in mathematics in regard to peer interactions or personal concerns.

Research Questions

This study was a phenomenological qualitative study of the perspectives of rural Minnesota graduated high-ability learners in mathematics and the mathematics teachers of high-ability mathematics students. Research questions that guided this study included:

- What were the classroom experiences of high-ability learners in mathematics attending one-section and two-section high schools in rural Minnesota?
- What classroom experiences have mathematics teachers of high-ability learners in mathematics observed while teaching students attending one-section and two-section high schools in rural Minnesota?

Need for the Study

STEM is a field that is growing and in need of capable young people. There is a high demand for students that achieve well in the areas of science, technology, engineering, and math (Ball Foundation, 2012; Carnevale, Smith, & Melton, 2011; Casey, 2012). The National Council of Teachers of Mathematics (NCTM) published *An Agenda for Action* in 1980 where the authors stated, "The student most neglected, in terms of realizing their full potential, is the gifted student of mathematics. Outstanding mathematical ability is a precious societal resource, sorely needed to maintain leadership in a technological world" (National Council of Teachers of Mathematics, 1980, para. 13).

The National Defense Education Act of 1958, which supported STEM education, was passed in response to the Union of Soviet Socialist Republic (USSR) launch of Sputnik (National Defense Education Act, 1958). The result was that United States legislators and school personnel started re-examining the education schools were offering to students. To support the need for people qualified in the area of STEM, Congress passed the National Defense Education Act (NDEA) of 1958, Public Law 85-864. Since then, reports such as the Marland Report of 1971, *A Nation at Risk* (National Commission on Excellence in Education, 1983), *National Excellence: A Case for Developing America's Talent* (United States Department of Education, 1993) and *A Nation Deceived* (Colangelo, Assouline, & Gross, 2004) have been issued. These reports included information regarding the achievement of America's students and recommendations for raising standards. In addition, Congress passed legislation which includes the Jacob K. Javits Gifted and Talented Students Education Act of 1988 as part of the reauthorization of the Elementary and Secondary Education Act of 1965 and the No Child Left Behind Act of 2001 to encourage high standards for students (Jacob K. Javits Gifted and Talented Students Education Act, 1988; National Association for Gifted Children, n.d.b). Therefore, researching the educational experiences of rural gifted and talented students was timely and of national importance with the increased demand for high-ability learners in STEM to make contributions in the field (Ball Foundation, 2012; Carnevale et al., 2011; Casey, 2012).

There have also been studies that compared achievement of students in the United States to that of students in other countries. One study, the Trends in International Mathematics and Science Study (TIMSS), is administered every 4 years to over 40 countries and other education systems. In 2007, the TIMSS showed American eighth grade students scoring statistically lower than five countries or education systems:

Chinese Taipei, Republic of Korea, Singapore, Hong Kong, and Japan. The same report showed United States students statistically ahead of 37 other countries or education systems (National Center for Education Statistics, 2009). In 2011, eighth grade students in the United States remained behind the five countries or education systems (mentioned earlier in this paragraph), in addition to the Russian Federation (NCES, n.d.b).

A second study, allowing for national and international comparison, was the National Assessment of Educational Progress (NAEP) which was considered the "Nation's Report Card." In this study, Minnesota ranked in the top five in the nation, on both the fourth and eighth grade mathematics tests given in 2011 (NCES, 2011b; NCES, 2011c). In addition, in December 2012, the National Center for Education Statistics (NCES) released 2011 TIMSS scores with scores for nine validation states, which included Minnesota. The purpose of the validation states' scores was for a NAEP-TIMSS Linking Study which allowed individual states to compare their scores internationally (NCES, 2011a). Eighth grade students in Minnesota obtained an average score of 545 on the TIMSS, only trailing two states, Massachusetts (another state where identification and programming for high-ability students was not mandated) with a score of 561and Vermont (a state requiring identification and programming for high-ability students) with a score of 547. Minnesota students scored statistically higher than the United States average score of 509. When compared internationally, Minnesota students still trailed behind Republic of Korea with a score of 613, Singapore with a score of 611, Chinese Taipei with a score of 609, Hong Kong with a score of 586, and Japan with a score of 570 (NCES, 2011a, n.d.b).

These various reports and studies show a need to improve students' learning, particularly in the area of mathematics. However, even though there have been several research studies involving students identified as gifted and talented, most studies do not involve rural students attending one-section and two-section schools in the area of mathematics (Dai, Swanson, & Cheng, 2011). Howley, Pendarvis, and Gholson (2005) were an exception; their study specifically addressed mathematics in a rural school. The study looked at the perceptions of mathematics instructors and elementary students engaged in mathematical ideas at home and in the community (Howley, Pendarvis, & Gholson, 2005).

According to Dai, Swanson, and Cheng (2011), most studies involving gifted and talented students have been quantitative studies. Dai et al.'s survey involved searching the PsycINFO database (a database listing abstracts of articles relating to the field of psychology) for the terms "gifted and talented education" (Dai et al., 2011). The search returned 2,859 articles from the years 1998-2010. From that, 1,234 articles were determined to be empirical studies where the authors "collected, analyzed, and presented data" (Dai et al., 2011, p. 127) on the topic. Of the 1,234 empirical studies, 894 were quantitative, 36 were mixed methods, and 304 studies were qualitative. Of the qualitative studies, 115 involved interviews. The other studies involved narratives, observations, and case studies. The topics associated with the qualitative studies in Dai et al.'s survey in order of prevalence were: achievement/underachievement (15%), talent/talent development (12%), school environment (11%), creativity (10%), teacher beliefs (9%), programming (9%), social-emotional (9%), identification (9%), and instruction (7%; Dai et al., 2011). Dai et al. found in general that qualitative studies focused on topics that were local and sensitive to school contexts and practices. Qualitative studies were also more likely to be of educational rather than psychological research (Dai et al., 2011). In the area of mathematics, no qualitative studies were noted. Therefore, since qualitative studies involving interviews accounted for only 9% of all studies (which totaled 115 qualitative studies) and there were no qualitative mathematics studies, Dai et al.'s research supports a need for this qualitative study (Dai et al., 2011).

Further, several studies indicated a need to learn more about students identified as gifted and talented in mathematics (Adelson, McCoach, & Gavin, 2012; Snyder, Nietfeld, Linnenbrink-Garcia, 2011). Even though this study focused on high-ability learners in mathematics, rather than students identified as gifted and talented in mathematics, the students selected shared a common characteristic with many students identified as gifted and talented, a score at or above the 95th percentile on a nationally-normed test. This common characteristic allows comparisons to be completed between studies involving students identified as gifted and talented in mathematics and students participating in this study.

Pilot Study

A pilot study was completed prior to the start of this study. The pilot study involved one rural school district in Minnesota. The school had the same two-section school configuration as the proposed schools for this study and was located in one of the counties selected to be included in this study. The pilot study involved three students, four parents, and one teacher. The participants were interviewed and the data analyzed.

From this pilot study, the researcher identified four themes inherent in the educational experience of students excelling in mathematics: school programming options, student personality, peer interactions, and parental involvement.

The pilot study provided an opportunity for the researcher to do the entire study on a small scale (Krathwohl & Smith, 2005). The researcher was able to test the interview questions. The initial questions were modified after each interview for clarification and to refine the specific wording needed to obtain thick, rich descriptions of students' educational experiences. The pilot study was used for background information for this study; the results were not included in this study, and pilot study participants were not involved in this study.

Research Framework

This study was a phenomenological qualitative research study involving high-ability learners in mathematics in high school and mathematics teachers of high-ability learners. The guiding framework chosen for this study was constructivism (Glesne, 2011). Working within this guiding framework, the resulting research design chosen was a phenomenological study using ethnographic methodologies (Glesne, 2011).

Constructivism was chosen for the research study framework because the study used phenomenological qualitative research methods to identify educational experiences of high-ability mathematics learners from rural one-section and two-section high schools. Creswell (2007) said that in using constructivism, researchers, "seek understanding of the world in which they live and work . . . look[ing] for the complexity of views rather than narrow[ing] the meaning into a few categories or ideas" (p. 20). Moustakas (1994) stated that the purpose of phenomenology was “to determine what an experience means for the persons who have had the experience and are able to provide a comprehensive description of it” (p. 13). To obtain an understanding of student experiences, it was important to hear both student and teacher perspectives.

The researcher wanted to know the personal perspectives of students and teachers involved with the students’ regarding their school experiences which required the researcher to use constructivism qualitative methods. According to Glesne (2011), as a researcher,

> You observe, ask questions, and interact with research participants. You may look for patterns in your analyses, but you do not try to reduce the multiple interpretations to numbers, nor to a norm. Your final write-up will be quite descriptive in nature. (p. 8)

By using qualitative research methods, students’ and teachers’ experiences which were “not approachable through quantitative approaches” (Moustakas, 1994, p. 21) were able to be identified. Qualitative research methods prevent the teachers and students from being transformed into numbers and statistics. In addition, qualitative research methods allow the researcher to take a role that allows for personal involvement and understanding of the issues (Moustakas, 1994).

Creswell (2007) said that “researchers recognize that their own background shapes their interpretation . . . [therefore] researchers make an interpretation of what they find, an interpretation shaped by their own experiences and background” (p. 21). To help eliminate presuppositions, an Epoche was written. The Epoche, a statement of a researcher's thoughts "requires the elimination of suppositions and the raising of knowledge above every possible doubt" (Moustakas, 1994, p. 26). Then, "in the Epoche, the everyday understandings, judgments, and knowings are set aside, and phenomena are revisited, freshly, naively, in a wide open sense" (Moustakas, 1994, p. 33). Due to the fact the researcher was identified as a student gifted and talented in mathematics while in school, the researcher knows that she cannot be detached and that her background and experiences would have an impact on the final interpretation. Therefore, the constructivism approach was the most appropriate for this study.

Within the constructivism framework, the research design chosen was phenomenology. "A phenomenological study often begins with a situation that the researcher has a personal experience with and wishes to understand from others' perspectives" (Slavin, 2007, p. 149). For this study, the researcher had experience with gifted and talented programs and wanted to learn about the experiences of students and teachers who were not part of specialized programs.

Moustakas (1994) said phenomenology is "the science of describing what one perceives, senses, and knows in one's immediate awareness and experience" (p. 26). Creswell (2007) continued, "A phenomenological study describes the meaning for several individuals of their lived experiences of a concept or a phenomenon" (p. 57). To obtain the beliefs of the students and teachers about their educational experiences, it was important that those beliefs were expressed in the students' and teachers' own language with the researcher having the opportunity to probe for additional information and meaning through interviews (Moustakas, 1994; Roulston, 2010). Therefore, the methods of generating data were ethnographic where interviews of graduated students and mathematics teachers provided the data.

When using a constructivist approach, two assumptions were noted by Glesne (2011): “reality is socially constructed and variables are complex, interwoven, and difficult to measure” (p. 9). As a result, the ethnographic field method of interviews was selected for the study. The primary reasons were to allow the researcher to “interpret people’s constructions of reality and identify uniqueness and patterns in their perspectives and behaviors” (Glesne, 2011, p. 19). Each graduated student provided information which built upon previously gathered information and provided the researcher with perspectives on educational experiences the students had in a mathematics classroom.

Furthermore, the final product, according to Creswell (2007), is a “cultural portrait of the group that incorporates the views of the participants as well as the views of the researcher. It might also advocate for the needs of the group or suggest changes in society” (p. 72). This was important as the students and teachers participating in this study provided the reader with an opportunity to share in the participants’ educational experiences of mathematics classrooms.

Delimitations of the Study

There were five delimitations for this study. The first delimitation was the study was limited to one-section and two-section school districts. One-section and two-section schools were selected because of specific challenges that exist in small schools due to the size of the student body. There were generally fewer than 50 students in each grade in schools participating in this study. As a result, the number of teachers participating in the study was limited to one to three mathematics teachers in each participating high school. Schools with limited numbers of teachers may result in the same teacher teaching individual students over multiple years. When this occurs, students may be exposed to only one teaching style, thus limiting the students' exposure to mathematics topics of interest to the teacher. Plus students may not have been exposed to additional problem solving strategies and alternative methods for completing problems. A single mathematics teacher also results in fewer elective classes being offered at a school because one teacher has a limited amount of time each day. With few elective classes, students in this study were less likely to experience a variety of topics in mathematics which may have restricted students from taking higher level mathematics courses such as calculus prior to attending college.

The second delimitation is the study involved students from rural Minnesota schools which were located more than 25 miles from a city with a population of 50,000 or more. Therefore, students had to travel more than 25 miles to experience educational opportunities available in larger communities. Of the school districts in Minnesota located more than 25 miles from an urban area, school districts in three counties in rural Minnesota were selected to participate in this study. The three counties included were Beltrami, Cass, and Hubbard counties, all located in north central Minnesota.

The third delimitation was the study was limited to students who graduated in 2010, 2011, or 2012. These students were selected because they recently attended a one-section or two-section high school in rural Minnesota so their memories of high school were at most four years old. The students were able to explain their perspectives and experiences effectively because memories were recent.

The fourth delimitation was some of the references for the state statutes were historical. The statutes for the definitions of gifted and talented were initially taken from the 2012 legislation year for consistency. The legislative year of 2012 was chosen because it was the latest year of the graduated seniors participating in the study. Since 2012, many of the states updated their websites to the 2013 and 2014 legislative session statutes. As a result, some of the definitions and 2012 specific statutes quoted in this study are only available through historical information kept regarding the specific legislative session.

The final delimitation of the study was only high-ability learners in mathematics while in high school and mathematics teachers were interviewed. High-ability learners in mathematics were chosen because they were able to provide personal experiences about what it was like to be a student who excelled in mathematics in a rural, one-section or two-section school in Minnesota. The teachers were selected to be part of the study because they were able to explain their school district's programming options available to students. The teachers also provided observations of the high-ability students with their peers in the mathematics classroom. Plus, the teachers described their observations of the high-ability learners' experiences in the mathematics classroom.

Thick, rich descriptions from students and teachers allow readers to determine how to generalize results of a study to fit their specific settings. It was stated by Merriam (2009), "The general lies in the particular; that is, what we learn in a particular situation we can transfer or generalize to similar situations subsequently encountered" (p. 225). While this study focused on four one-section or two-section schools in three counties in Minnesota, the findings may assist other school educators when teaching high-ability learners in mathematics.

Assumptions of the Study

There were two assumptions in this study. The first assumption was that schools would participate and assist in identifying eligible students and in sending letters to students inviting them to participate. And the second assumption was that all graduated high-ability learners in mathematics and mathematics teachers would answer honestly and not be hesitant to share ideas (Creswell, 2007).

Acronyms and Definitions of Terms

The following terms were used throughout the study and these definitions clarify their meanings within the context of this study.

ACT – A national college admissions test that consists of four subject area tests: English, mathematics, reading, and science. The students receive a score on each subject area test and a composite score (ACT, Inc., 2014b).

College in the High School (CIHS) – A program "that delivers University courses, in collaboration with area high schools, to advanced high school students" (those with grade point averages of 3.00 or better; University of Minnesota Crookston, 2014, para. 1).

Criterion-referenced testing – “An assessment that compares a student’s test performance to their mastery of a body of knowledge or specific skill” (National Association for Gifted Children, n.d.a, para. 18).

Evaluation – Tests and other assessment procedures, including a review of information, that were used to decide whether a student should be identified as gifted and talented.

FERPA – Family Educational Rights and Privacy Act of 1984, 20 U.S.C. § 1232g; 34 CFR Part 99. Federal law, enacted in 1984, that gives students over the age of 18 or the parents of students under 18, the right to see, correct and control access to student records (United States Department of Education, 2014).

High School – School configuration approved by the Minnesota Department of Education as having students in Grades 7-12 inclusive.

High-ability learners in mathematics – Students achieving at the 95th percentile rank or higher on the ACT test. This definition was obtained by compiling all the definitions states use for identifying gifted and talented students (see Appendix A). As a result, seven states defined gifted and talented students as those students scoring at or above the 95th percentile. Four additional states defined gifted and talented students as those scoring at or above two standard deviations above the norm on a standardized test. One state defined gifted and talented students as those with an intelligence quotient (IQ) of 130 or higher, which is two standard deviations above the norm. Only five other states give specific numbers for identifying students as gifted and talented: one state uses 90th percentile, one uses 97th percentile, one uses 98th percentile, and two use the 96th

percentile. All the other states that have a definition for gifted and talented students do not give a specific percentage; instead, the states' definitions include terms such as superior cognitive ability, high performance capability, superior intellect, extra ordinary learning ability, exceptional potential, and high potential. Therefore, for the purposes of this study, high-ability learners in mathematics were defined as those students achieving at or above the 95th percentile on the ACT mathematics subtest.

NAEP – National Assessment of Educational Progress - Produces the Nation's Report Card which gives information about the academic achievement of students in Grades 4, 8, and 12. The test was sponsored by the United States Department of Education and began in 1969. The test is conducted in mathematics and reading every two years. School districts in each state were selected to participate in the testing (NCES, 2012).

NCLB – No Child Left Behind Act of 2001 Public Law No. 107-110, §115 Stat. 1425 – An act of the United States Congress which reauthorized the Elementary and Secondary Education Act (ESEA) of 1965 (United States Department of Education, 2010).

Norm-referenced testing – "An assessment that compares an individual's results with a large group of individuals who have taken the same assessment" (National Association for Gifted Children, n.d.a, para. 40).

One-section and two-section schools – Schools which average under 50 students per grade level, allowing for one or two classes per grade at the elementary level and one or two classes per grade for required classes at the high school level.

PSEO – "Postsecondary Enrollment Options (PSEO) is a program that allows 10^{th}, 11^{th}- and 12^{th}-grade students to earn college credit while still in high school" (Minnesota Department of Education, 2014c, para. 1).

Public schools – "Schools supported in whole or in part by state funds" (Admission to Public School Act, 2012, Subdivision 1a).

Pull-out program – "A program that takes a student out of the regular classroom during the school day for special programming" (National Association for Gifted Children, n.d.a, para. 44).

Regular education class – "Educational environments where children without disabilities receive instruction and participate in activities throughout the school day. It includes instruction that occurs outside of the actual classroom such as within the school or community where interaction occurs with persons without disabilities (e.g., assemblies, field trips, and community transition services)" (Ohio Department of Education, 2013, para. 6).

Rural school – The term rural school was defined as a school located in a rural area of the United States of America. The U.S. Census Bureau defined a rural area as not being urban. Urban was defined as a place with a minimum population of 50,000 (United States Census Bureau, 2012b). This study further restricted the schools to the classification of "Rural: Remote (43) school." The National Center for Education Statistics defined Rural: Remote (43) schools as being located in a "rural territory that is more than 25 miles from an urbanized area and is also more than 10 miles from an urban cluster" (NCES, n.d.a, Section titled New Urban-Centric Locale Codes, para. 12).

Socioeconomic status – "The social standing or class of an individual or group. It is often measured as a combination of education, income, and occupation" (American Psychological Association, 2014). For students in Minnesota schools, socioeconomic status is categorized using the economic indicator of whether or not a family is on free or reduced lunch (Minnesota Department of Education, 2011).

STEM – Science, Technology, Engineering, and Mathematics (SciMathMN and the Minnesota Department of Education, 2014).

Researcher's Background

The researcher has a background in education as a student, teacher, and principal. As a student, the researcher was identified as gifted and talented in mathematics in elementary school in a large rural Minnesota school district, over 30 years ago. The researcher participated in a pull-out program for students identified as gifted and talented. While in the program, the researcher felt supported by both peers and teachers and was able to be challenged academically.

After graduating from high school as valedictorian, the researcher obtained a Bachelor of Science degree in mathematics and mathematics education with a minor in physics from Bemidji State University, Bemidji, Minnesota, while graduating top of her college class after four years. Throughout college, the researcher was often encouraged to attend graduate school for mathematics rather than going into education, as it was a "waste of talent" to be a teacher.

After college, the researcher obtained a teaching position as a junior high mathematics teacher in a one-section 7-12 school in rural Minnesota. During the researcher's initial 8 years of teaching, she obtained a Master of Science degree in mathematics education from Bemidji State University and also Minnesota principal and superintendent licenses from the University of Minnesota, Minneapolis, Minnesota. Starting in the Fall of 2002, the researcher served as principal in a rural Minnesota school district for the next 8 years. This gave her the opportunity to schedule classes for students, see student national and state test scores, and help students select colleges. This experience provided her with a new perspective on peer interactions, programming needs for students, and parent involvement. Then, after having her first child, the researcher returned to teaching part-time while also serving in the roles of district assessment coordinator and student academic advisor. The researcher also started her doctoral degree at this time.

Shortly after the researcher began teaching mathematics, the researcher began observing high-ability learners in mathematics. These students were achieving well and appeared to have mostly positive peer and teacher relationships, even though the students were not formally identified as gifted and talented, not given special programming, and not given any special support. This led the researcher to start asking questions about the experiences of high-ability learners in mathematics in one-section and two-section schools in rural Minnesota.

Through all her educational experiences, the researcher has obtained an extensive background in education. The researcher's background includes the areas of mathematics, Minnesota law, Minnesota student assessments, and best practices in the classroom. Plus, by being gifted and talented in mathematics herself, the researcher has personal experiences and was able to relate to participants in this study.

Organization of the Study

Chapter I provided an overview of high-ability learners in mathematics. It described the problem, purpose of the study, and two research questions. The chapter then outlined a need for the study, a description of the pilot study, and an explanation of the research framework. Chapter I also included delimitations, assumptions, acronyms and definitions of terms, and researcher's background. Chapter I concluded with the organization of the study.

The remaining four chapters include the background of, design of, data from, and recommendations for the study. Chapter II examines three areas of the literature related to high-ability learners in mathematics and mathematics teachers. First, there is a historical account of the field of gifted and talented education. Then, there is one section on influences in the school context and one on the student context. Chapter III introduces the qualitative research design of the study. This chapter discusses the topic and participant selection, interview methods, methods of analysis, validity, and ethical considerations for this study. Chapter IV presents the themes developed from analyzing the data from student and teacher interviews. Chapter V provides the discussion and implications of results including recommendations for educational practices in the educational setting involving high-ability students in mathematics.

CHAPTER II

REVIEW OF THE LITERATURE

A literature review provides background information for the study. However, research involving students identified as gifted and talented is diffuse, not unified or firmly policed (VanTassel-Baska, 2006). This statement is demonstrated by the fact that there was no one definition of gifted and talented accepted nationwide. Each state had its own definition for what it means to be gifted and talented (see Appendix A). In addition, there were 35 states where identification of high-ability students was not required and 38 states where programming was not required (see Appendix B). At the time of this study, Minnesota Statute 120B.15 entitled *Gifted and Talented Students Programs* (2014), read, "School districts may identify students, locally develop programs addressing instructional and affective needs, provide staff development, and evaluate programs to provide gifted and talented students with challenging and appropriate educational programs" (Section 120B.15a). This statute has allowed schools to decide what it means to be gifted and talented and the type of programming, if any, a school will provide for gifted and talented students.

During the review of literature, the author found numerous terms to describe students with intellectual giftedness. Some of the terms used included: gifted, talented, high ability, high potential, able, superior, exceptional, quick, prodigy, and genius. Some of the terms were used interchangeably while others specify specific categories of students. However, all of the terms differentiate students from their peers based on their intellectual ability (Mandelman, Tan, Aljughaiman, & Grigorenko, 2010).

History

Saying that someone is gifted in the State of Minnesota means different things in different school districts. The reason for this is that each school district in the state of Minnesota is allowed to create its own definition of giftedness. Minnesota is one of four states that do not have a formal state definition for giftedness (see Appendix A for a matrix of state definitions). Minnesota does, however, have a definition for gifted students in the Minnesota Automated Reporting Student System (MARSS) manual. This manual provides definitions for all student data reported to the Minnesota Department of Education (Minnesota Department of Education, 2011).

Current definitions, theories, and models used by researchers, educators, and the federal government have developed over the years. Currently, there are multiple definitions, theories, and models for giftedness. The multiple definitions, theories, and models have resulted in confusion regarding the meaning of terms and no single direction in the field of gifted and talented, both in practice and theory.

Terman (1926) first classified students as gifted in his study. The purpose of the study was to determine common traits in students with "superior intellectuality" (Terman, 1926, p. 631). Students included in the main experimental study group were identified as gifted using the Stanford-Binet Intelligence Test. Students selected for the study had a minimum IQ score of 135 (Terman, 1926). Therefore, to be classified as gifted, a student had to score in the top 1% on the single Stanford-Binet Intelligence Test.

The first attempt to create a national education policy which included special provisions for students identified as gifted and talented came in 1958 after the Union of Soviet Socialists Republic (U.S.S.R.) launched Sputnik in 1957. The United States Congress passed the National Defense Education Act of 1958 (P.L. 85-684) which appropriated $1 billion to identify academically gifted students and provide them with additional math, science, and foreign language lessons. Title V, Section 503(a)(1) of the Act defined gifted and talented students as those "with outstanding aptitudes and ability, generally through the use of IQ testing" (National Defense Education Act, 1958, p. 1592).

The next legislative action was in 1970 when Congress passed the Elementary and Secondary Education Assistance Programs Extension (Public Law 91-230, Section 806) requiring a report on the status of education for gifted and talented students. Sidney P. Marland, Jr. (1971), United States Commissioner of Education, presented the *Education of the Gifted and Talented* report to the United States Congress in 1972. In his report, Marland provided the current most widely used formal definition of gifted and talented students because the definition moved beyond identifying students as gifted based only on their IQ. Many of the states in the United States, which have a definition of gifted and talented students, use the definition provided by Marland or a variation of it as their formal definition. The following is the definition Marland used in his report:

> Gifted and talented children are those identified by professionally qualified persons who by virtue of outstanding abilities are capable of high performance. These are children who require differentiated educational programs and/or

services beyond those normally provided by the regular school program in order to realize their contribution to self and society. Children capable of high performance include those with demonstrated achievement and/or potential ability in any of the following areas, singly or in combination:

1. general intellectual ability
2. specific academic aptitude
3. creative or productive thinking
4. leadership ability
5. visual and performing arts
6. psychomotor ability. (Marland, 1971, p. 8)

Marland listed six areas where a student can be classified as gifted and talented. These six areas were adopted and further defined by the National Association for Gifted Children (NAGC). According to the NAGC, *general intellectual ability* defines the student with a high general information intellect. The student gifted in *specific academic aptitude* is the student with high performance on an achievement test or aptitude test in one area such as mathematics or language arts. The *creative or productive thinking* student is the one that can create new ideas "by bringing together elements usually thought of as independent or dissimilar and the aptitude for developing new meanings that have social value" (Giftedness and the Gifted, 1990, p. 4). The *leadership ability* gifted and talented area defines the student that has the ability to direct individuals or groups to achieve a goal. The fifth area of giftedness is *visual or performing arts* where students demonstrate special talents in visual art, music, dance, drama, and other related areas. Finally, the sixth area is *psychomotor ability* where students demonstrate special ability in kinesthetic motor activities such as dance and athletics (Giftedness, 1990).

Moving beyond classifying students as gifted and talented in the six areas, Joseph Renzulli proposed a three-part definition of giftedness called the Three-Ring Conception of Giftedness in 1978 (Reis & Renzulli, 2010). Renzulli said, “Intelligence is not a unitary concept, but rather there are many kinds of intelligence and therefore single definitions cannot be used to explain this complicated concept” (Renzulli, n.d., p. 5). His definition did not rely on a student’s intelligence quotient (IQ); instead, Renzulli defined giftedness as an interaction between above average general and/or specific abilities, high levels of task commitment (motivation), and high levels of creativity (Reis & Renzulli, 2010).

A few years later, in 1983, Howard Gardner defined his concept of multiple intelligences. Gardner defined seven intelligences as: linguistic, logical/mathematical, spatial, musical, bodily-kinesthetic, interpersonal, and intrapersonal intelligences. In addition, Gardner postulated there were multiple intelligences, and all people possess all of the intelligences, and everyone is unique. Gardner’s multiple intelligences theory further challenged the idea that giftedness could be defined by IQ and that a test score was the best way to identify students who were gifted (Gardner, 1998).

About the same time, a model for giftedness was developed by Kurt A. Heller (2004) called the Munich Model of Giftedness. Heller defined giftedness based on four interdependent dimensions. The first dimension of giftedness was talent factors which were considered a predictor of giftedness and included intellectual, creative, and artistic abilities, along with social competence, practical intelligence, musicality, and psycho-motor skills. The second dimension was non-cognitive personality characteristics which Heller (2004) defined as moderators of giftedness. The non-cognitive personality characteristics included the ability to cope with stress, achievement motivation, test anxiety, control expectations, and learning and working strategies. The third dimension of giftedness was environmental conditions which Heller (2004) determined were also moderators of giftedness. The environmental conditions dimension included family learning environment, family climate, quality of instruction, classroom climate, and critical life events. The final dimension was performance areas. This was the main criteria of giftedness. Students' performances in the areas of athletics, art, computer science, languages, mathematics, natural sciences, social relationships, or technology were considered in the dimension (Heller, 2004).

The next definition released by the United States Department of Education, Office of Educational Research and Improvement (OERI) was published in the 1993 report, *National Excellence: A Case for Developing America's Talent*. In the report, the authors dropped the term gifted and instead used "outstanding talent." The term gifted was not to be used when talking about children. Children were developing their ability; so gifted is in opposition to what neuroscience and psychology had been saying about children and their learning. Therefore, the following definition was developed:

> Children and youth with outstanding talent perform or show the potential for performing at remarkably high levels of accomplishment when compared with others of their age, experience, or environment. These children and youth exhibit

high performance capability in intellectual, creative, and/or artistic areas, possess an unusual leadership capacity, or excel in specific academic fields. They require services or activities not ordinarily provided by the schools. (United States Department of Education, 1993, p. 25)

The authors of a *National Excellence: A Case for Developing America's Talent* used a broad definition of outstanding talent. It included creativity, artistic, intellectual, and leadership skills as part of the definition (United States Department of Education, 1993).

Two years later in 1995, another theory to describe giftedness was developed by Zhang and Sternberg (1998). Zhang and Sternberg developed the Pentagonal Implicit Theory of Giftedness which defines a gifted person as one who meets five criteria: excellence, rarity, productivity, demonstrability, and value. Excellence was further defined as a superior level of performance for individuals relative to their peers in some dimension. Rarity meant that an individual possessed a skill or attribute that was rare among their peers. Zhang and Sternberg (1998) added productivity as a criteria because they felt it was not sufficient to have a high score on an intelligence test; instead, an individual must be able to produce something that can be translated into productive work. Fourth, the skill or aptitude of giftedness must be demonstrable through one or more valid assessments. Finally, an individual must demonstrate superior performance in an area that is valued by society.

In 2000, Usiskin was the first to specifically define students as gifted and talented in mathematics through his eight-tiered hierarchy for mathematical talent. He defined Levels 0 and 1 as average students with limited mathematical talent. Level 2 included students good at math, capable of taking advanced mathematics classes in high school. Level 3 was for "terrific students" (para. 17) who are capable of scoring 750-800 on the SAT. Level 4 included students who are "exceptional students" (para. 23) at mathematics. These exceptional students excel in mathematics competitions, participate in math and science camps, and have the potential to do graduate level work in mathematics. Level 5 was for the professional mathematician, the adult who has completed a doctorate in mathematics and is capable of publishing in the field. Level 6 was for mathematicians who have made contributions to the field of mathematics. Finally, Level 7 was reserved for exemplary geniuses like Leonard Euler and Karl Friedrich Gauss. Elementary and high school gifted students are found in Levels 3 and 4 of Usiskin's hierarchy. And, professional people who are truly gifted in mathematics and become mathematicians, enter Levels 5 through 7 (Usiskin, 2000).

The United States of America added another definition of giftedness in the No Child Left Behind Act of 2001. Gifted and talented students are defined as those

> who give evidence of high achievement capability in areas such as intellectual, creative, artistic, or leadership capacity, or in specific academic fields, and who need services or activities not ordinarily provided by the school in order to fully develop those capabilities. (Strengthening and Improvement of Elementary and Secondary Schools, 2013, p. 1544)

This definition is closely related to the definition provided by Marland in 1971.

In 2005, Sriraman suggested definitions for mathematical giftedness and mathematical creativity. He defined mathematical giftedness as being able to quickly understand known mathematical concepts and perform complex mathematical operations at a level beyond what is typical for an individual's age and schooling. Mathematical creativity included the characteristics of giftedness plus, in adults, an ability to produce original work that significantly extends the body of knowledge, or to pose new questions for other mathematicians (Sriraman, 2005).

The National Association for Gifted Children (NAGC) created its own definition of gifted. The definition is based on previous definitions with slight modifications. At the time of this report, NAGC defined gifted as:

> Those who demonstrate outstanding levels of aptitude (defined as an exceptional ability to reason and learn) or competence (documented performance or achievement in top 10% or rarer) in one or more domains. Domains include any structured area of activity with its own symbol system (e.g., mathematics, music, language) and/or set of sensorimotor skills (e.g., painting, dance, sports). (National Association for Gifted Children, n.d.c)

This definition includes a clarifier of achievement by defining it as the top 10% of students. The definition also divides the domains into those with symbol systems and those with sensorimotor skills.

A newly developed definition of gifted students was presented by Renzulli in 2011. He developed his definition based on criticisms of previous definitions. The definition he presented was:

> Giftedness consists of an interaction among three basic clusters of human traits – these clusters being above-average general abilities, high levels of task

> commitment, and high levels of creativity. Gifted and talented children are those possessing or capable of developing this composite set of traits and applying them to any potentially valuable area of human performance. Children who manifest or are capable of developing an interaction among the three clusters require a wide variety of educational opportunities and services that are not ordinarily provided through regular instructional programs. (Renzulli, 2011, p. 87)

This definition presented by Renzulli is a refined version of his Three-Ring Conception of Giftedness that he presented in 1978, maintaining the three areas of abilities, task commitment, and creativity and adding the interaction between the three as being vital (Renzulli, 2011).

As can be seen from many varied definitions, theories, and models, there is no one single definition of giftedness which leads to researchers, educators, federal agencies, school districts, and others determining a single standard definition for gifted and talented. The lack of a single definition, theory, or model allows school districts, in states like Minnesota, to create their own definition of gifted and talented. In addition, the lack of a single definition, theory, or model also leads to confusion and a lack of cohesion and direction in the field of gifted and talented.

School Context

Educators generally agree that students arrive at school with various levels of readiness and ability (Adelson et al., 2012). However, that is where the consensus ends. Educators cannot agree on how to best meet the needs of diverse learners, particularly gifted students. This lack of agreement is demonstrated by a wide array of state policies and definitions and the lack of a national definition or lack of federal mandates such as those provided for students receiving special education services through the Individuals with Disabilities Education Act (IDEA) of 2004.

In the *State of the States in Gifted Education* report by the National Association for Gifted Children (2009), the authors state there are an estimated 3,000,000 academically gifted students in the United States. The services these students receive in the classroom vary from state to state and between schools. "Without a coherent national strategy or a federal mandate . . . the variation in policies results in a disparity of services between and within states" (National Association for Gifted Children, 2009, p. 7). Differences result from individual schools making programming decisions. Therefore, students in one school might receive programming while students in a neighboring school might not receive any programming (National Association for Gifted Children, 2009, 2012-2013).

One of the first studies conducted involving school programming was completed by Whipple (1919). Whipple was a psychologist who believed gifted students were not provided a fair opportunity to develop their potential in regular classrooms. He wrote, "Bright children as well as dull children fail to profit to the utmost from instruction and training adjusted to the mental pace of the average" (Whipple, 1919, p. 6). In 1916, Whipple selected a group of 30 gifted students, 15 in Grade 5 and 15 in Grade 6, at Leal Elementary School in Urbana, Illinois, to participate in a special class for gifted students. He believed that special classes were necessary as the classes cultivated the students' potential and also benefited society. Furthermore, Whipple believed that selection for the classes should only be made based on mental tests and not on “ordinary classroom records of the public school” (Whipple, 1919, p. 10).

Almost 80 years later, Benbow and Stanley (1996) stated the achievement of many gifted students has declined over the years. There has been multiple reasons for the decline in student performance. First, there has been egalitarianism in society and schools, which pits equity against excellence. Second, many people equate “aptitude and achievement testing with elitism” (Benbow & Stanley, 1996, p. 249). Third, American schools insist on teaching all students the same curriculum at the same level. Finally, educational policies do not take into consideration the “vast range of individual differences among students” (Benbow & Stanley, 1996, p. 249). Benbow and Stanley further stated that teaching the same thing to all students has resulted in inequity; all students should have an opportunity to reach their potential. However, due to a fear of elitism and a lack of effective policies, educators will probably continue to teach the same thing to all students.

This same opinion had been stated previously. The United States Department of Education (1993) stated that gifted and talented students have not been reaching their full potential because Americans tend to have low educational expectations. In the writings of Alexis de Tocqueville in the 1830s, de Tocqueville stated in the United States “there exists in the human heart a depraved taste for equality, which impels the weak to attempt to lower the powerful to their own level . . . equality is their idol” (de Tocqueville, trans. 1863, p. 68). As a result of the American culture’s valuing equality, there are low levels of interest in education and intellect as Americans tend to move toward the middle and favor conformity over deviation from the norm (de Tocqueville, trans. 1863). Furthermore, Hollingworth (1926) wrote a similar philosophy on the education of gifted students by stating, “because of social attitudes . . . educators are hampered by a certain embarrassment in making frank provision for gifted children. It is felt that explicit recognition . . . [of] the gifted will give offense to a community grounded in the faith that all are equal” (p. 296). More recently, Gregory Anrig, president of the Educational Testing Service, was quoted as saying “as a culture we seem to value beauty and brawn far more than brains” (United States Department of Education, 1993, p. 14). Finally, Clark (2005), said, “By focusing the bulk of our time on the majority of students, we often fail to address the needs of a smaller but equally important group – the brightest and most gifted” (Clark, 2005, p. 56). These are a few of the comments from the 1830s to today stating the sentiment that America’s gifted and talented students are being forgotten in the classroom.

With schools being a large part of students’ lives, the time spent there should be effective and worthwhile. Reis (2007), observed gifted students in an elementary school on nine different occasions. She observed the gifted students working independently, surfing the web, talking to friends, and reading easy books; not once did she observe the students receiving reading instruction. When asked about the situation, the teacher responded, “The top group already reads at grade level so I rarely have any instructional time to give to them” (p. 2). Therefore, the basic idea is that the gifted students will succeed on their own while the teacher helps the other students.

The philosophies and classroom practices of some educators in American schools has changed little in regard to gifted and talented students since 1863; they believe the gifted and talented students can make it on their own, or they do not want to be elitist. However, many other educators and researchers are concerned with a lack of effective policies directed towards the students who are gifted and talented. There is also concern about teaching the same material to all students in the classrooms rather than adapting to individual student needs. Finally, there is concern about the programming available for gifted and talented students, especially in rural areas.

School Influences

The value of gifted programs is a debated topic today. The effects of the programs are being studied and evaluated by students, parents, educators, and researchers. Students and parents want the best possible education available. The idea of having the best possible education is sometimes part of a philosophical debate of excellence versus equality. Part of society wants top students who can help the United States remain competitive in a global economy. However, another part of society views gifted programs as detrimental to students as it takes funding from other students and creates an elitist environment (Adelson et al., 2012).

De Vise (2008) wrote, “The gifted label is a hot potato in public education. Any formula for identifying gifted children, no matter how sophisticated, can be condemned for those it leaves out” (para. 11). Furthermore, “The aim is to get away from the idea of putting kids in boxes and saying, you’re gifted and you’re not” (de Vise, 2008, para. 14). The debate remains whether or not schools should identify gifted and talented students and also whether or not special programming should be provided to the gifted and talented students. There are research studies showing programming is not beneficial and other research studies showing programming is beneficial for the gifted and talented students.

No benefits were found for gifted and talented programming in one longitudinal study by Adelson et al. (2012). The study involved the same 2,740 students from 720 schools remaining in the same school for kindergarten in 1998-1999, third grade in 2001-2002, and fifth grade in 2003-2004. The authors studied the effect on mathematics achievement of gifted students who participated in a gifted program. The results, after being adjusted for student-level variables and for schools that provided gifted programming, were not statistically significant. Therefore, Adelson et al. (2012) concluded the effect of providing a gifted mathematics program to gifted and talented students was null.

Furthermore, in the same study by Adelson et al. (2012), a second research question involved the effects of being in a gifted program on gifted students' mathematics attitudes. After adjusting the data for selection bias and the "differential effect between gifted students in a school with a gifted program and those not in a school with a gifted program" (p. 31), the result was not statistically significant. Therefore, Adelson et al. (2012) concluded that on average there was essentially no effect on mathematics attitudes of students participating in a gifted mathematics program from those who were not.

However, there are multiple studies and reports which support providing special programming for students identified as gifted and talented. Sousa (2009) stated that students learn differently, and teaching all students the same way does not provide individual students with an equal opportunity to learn. He continued, “Gifted students who are not identified and served by these programs are not likely to ever have their needs fully met while in school. The loss of such potential is a serious blow to society” (p. 5).

One report supporting special programming for gifted and talented students is *National Excellence: A Case for Developing America’s Talent* (1993) by the United States Department of Education where six recommendations were stated for meeting the needs of talented American students. The first recommendation was that challenging curriculum standards be developed to ensure students continue to learn and avoid repetition of material. Second, high level learning opportunities should be established to meet the needs of these talented students; this includes both in school and out of school alternative activities. Third, schools should ensure access to early childhood education so that all students have an opportunity to start learning at an early age. Fourth, the authors of the report recommended expanding opportunities for economically disadvantaged and minority students. Finally, the authors encouraged appropriate teacher training as teachers are “the key to success” (United States Department of Education, 1993, p. 27).

A school programming study conducted by Swanson (2006), looked at the effects of programming for gifted students from low socioeconomic status families in three schools. The results of the study supported previous findings showing that students’ achievement is affected by being challenged with high standards and expectations. Swanson further found that students' achievement improved when students were in an environment that was supportive and included a rich and challenging curriculum (Swanson, 2006).

Another study supporting programming for gifted and talented students was conducted by Delcourt, Cornell, and Goldberg (2007). Delcourt et al. found that the type of gifted program students participated in had an effect on students' academic achievement. There were 460 elementary school students, from 14 school districts in 10 states, involved in the study: 290 students in programs for the gifted, 50 high achieving students who were not involved in programs, and 120 non-gifted students. Delcourt et al. (2007) found that ability grouping for gifted students was effective and students attending special programs (i.e. special schools, separate classes, and pullout programs) performed better on the Iowa Tests of Basic Skills (ITBS) than their gifted peers who were not participating in any programs or were attending within-class programs. In mathematics problem solving, specifically, the authors showed students achieved adjusted mean scores of 45.58 when attending special schools, 49.56 when attending a separate class, 50.28 when participating in a pull-out program, and 42.82 when participating within-class programs while high achiever students scored a mean of 40.28 when not participating in any special programming. Similar results were obtained in the area of mathematics concepts where the students in a special school scored an adjusted mean of 48.67, separate class students scored 52.08, pullout students scored 51.12, and within-class students scored 43.77 while high achiever students not participating in special programs scored 40.63. Delcourt et al. (2007) found that students participating in within-class programs achieved the lowest scores in all areas of achievement when compared to their gifted peers. The final conclusion by Delcourt et al. (2007) was that "research on the effects of gifted programs is still generally sparse, unsystematic, and far from conclusive" (p. 361).

Another study supporting mathematics programming for gifted and talented students was conducted by Gavin, Casa, Adelson, Carroll, and Jensen-Sheffield (2009). In this study, Gavin et al. found that students showed higher mathematics achievement when high-end curriculum was used, particularly in self-contained settings. The study involved students in Grades 3 to 5 from 11 urban and suburban school districts. The students used the federal Jacob K. Javits research grant curriculum *Project* M^3*: Mentoring Mathematical Minds*. Those students participating in the curriculum showed a statistically significant positive impact on their mathematics achievement as tested on the Iowa Tests of Basic Skills (ITBS; Gavin et al., 2007; Gavin et al., 2009).

Finally, Xiang, Dahlin, Cronin, Theaker, and Durant (2011) published a study which supported programming for gifted and talented students. The longitudinal study involved tracking 81,767 students from more than 1,500 schools in 30 states from Grades 3 to 8 and an additional 43,423 students from over 800 schools in 28 states from Grades 6 to 10. Xiang et al. (2011) found that a majority of students performing above the 90th percentile on the Northwest Evaluation Association's (NWEA) Measures of Academic Progress (MAP) exam stayed there over time. More precisely, 57.3% of third grade students were still performing above the 90th percentile by eighth grade while the other

42.7% of students fell below the 90^{th} percentile. However, according to Xiang et al., most student scores that fell below the 90^{th} percentile still stayed above the 70^{th} percentile. Likewise, 69.9% of sixth grade students performing above the 90^{th} percentile were still performing at that level in tenth grade (Xiang et al., 2011).

Xiang et al., however, did not see a decline in the total number of students performing at the 90^{th} percentile. Instead, the total number of students performing above the 90^{th} percentile grew by 1.7% for students in Grades 3 to 8 and 4.3% for students in Grades 6 to 10. The authors attributed the growth to what they call, "late bloomers" (Xiang et al., 2011, p. 2). These were the students that performed above average in third grade and then climbed to the high achieving group by eighth grade (Xiang et al., 2011).

Advocates for gifted education programming say that special programming for gifted and talented students provides students with an appropriate education (Delcourt et al., 2007; Rogers, 2007). Advocates promote two primary goals for gifted education. The first goal is to increase the learning of students to a level matching the students' potential. The second goal is to enhance the students' self-concepts by allowing students to interact with like-ability peers who have similar interests (Rogers, 2007).

However, it is difficult to convince people of a need for programming for gifted and talented students when a limited number of studies support the need. One of the reasons given for a lack of research in the area of programming for gifted and talented students is ethical considerations. One ethical consideration has been researchers cannot withhold services from one group of students and provide services to another similar group of students. There is an ethical problem when withholding services from selected students. Similarly, researchers are unable to randomly assign gifted students to a control group or gifted program. As a result, researchers have difficulty obtaining control groups to study. A third ethical consideration is that researchers are unable to randomly assign non-gifted students to schools that provide gifted programming due to student demographics, district policies, etc. A fourth ethical consideration is that researchers are unable to assign schools to adopt gifted programming policy. As a result, researchers must use "quasi-experimental techniques to evaluate the efficacy of gifted programs" (Adelson et al., 2012, p. 26). The problem with many of these "quasi-experimental techniques," however, is that control groups and experimental groups differ in many ways other than in the variable to be tested, the gifted program (Adelson et al., 2012). The differences between the control and experimental groups may result in selection bias and "threaten the internal validity of the study and hamper the researcher's ability to make causal inferences" (Adelson et al., 2012, p. 26).

Another reason for a lack of research evidence on the effects of gifted programming is the lack of a standard definition for gifted and talented. Students may be identified as gifted and talented and provided programming in one school, but in a neighboring school, students at the same or similar ability level may not be identified as gifted and talented. Therefore, comparisons between groups are rarely possible (Adelson et al., 2012). "The field will continue to flounder in a sea of disconnected knowledge claims that limit the potential for meaningful growth . . . and renders us more vulnerable to the winds of chance in the education arena" (VanTassel-Baska, 2006, p. 339). Furthermore, the gifted and talented field can be "characterized as fractured, contested, and porous rather than unified, insular, and firmly policed . . . [the field] is populated by diverse, often internally contested, ideas, and lacks a coherent set of research agendas and a commonly accepted methodology and nomenclature" (Dai et al., 2011, p. 126).

Teacher Influences

In addition to the special programming provided to students identified as gifted and talented, the teachers of the students are another factor. Kendall (2011) said, "We know a few things. We know that the teacher has the single greatest influence on student learning in the school . . . and that holding students to high standards drives them to work to meet what is expected of them" (p. 56).

One of the earliest studies involving the influence teachers had on students was conducted by Hollingworth (1926). Hollingworth said that one of the most important qualifications is attitude. "The teacher must be free from unconscious jealousy and from unconfessed bias against gifted children" (Hollingworth, 1926, p. 306). Furthermore, Hollingworth continued, the teacher must have a "sense of humor, patience, and love of truth for its own sake. The teacher should be a person of very superior intelligence in order to gain and hold the respect of the gifted pupils" (Hollingworth, 1926, p. 307).

In a more recent study, Callahan (2007) also found that teachers influence the students. Callahan found that students are more successful when teachers show genuine concern for their students. She also found that when teachers maintain high academic standards which are not lowered and there is no "dumbing down" (Callahan, 2007, p. 53) of the curriculum, students are more successful. To maintain high academic standards, teachers must adopt strategies such as additional support to students who need it, providing frequent feedback, and having strict policies (Callahan, 2007).

A third study demonstrating the influence teachers have on students was conducted by Mills (2003). The study involved 63 teachers from the Center for Talented Youth summer programs at Johns Hopkins University. Teachers selected for the study had been identified by student participants as exemplary teachers in the program. Mills found that when selecting teachers to work with gifted students, it was important to select teachers with a strong background in mathematics and a passion for mathematics and students. Secondly, she stated that it is important to expose students to many different styles of teaching as students need to understand styles other than their own. Thirdly, teachers must understand gifted students and their "cognitive style preferences" (Mills, 2003, p. 272).

Mills (2003) also found that when she administered the Myers-Briggs Type Indicator (MBTI), to summer program teachers, there were many similarities between teachers and a group of 1,247 students who had participated in the summer programs. MBTI is a personality inventory used to identify personality preferences in four domains (The Myers & Briggs Foundation, 2013). First, almost 50% of the teachers were extraverts (E), who tended to be action-oriented, sometimes impulsive people who were interested in the world of people and their experiences, rather than introverts (I) who think through things and are more detached individuals. Secondly, almost all of the teachers, 82.5%, preferred intuition (N) over sensing (S), with a preference for abstract and symbolic relationships. Thirdly, almost 70% of teachers were classified as thinking

(T), people that prefer logical and impersonal styles of decision making, rather than feeling (F), people who prefer interpersonal styles of decision making. Finally, a majority of the teachers, 65%, were classified as judging (J), where they were decisive, planned, and orderly in their approach to teaching rather than perceiving (P), where individuals are more flexible, adaptable, and spontaneous (Mills, 2003).

Mills (2003) also administered the Myers-Briggs Type Indicator to a group of students who had participated in the Center for Talented Youth summer programs. When the results of the four dimensions were compared with those of the teachers, the results were very similar. The only difference appeared in the fourth dimension of judging versus perceiving where students preferred perceiving to judging, 60.3% to 39.7% (Mills, 2003).

In a study by Karp (2010) involving Russian teachers in a specialized mathematics school, Karp found that the teaching style and techniques used by all gifted and talented teachers involved problem solving. Problem solving sessions allowed for a conversation to happen in classrooms, providing students an opportunity for various ideas to be presented. To prepare to teach gifted students, Karp found that teachers believed a strong fundamental education in mathematics was absolutely necessary when working with gifted students. Extra mathematics allowed the teacher to be familiar with a variety of problems and areas of mathematics. Further, teachers believed that having the opportunity to discuss teaching strategies with their peers was an important aspect of teaching. Finally, experience teaching was important for working with gifted students;

the more years and experiences a teacher had, the more successful the teachers seemed to be with their students (Karp, 2010).

Studies have demonstrated that teacher personalities and lesson preparation and presentation were a factor in the classroom. However, not all gifted and talented students receive specialized programming or teachers trained in the needs of gifted and talented students. In the *State of the States in Gifted Education* report, by the National Association for Gifted Children (2009), responses to surveys sent to school districts indicated that a regular classroom was one of the top three methods of delivering instruction to gifted students. However, only three states required regular classroom teachers to receive any training in the area of gifted education (National Association for Gifted Children, 2012-2013). Further, for those students in specialized gifted programs, only 17 states required teachers of specialized gifted programs to have a special license or endorsement. These results indicate a lack of state required training for teachers of the gifted in a majority of the states (National Association for Gifted Children, 2012-2013).

Studies show teachers influence students in their classroom. Teachers influence students academically, socially, and personally. However, several states, including Minnesota, do not require teachers to receive any training regarding the needs of the gifted and talented students.

Rural Education

In addition to making six recommendations, the *National Excellence: A Case for Developing America's Talent* report by the United States Department of Education (1993), also noted that "small towns and rural schools often have limited resources and are unable to offer advanced classes and special learning opportunities" (p. 21). Primary reasons for a lack of additional classes in rural towns are small numbers of students, poverty level of families, generally low tax bases, and the difficulty rural school districts have obtaining qualified teachers. The authors continued, "This is especially troubling because there are often fewer other community resources available in rural areas, making the school the primary center of intellectual and cultural life for students" (United States Department of Education, 1993, p. 21).

The *National Excellence* report, like earlier studies comparing rural and non-rural students, found that students attending rural schools were disadvantaged academically compared to their non-rural peers. However, one of the first noted studies to contradict those findings was a study conducted by Fan and Chen (1999). Fan and Chen found that students who attended rural schools generally performed as well as their non-rural peers on a variety of achievement measures. The authors concluded, "all else equal, rural youth do not suffer disadvantages simply as the result of their residence in rural areas or their attendance at rural schools" (Fan & Chen, 1999, p. 31).

Since 1999, several additional studies have been conducted involving the differences between rural and non-rural students. One such study by Anderson and Chang (2011) examined the mathematics course-taking of rural high school students. They found that course-taking patterns of rural and non-rural high school graduates was not the same, namely rural graduates earned fewer mathematics credits than did non-rural graduates. In addition, rural graduates tended to begin their high school career at a lower level of math than non-rural graduates. Finally, rural high school students had less access to advanced placement mathematics courses than their non-rural peers (Anderson & Chang, 2011). The study by Anderson and Chang showed that rural students take fewer classes, and their opportunity to take additional classes is limited. Therefore, the reduced number of classes is less the result of student choice and more the result of class offerings provided by the school.

In another study conducted by Reeves (2012), he found that student demographics and school size accounted for a small part of the mathematics achievement gaps between rural and non-rural students. The largest influences were a result of their family's socioeconomic status (SES) and their friend group. Reeves found that rural students come from lower-SES family backgrounds which are associated with lower academic commitments and aspirations. Secondly, he found that students were greatly influenced by the choices their friends made in course selection (Reeves, 2012).

A third study conducted by Byun, Meece, and Irvin (2012) compared rural and non-rural students' postsecondary educational attainment. The study found that poverty rates were higher for youth in rural areas than for non-rural youth. In addition, parents in rural areas had lower college graduation rates and educational expectations for their children. Plus, rural youth had lower standardized test scores and were significantly less likely to take rigorous courses and have access to college preparatory programs than their non-rural peers. However, parents of rural students were more likely to know and talk to the parents of their child's friends and rural students more frequently participated in religious activities than their non-rural counterparts. The final result of the study, after controlling for these differences, was that rural students had a small increase in likelihood for completing a bachelor's degree over their non-rural peers (Byun et al., 2012).

Results of studies have changed over time. Earlier studies showed that the rural location was the reason for rural students being behind their non-rural peers. However, more recent studies indicate that school class offerings, parent SES, and parental expectations for students in rural areas were lower than those for students in non-rural areas. When controlling for these factors, rural students did as well academically as their non-rural peers.

Curriculum

The curriculum adopted by school districts determines what students are to be taught in classrooms. One part of a curriculum is the textbook. The debate over curriculum and textbook adoption has been ongoing for many years. In addition, there is a debate over accelerating gifted students through a curriculum, allowing them to go faster and further than their non-accelerated peers.

Some educators and researchers believe that textbooks have been "'written down' by their publishers to ever-lower reading levels," as stated in *A Nation at Risk* (National Commission on Excellence in Education, 1983, p. 19). Further, Bell stated, "Current efforts to reform the schools will 'fall flat and fail' if textbooks are not improved. . . . Textbooks drive content, set the level of rigor, and influence the degree of intellectual challenge to students" (as cited in Reis et al., 1993, p. 8).

Chall and Conard (1991), agreed with Bell. "On the whole, the later the copyright dates of the textbooks for the same grade, the easier they were, as measured by indices of readability level, maturity level, difficulty of questions and extent of illustration" (p. 2). Chall and Conard stressed the importance of curriculum matching student abilities. Chall and Conard also stated that for the most learning to occur, instructional task should match the student. "If the match is not optimal, learning is less efficient and development may be halted" (p. 19). Finally, Chall and Conard continued that selection of textbooks is vital in a classroom, and teachers must look at the textbook's level of difficulty, repetition of material, and the needs of the students (Chall & Conard, 1991).

Adding to the curriculum debate was the federal legislation of No Child Left Behind which mandated states adopt standards and test students on those standards (No Child Left Behind, 2002). Each state has adopted its own standards and own assessments to determine Adequate Yearly Progress (AYP; Kendall, 2011). Then in the spring of 2009, governors and state commissioners of education formed the Common Core State Standards Initiative (CCSSI) to develop a set of national standards in English and Mathematics. In June 2010, the Common Core State Standards for Mathematics was published (Kendall, 2011). Minnesota adopted the English standards but decided not to adopt the mathematics standards, making Minnesota one of five states not adopting the standards by the beginning of 2014. The other four states not adopting the mathematics and English Common Core State Standards were Alaska, Nebraska, Texas, and Virginia. By November 2014, Indiana and Oklahoma both passed legislations abandoning the Common Core standards, with South Carolina planning to abandon the Common Core standards beginning in the 2015-2016 school year (Common Core State Standards Initiative, 2014).

With the addition of standards, an enhanced debate has resulted involving the curriculum for gifted students. In a study conducted by Reis et al. (1993), they found that students in gifted programs had higher academic achievement on tests than gifted students not participating in special gifted and talented programs. Reis et al. conducted a study which involved 27 school districts and approximately 436 teachers in Grades 2 through 6. Of the 469 students involved in the study, 213 were in the experimental group where curriculum compacting was used while 256 were in the control group (no compacting of curriculum). The students took a pretest and posttest using the Iowa Tests of Basic Skills in the area of mathematics. Reis et al. study results showed a significant difference between scores of the experimental group and control group on posttests. Students who participated in curriculum compacting in mathematics outperformed their peers from regular classrooms. In addition, students took the Arlin-Hills Attitudes Survey Toward School Learning Processes. Reis et al. (1993) found that students whose curriculum was compacted in mathematics had significantly better attitudes towards learning than did students in the control group.

Curriculum compacting is an instructional technique developed by Reis, Smith, and Renzulli beginning in the mid 1970s (Reis et al., 1993). It was designed for classroom teachers to eliminate curriculum students had already mastered and streamline work to allow students to complete the work at a faster rate. The time gained using the system has been used for enrichment and acceleration activities (Reis et al., 1993).

Reis et al.'s (1993) study also found that 95% of teachers were able to identify high ability students in their classrooms. The authors also found that 80% of teachers were able to identify the curriculum that high ability students had not mastered. Finally, Reis et al. found that approximately 40-50% of the curriculum could be eliminated, especially in mathematics because much of the curriculum was repeated from year to year (Reis et al., 1993).

Furthermore, Hannah, James, Montelle, and Nokes (2011) found curriculum acceleration worked well for gifted students in mathematics. Mathematics is predominately skills-based and very linear at the elementary and high school levels. As a result, gifted students are able to move through the curriculum quicker than their non-gifted peers. Hannah et al. also pointed out that the practice of acceleration generally does not require additional resources, allowing school districts to implement the practice without adding additional costs.

Furthermore, Park, Lubinski, and Benbow (2013) studied the long-term effect of acceleration on mathematically gifted students. Adult participants in the study were identified in the 1970s. Park et al. found the participants who had been accelerated in school were more likely to pursue advanced degrees in STEM and had more publications than non-accelerated students. These results suggested that acceleration of students enhanced the STEM accomplishments of mathematically gifted students (Park et al., 2013).

These studies indicate that curriculum determines what students are taught in the classroom. However, the debate over curriculum, textbook adoption, and the acceleration or compacting of curriculum for gifted students will continue in the near future.

Additional research, such as that by Park, Lubinski, and Benbow, will be needed to resolve the debate.

Student Context

In addition to the influences of the school context on gifted students, there are also student context influences which include student characteristics, peer interactions, socioeconomic status, and the motivational environment of the student. The four student context influences have been researched extensively since 1926.

Student Characteristics

Terman (1926) conducted the first study to describe physical growth and general health of gifted students, explain their learning characteristics, reading preferences, play interests, and moral traits. Terman found that physical growth of gifted students was normal compared to their non-gifted peers. There was no evidence of the “intellectually precocious child [being] weak, undersized, or nervously unstable” (Terman, 1926, p. 634). Furthermore, gifted students could be identified at an early age by their curiosity, amount of information they knew, and their desire to learn to read. Once students started reading, the preference of gifted students was to read “books of science, history, biography, travel, and informational fiction and less in books of adventure, mystery, and emotional fiction” (Terman, 1926, p. 637). In regard to playing, Terman found previously held beliefs that gifted students did not like to play, was unfounded. However, Terman did note that gifted students may have devoted fewer hours per week to playing; but the reason was that playing competed with all the other interests of the students. In regard to moral traits, Terman found that gifted students were more honest and trustworthy than their non-gifted peers as "few have ever denied that there is at least a certain amount of positive correlation between intelligence and character" (Terman, 1926, p. 638).

Hollingworth was another pioneer in the area of gifted and talented students. She was concerned about the psychosocial development of gifted students. Hollingworth (1926) addressed a variety of concerns for gifted students and presented her program for emotional education where the highly gifted students were segregated into special classes. She disagreed with Terman's (1926) findings that gifted students were superior to average in emotional stability and control. She felt that gifted students had special needs which could only be met through identification and training. She also felt that gifted students could not be reduced to statistical averages and IQ scores. As a result, she spent much of her adult life studying gifted students at Public School 165 in New York City (Hollingworth, 1926).

In a 1980s study, Deci and Ryan (2008) defined the self-determination theory. The theory is "an empirically based theory of human motivation, development, and wellness. The theory focuses on types, rather than just amount, of motivation" (Deci & Ryan, 2008, p. 182). Self-determination theory involves three major categories of motivation: intrinsic motivation, extrinsic motivation, and amotivation. Intrinsic motivation involves students engaging in an activity due to the value or enjoyment of doing it. Extrinsic motivation involves the students participating in an activity due to an external outcome. Amotivation is when students lack intention or value in the activity resulting in the students doing nothing (Garn, Matthews, & Jolly, 2010).

Extrinsic motivation was further delineated into four categories by Ryan & Deci (2000). The first category was integration. Integration is defined as students participating in an activity because it is imbedded in their value system. For example, students work hard in school because they value praise from their teacher or parents. The second category is identification where students participate in an activity contingent on an external reward such as getting good grades. The third category of extrinsic motivation is introjection. In this category, students engage in an activity for reasons not fully accepted as their own such as pleasing their parents. Finally, external forms of extrinsic motivation involve token rewards or punishments.

Another study regarding personal characteristics of gifted and talented students was conducted by Ablard and Lipschultz (1998). They studied 222 seventh grade gifted students (those scoring at or above the 97th percentile on the California Achievement Test), involved in self-regulated learning (SRL). Self-regulated learners are defined as students who are able to "engage in academic tasks for personal interest and satisfaction and are metacognitively and behaviorally active participants in their own learning" (Ablard & Lipschultz, 1998, p. 94). High achieving students reported frequent use of SRL strategies. SRL strategies included organizing and transforming information, reviewing notes, goal setting, reviewing of texts, keeping records, self-evaluating, and seeking assistance from adults when needed. However, students varied widely in their use of SRL strategies. Those students with mastery or task goal orientations reported frequent use of SRL strategies while doing math homework. However, those students with high performance or ego goal orientations reported limited use of SRL. And for those students with low mastery and performance goal orientations, students reported low use of SRL. The conclusion of the study was that a majority of the students had high task orientations and used SRL strategies to assist their learning and performance, or ego orientation was limited (Ablard & Lipschultz, 1998).

Peer Interactions

One of the first studies completed involving peer interactions was conducted by Hollingworth (1926). She found that highly gifted students preferred solitary play, engaging in activities such as swimming, skating, walking, horseback riding, and other activities which did not depend on a group. Hollingworth believed the difficulties in forming friendships were the result of the gifted students not finding a "like-minded" friend (Hollingworth, 1926). Hollingworth's finding that gifted students have difficulty forming friendships was similar to Terman's who observed gifted students playing alone more frequently than students with average intelligence (Terman, 1926).

Some research indicates that gifted students feel they do not fit in with or they feel different from their peers (Coleman & Cross, 1988; Swiatek & Dorr, 1998). In their study of gifted students, Swiatek and Dorr found the students used four social factors to fit in with their peers: denial of giftedness, hiding giftedness, emphasis on popularity over academics, focusing on peer acceptance. Coleman and Cross also found that students felt their giftedness interfered with being accepted by their peers. As a result, the students would try to "minimize their visibility as gifted students" to others (Coleman & Cross, 1988, p. 41).

In a more recent study conducted by Furrer and Skinner (2003), they found that "low relatedness" to peers did not have a "serious consequence for children's engagement" (p. 159). The result was that students who have positive relationships with adults may do well academically despite poor peer relations. The results by Furrer and Skinner were similar to those found by Ryan, Stiller, and Lynch (1994). Ryan et al. found that after the effects of relatedness were controlled for parents and teachers, the effects of relatedness to peers had little effect on academic achievement. However, a low relatedness to peers did affect the students' emotional experiences in the classroom (Furrer & Skinner, 2003).

French, Walker, and Shore (2011) found that gifted students did not prefer to spend time alone after school any more than their non-gifted peers. This finding suggested that gifted students may spend time alone during the school day and after school, but their desire to spend time with their peers is not different than their non-gifted peers. The researchers also found that the willingness of gifted students to work with others was dependent on their feeling supported by peers and teachers. Without this support, gifted students have feelings of free-riding by their non-gifted peers (French, Walker, & Shore, 2011).

In contrast, a study by Kao (2011) found that mathematically gifted adolescent females did prefer to work alone. Kao further stated that the girls were indifferent to popularity and were more attached to family than to friends. In addition, the girls preferred self-contained gifted classes with a majority of boys. This study found some inconsistencies with previous literature and provided a new perspective for research on mathematically gifted females (Kao, 2011).

Furthermore, in a study conducted on accelerated and non-accelerated gifted students, Hoogeveen, van Hell, and Verhoeven (2012) found that accelerated students were "less susceptible to personal and environmental factors" (p. 598). Hoogeveen et al. also found that age differences between students did not negatively affect relationships students had with peers. Conversely, non-accelerated peers' had a drop in their self-concept and strained peer relationships (Hoogeveen, van Hell, & Verhoeven, 2012).

Similarly, Lee, Olszewski-Kubilius, and Thomson (2012) found that gifted students did not feel their giftedness was a negative factor in their peer relationships. However, they rated their academic self-concept more positively than their social self-concept. Lee et al. also found that gifted students' relationships were more positive for those students who were accelerated when compared to those students who were not. Finally, students whose academic strength was in the verbal area were more likely to have difficulties with peer relationships (Lee, Olszewski-Kubilius, & Thomson, 2012).

Research studies show conflicting results involving peer interactions of gifted students. Earlier research results indicated gifted students felt different than their non-gifted peers and had difficulty in social situations. More recent studies indicate there is less of a difference between gifted students and their non-gifted peers than previously believed in regard to peer relationships and that gifted students are able to adapt socially.

Socioeconomic Status

Typically, students identified as gifted come from upper socioeconomic status families who are able to access additional resources to meet their children's needs. In contrast, students from families with lower socioeconomic status traditionally have access to fewer resources. Therefore, poorer children have fewer opportunities to learn and explore new ideas (Garn et al., 2010).

The participation of students in gifted and talented programs from various socioeconomic statuses was studied by Olszewski-Kubilius and Lee (2011). Their study involved 257,829 students who participated in talent search testing from 2000 to 2008. Out of all students tested, 18.5% were from households with family incomes less than $50,000. The other 81.5% of the students were from families with incomes of $50,000 or more. And, of those 81.5%, 30.9% of the students were from families with incomes greater than $120,000. According to the study, students from families with incomes less than $50,000 have "hit a proverbial 'glass ceiling'" (p. 71). Students from lower income families have not been participating in special programs. Therefore, students from lower income families have not been exposed to the same opportunities as their counterparts in more affluent areas who have more opportunities for entrance to supplementary education programs and selective post secondary institutions (Olszewski-Kubilius & Lee, 2011).

A second study by Wyner, Bridgeland, and Diiulio (2009) showed similar results. Wyner et al. reported that students coming from low-income families were at a disadvantage. Wyner et al. found that of students performing in the top quartile in first grade, only 28% were from low-income families. Furthermore, by fifth grade, only 58% of low-income students in the top quartile in first grade remained in the top quartile. Therefore, by the time students were in fifth grade, less than 15% of students in the top quartile were from low-income families (Wyner, Bridgeland, & Diiulio, 2009).

A third study conducted by Stambaugh (2007) found that students from low-income families are likely to underperform in school. Students' underperformance was due to "their unique experiences, varied environments, and minimal acculturation to middle class values" (p. 83). According to Stambaugh, the result is a repeating cycle where high-potential students remain unnoticed and do not reach their academic potential; therefore, there needs to be a concerted effort to recognize and improve the learning of these students (Stambaugh, 2007).

Payne (2005), described some of the cultural differences between students from lower socioeconomic status families as compared to those from middle-class socioeconomic status families. One of the differences Payne noted was the students' views of education. For students in lower socioeconomic status families, education is viewed as abstract and not as reality. However, in middle class families, education is viewed as crucial to making money. A second difference is in personality. For students from lower socioeconomic status families, a sense of humor is highly valued. However, in middle class families, achievement is highly valued. A third difference is in regard to time. For students in lower socioeconomic status families, the present is most important because decisions are based on feelings of survival. In middle class families, the future is important and decisions are made based on future implications. Finally, in regard to destiny, students from lower socioeconomic status families believe in fate, and the students cannot do much to change the future. Students from middle class families believe in choice and the future can change with good choices now (Payne, 2005).

Renzulli and Park (2000) studied the reasons gifted and talented students dropped out of high school. The study involved 334 students identified as gifted and talented who had dropped out of school. Students participating in the study were asked to complete two questionnaires regarding their reasons for dropping out of high school. There were a variety of reasons students gave for dropping out. Male gifted students dropped out because they were failing at school (49%), got a job (40.7%), could not keep up with their school work (38.1%), did not like school (37.4%), or could not go to school and work at the same time (32.7%). Female gifted students reported dropping out of school because they did not like school (35.5%), were pregnant (33.8%), became a parent (29.1%), or were failing at school (29.1%; Renzulli & Park, 2000).

In a second part of the study conducted by Renzulli and Park (2000), 3,520 gifted and talented students who dropped out of high school answered questionnaires regarding their demographics and school grades and extra-curricular activities. One part of the demographic portion of the questionnaire included questions regarding the socioeconomic status of the family. Renzulli and Park found that almost half (48.18%) of students that dropped out of high school were from the lowest quartile of socioeconomic status families while only 3.56% of them were from the highest quartile. A second part of the demographic portion of Renzulli and Park's questionnaire included questions about students' parents' highest educational level. Renzulli and Park found that 39.99% of students who had dropped out of high school had fathers who had dropped out of high school while 25.55% of the gifted students had mothers who had not graduated from high school. A third part of the questionnaire found that gifted dropouts participated in fewer extra-curricular activities than their peers who graduated. Overall, the authors show socioeconomic status, parents' educational levels, and extra-curricular participation were related to gifted students dropping out of school (Renzulli & Park, 2000).

Wyner et al. (2009) also looked at students from lower-income families. The authors began by stating "very little is known about high achieving students from lower-income families" (Wyner et al., 2009, p. 4). Lower-income students studied were those who scored in the top quartile in nationally normed standardized tests and family incomes were below the national median. Wyner et al. stated in their report that of students performing in the top quartile on tests used in the Early Childhood Longitudinal Study – Kindergarten (ECLS-K) cohort, only 28% were from lower-income families while 72% were from higher-income families. With all things being equal, the number of students from lower-income and higher-income families should have been the same, given the incomes were divided using the national median (Wyner et al., 2009). These differences may be the result of lower-income children not having the same access to high-quality preschool programs which can have an effect on students' "academic ability, cognitive development, social adjustment, and professional achievement" (Wyner et al., 2009, p. 12).

Furthermore, Wyner et al. (2009) showed that by the time students reached high school mathematics classes, 25% of those students from lower-income families fall out of the top quartile while only 16% of those from higher-income families fall out of the top quartile. Plus, for those students not in the top quartile in fifth grade, students from higher-income families are more than twice as likely to rise into the top quartile as those students from lower-income families (Wyner et al., 2009). Finally, Wyner et al. showed that lower-income students do not maintain their academic status as well as their higher-income peers.

Multiple studies have been done involving students from low-income homes. Similar results have been found. Students from low-income or low socioeconomic status families are less likely to be identified as gifted and less likely to be found in the upper quartile of students based on academic achievement.

Motivational Environment

Parents can impact their children's academic motivation in school. However, at the time of this study little had been known about the motivational environment provided by families of gifted and talented students, and the impact parents have on academic achievement of their students. As a result, there is a need for additional research in the area of motivational environment (Garn et al., 2010).

One of the first studies involving parental influences of gifted students was conducted by Terman. The Terman (1926) study used a Whittier Scale Rating for 288 homes of gifted children, 50 homes of non-gifted children, and 120 homes of delinquent boys. The Whittier Scale Rating is a six-point scale with five categories: necessities, neatness, size, parental conditions, and parental supervision. In each of the categories, the gifted students scored higher than either the non-gifted students or the delinquents, see Table 1 (Terman, 1926).

Table 1. Terman Study on Parental Influences in Children.

	Necessities	Neatness	Size	Parental Conditions	Parental Supervision
Gifted Students	4.63	4.54	4.55	4.64	4.60
Non-Gifted Students	4.18	4.20	4.48	4.22	3.70
Delinquents	2.93	3.39	3.11	2.64	1.84

The Terman study (1926) also included parent education and family marital status. Terman (1926) found that the median education of parents of gifted children was Grade 12.1 (or just past a high school diploma) as 52.7% of the students had parents that had graduated from high school. Further, 26.4% of gifted students had one or both of their parents earning a college degree (Terman, 1926). Only 5.24% of gifted students' parents were divorced, and 1.9% of gifted students' parents were separated. The other 92.86% of gifted students lived with both their parents (Terman, 1926).

More recent studies were conducted by Gottfried, Fleming, and Gottfried (1994, 1998). Their studies explored the influence of parental support on intrinsic motivation and academic achievement over time. Gottfried et al. (1994) revealed similar findings to that of Terman's (1926) study in that the home environment had a direct effect on students' achievement. The researchers recommended that future studies explore the influences of home environment on motivation (Gottfried, Fleming, & Gottfried, 1994).

A qualitative study was conducted in 2009-2010 by Garn, Matthews, and Jolly (2010) which involved 30 parents of gifted and talented students from throughout the

United States. Garn et al. found that 80% of parents felt they understood what motivated their children even if the parents did not always feel successful in shaping it. In addition, 60% of parents said that developing intrinsic motivation was "an intensive and at times frustrating process . . . [as] 'strong willed,' 'opinionated,' and 'not easy to direct' were characteristics" (Garn et al., 2010, p. 266) parents used to describe their children.

In the same study by Garn et al. (2010), over half the parents in the study viewed their children's teacher as being "out of touch" with the motivational needs of their children, and the classroom activities were "a barrier to academic motivation" (Garn et al., 2010, p. 267). In addition, more than 80% of parents said they used a variety of techniques to assist their children with their school work. One of the techniques used by over half of the parents was "interactive instruction" (p. 267) where parents helped their children with their homework and were involved in their children's school activities. A second technique used by over two-thirds of the parents was restructuring the learning environment. The parents helped their children with time management skills, provided all the necessary supplies to complete an assignment, or helped their children break down assignments into manageable parts. The third technique used by over one-third of parents was relating their children's homework to the children's interests which helped the children make connections between new material and previously learned material. The fourth and final technique used by almost one-half of parents was initiating the children's interest to help develop the children's internalization (Garn et al., 2010).

In contrast, parents' negative attitudes toward school can undermine their children's motivation. A negative attitude toward school can be created when there is a parent-teacher conflict (Garn et al., 2010). The result is students have difficulty building a relationship with the teacher when parents are unsupportive of the teacher. When students and teachers do not have a strong sense of relatedness, students are not as engaged in the classroom. Furthermore, as students reach high school, students report a drop in relatedness to their teachers. At the same time, however, relatedness was a stronger predictor of engagement in high school students than in elementary students (Furrer & Skinner, 2003).

Relatedness describes how students attach to others. Furrer and Skinner's (2003) study argued that students with a history of secure attachments to their parents function well throughout their school years. Students with secure attachments to parents were found to have positive peer and teacher relations and did well in school. One possible reason for doing well is that students with positive relatedness to their parents feel safe and secure which allows students the freedom to explore and engage in activities and relationships with others (Furrer & Skinner, 2003).

A study was conducted by Campbell and Feng (2011) and involved 48 of the 2006-2007 Adult Academic Olympians. The Olympians were divided into two groups based on number of publications each member had written. Group A participants had written a mean of 92.88 publications while Group C participants had a mean of 6.63 publications (Campbell & Feng, 2011). Campbell and Feng discovered multiple findings in their study regarding the parents of the participants. First, of the 48 Olympians involved in the study, only two were from one-parent families and one of those was the result of a deceased parent. Second, Group A participants had a mean socioeconomic status of 88, indicating parents' occupations were professional. Group C participants had a mean socioeconomic score of 78, indicating parents' occupations were managers or officials. The third finding was Group A participants had a home atmosphere more conducive to learning when they were growing up. Their homes had books and magazines to spur interests of children, and their parents encouraged their children's development. However, for participants in Group C, there was not as positive a home environment, and there was less recognition of their talents (Campbell & Feng, 2011). As a result, Campbell and Feng concluded a home atmosphere conducive to learning or discovery was a significant predictor of life productivity for all participants. The home "atmosphere promotes academic achievement and has long-term effects" (Campbell & Feng, 2011, p. 24).

Similar results were found by Howley, Pendarvis, and Gholson (2005) when they looked at gifted students in a rural school district. The findings of Howley et al.'s study showed that students in a gifted program had families who were very supportive of their students' learning. In addition, there was an expectation to do well in school. Howley et al. further found that mothers, rather than fathers, appeared to play a more active role in helping students with homework, checking homework, giving students extra problems to solve, and maintaining routine practices in the home (Howley, Pendarvis, & Gholson, 2005).

All of these studies show that parents have an impact on the educational experiences of students identified as gifted and talented. This impact on students is the result of families' socioeconomic status, motivational environment, experiences provided to students, and the home atmosphere. Therefore, it is important for educators to know and understand the family background of their students.

Summary

Chapter II discussed several studies, theories, and reports which involved students identified as gifted and talented. The chapter began with a historical overview of the gifted and talented field. Following the historical aspect was a section involving the school context which involved the school, teacher, rural education and curriculum influences on gifted and talented students. The final section of the chapter was the student context which involved student characteristics, peer interactions, socioeconomic status, and motivational environment of the students.

The final three chapters of the study involve the design, data, and future recommendations. Chapter III discusses the qualitative research design of this study. Chapter IV presents themes from six student and four teacher interviews. Finally, Chapter V states the discussion and implication of results. Chapter V includes implications and recommendations of results for public schools and recommendations for further study.

CHAPTER III

RESEARCH DESIGN

Chapter III consists of the research design for this qualitative study. The research design includes topic and participant selection followed by interview methods and methods of data analysis. The final sections of Chapter III are validity and ethical considerations of this study.

Introduction

The purpose of this study was to use phenomenological qualitative research methods to identify educational experiences of high-ability mathematics learners from rural one-section and two-section high schools. Qualitative research was chosen because personal classroom experiences of students and mathematics teachers were used in this study to answer the two research questions. Phenomenological research is concerned with understanding a phenomenon from participants' perspectives through textural and structural descriptions of the individuals' experiences (Moustakas, 1994). Following a phenomenological approach, the researcher

> engages in disciplined and systematic efforts to set aside prejudgments regarding the phenomenon being investigated (known as the Epoche process) in order to launch the study as far as possible free of preconceptions, beliefs and knowledge of the phenomenon from prior experiences and professional studies – to be completely open, receptive, and naïve in listening to and hearing research

participants describe their experience of the phenomenon being investigated. (Moustakas, 1994, p. 22)

Through the Epoche process, in-depth semi-structured interviews, and analysis of data, and through writing textural and structural descriptions, this study investigated educational experiences of high-ability learners in mathematics and mathematics teachers.

Topic Selection

The first step in this research study was to select a topic. Multiple topics were explored before deciding on a topic involving students who had been identified as excelling in mathematics and who had attended public one-section or two-section high schools in three rural Minnesota counties.

The topic of mathematics was chosen due to the researcher's high interest and knowledge level about mathematics education. In addition, STEM education was addressed in the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education and Science (America COMPETES) Act of 2007. America COMPETES focused on three areas, one of which was strengthening educational opportunities in STEM for students in elementary through graduate school (America Creating Opportunities, 2007).

Second, students identified as excelling in mathematics were selected. At the time this report was written, there was no national definition for students identified as gifted and talented; and in Minnesota, local school districts were left to decide for themselves if school district personnel would identify gifted and talented students and if staff members would provide programming for those students. At the time of this research, school districts participating in this study were not identifying students as gifted and talented and were not providing special programming for gifted and talented students. Therefore, this study focused on high-ability learners in mathematics, rather than on students identified as gifted and talented in mathematics. However, the students selected have achieved a feature common with students identified as gifted and talented, a score at or above the 95^{th} percentile on a nationally-normed test. The common test score allows comparisons between the students in this study and other studies involving students identified as gifted and talented in mathematics.

Defining gifted and talented students as those students who score at or above the 95^{th} percentile means less than 5% of a school district's student population would statistically qualify as gifted and talented. As a result, in one-section and two-section school districts, statistically, between one and three students in each grade level would qualify as gifted and talented. Therefore, the needs of this minority group of gifted and talented students may be unmet while teachers try to meet the needs of the majority (95%) of students in the classroom.

At the time of this report, there has been a renewed focus on students in Minnesota who excel in mathematics. The reason for this renewed focus was that in 2012, Minnesota started holding schools accountable for students' learning using student growth scores as required in Minnesota's NCLB waiver (Minnesota Department of Education, 2014b). "Each student is given a growth score based on how their test score compares to their expected test score. All students have an expected score based on how the student scored in the prior year" (Minnesota Department of Education, 2013a, para. 11). The growth scores were then used to classify student learning as low, medium, or high. The students' growth scores are then averaged to determine a school growth score. The schools were then labeled as Reward Schools (top 15% of Title I schools), Celebration Schools (next 25% of schools), Priority Schools (lowest performing 5% of Title I schools), Focus Schools (next lowest 10% of schools) or Continuous Improvement Schools (next lowest 25% of schools; Minnesota Department of Education, 2013a). As a result of the change to growth score rankings, all students, including gifted and talented students, became a focus for educators. Each student's annual growth amount became important and not just whether the students pass the test or not. The educators could no longer focus on only those students who had not reached proficiency on the NCLB required tests; but instead, educators needed to ensure all students were growing, including gifted and talented students who consistently achieved proficiency on the tests (O'Malley, Murphy, Larsen-McClarty, Murphy, & McBride, 2011).

Minnesota was selected as the state for this research project because it was one of four states (Massachusetts, New Hampshire, and South Dakota being the other three) in the nation without a legislative definition of gifted and talented (see Appendix A). Minnesota was also one of 15 states that does not require services be provided for students identified as gifted and talented. Therefore, high-ability learners in mathematics in Minnesota need to be part of a research study to understand the educational experiences which allow them to be successful without being identified as gifted and talented.

Public school districts in Minnesota were chosen because they all follow the same state educational requirements, unlike private schools, home schools, intermediate school districts, state schools/academies, special education and vocational cooperative districts, and telecommunications districts. Academically, all students in public schools must take a minimum of three mathematics courses to graduate from high school (Minnesota Department of Education, 2013c). Finally, public schools have the same operating structure involving a school board, superintendent, school administrators, and teachers.

Finally, rural schools were chosen because they share similar educational opportunities available to students in regard to access to zoos, science centers, and art museums. At the time of this study, there were multiple studies involving urban schools; however, there were very few studies involving rural students' experiences. One reason for fewer studies may be because there are fewer people in rural areas than in urban areas resulting in researchers being required to travel to conduct research and obtain permission from multiple sites, rather than accessing multiple people in one city and obtaining permission to conduct research from one school district. In 2010, the United States Census Bureau found rural areas encompassed 19.3% of the population (United States Census Bureau, 2012a). Therefore, with over 80% of the population in urban clusters, those areas tend to become the focus of research studies.

Urban studies, however, have not been sufficient to show the needs of students in rural schools. Rural schools have limited staff resources, and it has been difficult to offer special programming for students to continually challenge them in mathematics (United States Department of Education, 1993). There has also been a limited educational opportunity for students to participate in their communities as numbers of museums, theaters, zoos, etc. have been limited in rural communities (United States Department of Education, 1993).

All five aspects of this research topic: mathematics, high-ability learners in mathematics, State of Minnesota, public schools, and rural were defined with care to make sure the study was “realistic, neither too broad nor too narrow” (Glesne, 2011, p. 31). As a result, this study should provide information to educators in all five aspects of this research topic.

Researching the Topic

After the topic was selected, the first step in the process was a review of related literature. The purpose of the literature review was to provide background information on the topic. By paying attention to existing theories and research from key sources, a deeper understanding of issues was obtained (Maxwell, 2005). As Maxwell recommended, the literature was critically examined to determine its usefulness in this study. Maxwell also suggested, “There is no way to be sure when the dominant approach is wrong or misleading or when your alternative is superior . . . see what happens when you abandon these assumptions . . . use the literature, don’t let it use you” (p. 45).

Information found in the literature was then used to develop a pilot study. The pilot study was completed during an Educational Foundations of Research (EFR) 520, Qualitative II course which was part of the researcher’s doctoral studies at the University of North Dakota. In addition to completing the pilot study, the researcher was able to discuss the study with her cohort members and professors to gain multiple perspectives and ideas on how to develop this current study.

The research methods and topic to be used in this study were discussed with professors through a variety of classes taken at the University of North Dakota. Extensive conversations regarding research methods for this topic occurred in EFR 510 and EFR 520 classes with Professor Dr. Marcus Weaver-Hightower. It was during EFR 510, Qualitative Research I, that the initial research design for the study was formulated. Then, during EFR 520, Qualitative Research II, the pilot study was completed involving students at the school where the researcher currently teaches.

During the pilot study, the researcher spent extensive time talking to peers about the topic and proposed research methods. Most conversations were held during EFR 510 and 520 classes. Questions such as selection bias and obtaining the identity of students from school district personnel were things to be considered.

The researcher also researched each state's definition of gifted and talented and whether special programming was required for students in other states. There were internet sources where this information was summarized. However, the information for the State of Minnesota was incorrect. As a result, the researcher looked up each state's statutes to provide consistency in how the information was reported and to ensure the information was current and accurate (see Appendices A and B).

Finally, the study was guided by a dissertation committee. The committee had five members, two from the department of Educational Leadership (EdL), one from the department of Educational Foundations of Research (EFR), one from the department of

Teaching and Learning (T&L) and one University of North Dakota member at large. This committee provided recommendations and suggestions on development of the study, analysis of data, and final dissertation.

Developing the Topic

The purpose of this study was to use phenomenological qualitative research methods to identify educational experiences of high-ability mathematics students from rural one-section and two-section high schools. The two research questions guiding this study were as follows:

- What were the classroom experiences of high-ability learners in mathematics attending one-section and two-section high schools in rural Minnesota?
- What classroom experiences have mathematics teachers of high-ability learners in mathematics observed while teaching students attending one-section and two-section high schools in rural Minnesota?

To answer research questions, a series of interview questions were developed (see Appendices C and D). Through the pilot study, questions were refined and reordered to improve the quality of questions for the purpose of obtaining thick, rich descriptions from students and mathematics teachers during interviews.

Participant Selection

To select participants for this study, purposeful sampling was used. The purposeful sampling strategy is used when, "particular settings, persons, or activities are selected deliberately in order to provide information that can't be gotten as well from other choices” (Maxwell, 2005, p. 88). To start, high schools in three counties in rural Minnesota were selected. The counties selected for the study were Beltrami, Cass, and Hubbard. The counties were chosen based on being located over 25 miles from a city with a population over 50,000 residents.

The first county selected was Hubbard County, the location where the pilot study was completed. Two surrounding counties were then added for the purpose of this study. Names of schools and school configurations for school districts in the three counties were then obtained from the National Center for Education Statistics (NCES) website. The NCES website was chosen rather than Minnesota’s Department of Education website to allow for national comparisons between school district demographics. A matrix of independent school districts in each county was formed (see Table 1 for school district matrix).

There were twelve independent school districts in three counties involved in this study. Beltrami County had four independent school districts. Cass County had five school districts. Hubbard County had three school districts.

The configuration of the schools was then compared. Only independent school districts with a high school encompassing Grades 7-12 and a National Center for Educational Statistics school locale designation as “Rural: Remote (43)” were included in this study (NCES, n.d.a). By limiting school districts in the study to high schools encompassing Grades 7-12 in independent school districts, the researcher was able to focus on schools with similar operating structures.

Table 2. School District Demographic Matrix.

County	School District	NCES District ID	School Configurations	Enrollment 7-12
Beltrami				
	Bemidji	2704440	KG-5, 6-8, 9-12	
	Blackduck	**2705730**	**EC-6, 7-12**	**257**
	Kelliher	**2717010**	**EC-6, 7-12**	**110**
	Red Lake	2730510	KG, 1-5, 6-8, 9-12	
Cass				
	Cass Lake	2708070	EC-4, 5-8, 9-12	
	Northland Community	**2730870**	**EC-6, 7-12**	**194**
	Pillager	2728350	EC-6, 7-12	382
	Pine River-Backus	2728970	EC-6, 7-12	392
	Walker-Hackensack-Akeley	**2702910**	**EC-6, 7-12**	**347**
Hubbard				
	Laporte	**2717940**	**EC-6, 7-12**	**114**
	Nevis	2723370	KG-6, 7-12	252
	Park Rapids	2728080	EC-4, 5-8, 9-12	

Note: Statistics were taken from the National Center for Education Statistics, 2011-2012 school year (NCES, 2011-2012a, 2011-2012b, 2011-2012c, 2011-2012d, 2011-2012e, 2011-2012f, 2011-2012g, 2011-2012h, 2011-2012i, 2011-2012j, 2011-2012k, 2011-2012l). Bolded text indicates school districts participating in the study.

The operating structures schools in this study utilized were:

- Elementary school for kindergarten through Grade 6,
- High school for students in Grades 7-12,
- No middle schools in the school districts selected,
- Superintendent of Schools, and
- High school teachers may teach students in Grades 7-12.

The school configuration of Grades 7-12 narrowed the total number of schools from 14 to 10. In Beltrami County, Blackduck School District and Kelliher School District both met the school configuration requirement. In Cass County, the four school districts of Northland, Pillager, Pine-River Backes, and Walker-Hackensack-Akeley had a high school configuration of Grades 7-12. In Hubbard County, both Laporte School District and Nevis School District met the school configuration requirement.

The “Rural: Remote (43)” requirement narrowed the number of school districts eligible to participate by two. Both school districts in Beltrami County met the Rural: Remote (43) criterion. In Cass County, Pillager School District did not meet the criterion, leaving the three school districts of Northland Community School District, Pine-River Backus School District, and Walker-Hackensack-Akeley School District as potential participating school districts. And, Hubbard County only had Laporte School District meet the Rural: Remote (43) criterion. The final result was eight school districts met the criteria defined for this study.

Next, the number of students in the eight high schools was compared. The smallest high school had 110 students and the largest had 455 students. Again, the data was obtained from the National Center for Education Statistics website. At the time of this study, the data on the website was from the 2011-2012 school year. The smallest school district was a one-section school and the largest school district was a four-section school. Due to the additional classes which can be offered in a high school with three-sections or four-sections per grade level, those larger schools were eliminated from the study. Therefore, five school districts in the three county area of rural Minnesota, all of which were one-section or two-section schools with an average enrollment of 60 or fewer students per grade with a total enrollment of 360 students or less in Grades 7-12 were eligible to participate in this study. School districts eligible for participation in this study were Blackduck School District and Kelliher School District from Beltrami County, Northland Community School District and Walker-Hackensack-Akeley School District from Cass County, and Laporte School District from Hubbard County.

School districts participating in this study did not identify students as gifted and talented and did not provide special programming for students excelling in mathematics. Therefore, this study focused on high-ability learners in mathematics, rather than on those identified as gifted and talented in mathematics. However, students selected had achieved a common requirement of students identified as gifted and talented, a score at or above the 95^{th} percentile on a nationally-normed test.

The test chosen for this study was the ACT. Students were selected for participating in this study if they achieved a score of 30 or more on the ACT mathematics subtest (ACT, Inc., 2014a). Students who scored 30 or more on the ACT mathematics subtest were in the 95^{th} percentile. By requiring students to be in the 95^{th} percentile, comparisons could be done between the students involved in this study and those students participating in other studies involving students identified as gifted and talented in mathematics.

The researcher did not have any connections to these five school districts other than having met one of the superintendents and two of the high school principals previously. Therefore, “backyard research” was not a concern (Glesne, 2011). Each of the other superintendents and principals were new to the researcher.

After identifying the five school districts eligible for inclusion in the study, superintendents of each school district were contacted to request school district support of the study. A letter of introduction was sent to each independent school district superintendent (see Appendix E). Superintendents who were willing to support the study were asked to sign a letter of support. A sample letter of support for the superintendents to sign was enclosed in their letter of introduction (see Appendix F). Those superintendents willing to participate in the study were then asked to provide the number of students who graduated in 2010, 2011, and 2012 with an ACT score of 30 or more on the mathematics portion of the test.

Letters of introduction and consent forms were provided to the superintendents or their designees to be sent to the identified students (see Appendices G and H). The researcher did not have access to the students’ names and their associated scores on the ACT. Therefore, the school districts were requested to send the letters to the identified students to participate in the study to ensure FERPA (Family Educational Rights and Privacy Act) and IRB (Institutional Review Board) requirements were met.

From the five eligible school districts, one school district did not have any students meet the requirements of the study. Two of the school districts had one student each meet the requirements of the study. One school district had two students and one school district had five students meet the requirements of the study. As a result, a total of nine students from four school districts were eligible for participation in the study. Of those nine students, six students consented to participate in the study.

Six of the nine students who were eligible for the study were interviewed, with at least one student from each of the four school districts. The original intent of this research project was to have students from the graduating years of 2010, 2011, and 2012. However, of the six students participating in the study, there were no students from 2010, two students graduated in 2011, and four students graduated in 2012. In regard to gender, the students and teachers were divided equally male and female. Finally, the students were also divided equally in regard to three students attended PSEO (post secondary enrollment options) their junior and senior year and three students did not attend PSEO.

The superintendents, from each of the independent school districts with students meeting the criteria for participation in the study, were also asked to assist in identifying a teacher to participate in the study. The superintendents, rather than the students, were asked to identify the teacher for the study because the superintendent needed to grant permission for the teacher to participate. Once the teacher agreed to participate in the study, the teacher was then given a Consent to Participate form (see Appendix I).

Four teachers were interviewed. There was one teacher from each of the school districts with students participating in the study. There were two male and two female teachers which maintained the balance in gender.

Interview Methods

Interviews were semi-structured and began with open-ended questions such as, "Please start by telling me about math classes you took in high school." Subsequent questions were conversational in an attempt to get the interviewee to discuss an idea further. The interviews were done at a time, place, and format convenient for the interviewee.

The interview format used was ethnographic interviewing. "The purpose of ethnographic interviewing is to explore the meanings that people ascribe to actions and events . . . generating participants' descriptions of key aspects" (Roulston, 2010, p. 19). In using ethnographic interviewing, the focus was on using a variety of open-ended questions.

Different types of questions were used throughout the interview to elicit various perspectives and explanations about educational experiences students had in mathematics classrooms. Patton (2002) defined six different question options: "behaviors/experiences, opinions/values, feelings/emotions, knowledge, sensory, and background" (p. 352). Experience questions were used when asking the interviewee about activities completed in classrooms. Opinion questions were used when asking how other peers would describe students participating in this study. Background questions were used when asking questions about academic programs students had participated in while in school (Glesne, 2011).

A list of questions was generated prior to interviews (see Appendices C and D for student and teacher interview protocols). The questions written were “not set within a binding contract; they are your best effort before you have a chance to use them” (Glesne, 2011, p. 103). The list of questions changed during interviews. Some questions were modified, others discarded, and some added during interviews, depending on the interviewees. As a result, semi-structured interviews were used for this study (Glesne, 2011; Roulston, 2010). By allowing interview questions to change throughout the study, the researcher was able to adapt to new information. If questions were set prior to a first interview, it was possible that questions would be too focused and . . .

> . . . may create tunnel vision. Research questions that are precisely framed too early in the study may lead you to overlook areas of theory or prior experience that are relevant to your understanding of what is going on, or cause you to not pay enough attention to a wide range of data. (Maxwell, 2005, p. 67)

The researcher wanted to gain an understanding of various educational experiences from students and teachers in regard to students excelling in mathematics. For this reason the interviews were semi-structured.

The first questions on the list were introductory and easy to answer (Roulston, 2010). Questions in the middle of the list were more direct and probing into the educational experiences of the high-ability mathematics learners. And, ending questions were designed to be concluding and end the interview on a positive note (Roulston, 2010).

When asking questions, careful attention was given to in-vivo terms and phrases participants used to characterize events (Emerson, Fretz, & Shaw, 1995). Those terms and phrases were used to ask later questions and gain more in depth explanations from interviewees (Roulston, 2010). And, various meanings of terms and how they were important to participants were explored in depth (Emerson et al., 1995).

The wording of questions during the interview process was important because the wording “affects how the interviewee responds” (Glesne, 2011, p. 106). Closed and dichotomous yes/no questions were not used except for clarifying questions during the interviews (Glesne, 2011; Roulston, 2010). Instead, questions were open, allowing interviewees to give answers in their own words about the specific topic (Roulston, 2010). Questions also required the interviewee to provide specific examples about their situation to allow the researcher to obtain a better understanding of the educational experiences each interviewee had in the classroom. Specific examples allowed the researcher to provide evidence for conclusions formed in the study (Biklen & Casella, 2007).

Interviews lasted approximately 60 minutes and were held at a time and place that was convenient for participants (Roulston, 2010). Interviews were conducted in person, if possible, to allow the researcher to formally meet interviewees and to observe informal communication like body language (Creswell, 2007). However, the interviewee was able to make a choice of the interview being done in person or through the use of technology.

As a result, four interviews were done using FaceTime, three interviews used Skype, and one interview used Google Talk. Two of the interviews were conducted in person, at a place chosen by the participant. The researcher was respectful of interviewees' time. Interviews started on time. The researcher remained on topic, yet was respectful of an interviewee's stories or side conversations that occurred.

Arrangements for interviews were made by email and/or by phone in the weeks prior to interviews. Participants were asked to agree to interviews being audio-taped. By taping interviews, the researcher was able to pay attention to participants and the information they were giving during interviews, rather than focusing on taking notes (Glesne, 2011). The audio-recorder was placed in a location so that it did not distract interviewees during interviews. And, since interviews were being audio-taped, background noise was a consideration when selecting an interview setting (Roulston, 2010).

To prepare for interviews in advance, the audio-recording equipment was checked to ensure the battery was charged and in good working order. The memory card for the audio-recorder was also checked to ensure there was sufficient storage space remaining for the interview. On the day of the interview, the researcher arrived early to prepare for the interview (Roulston, 2010).

Prior to each interview, the interviewee was informed about the study, their involvement in the study, and the fact their identity would remain anonymous through use of pseudonyms. The consent form was discussed with each interviewee and all questions regarding the interview process or aspects of the consent form was answered prior to the start of the interview. Finally, the interviewee was asked to approve use of an audio-recording device during the interview.

Following each interview, audio-recordings were given to a transcriber. Transcriptions were done verbatim using HyperTranscribe. Verbatim transcripts allowed the researcher to "collect 'rich' data, data that are detailed and varied enough that they provide a full and revealing picture of what is going on" (Maxwell, 2005, p. 110). The transcriber was paid hourly for her services. It was estimated that it would take approximately four hours to transcribe each 60 minute interview (Glesne, 2011).

The transcriptionist transcribed interviews verbatim because verbatim transcription allowed for options in the future if new ideas were developed. However, approximate transcripts were used in the results section of the paper, making it easier for people to read and understand. Approximate transcripts were edited with start-overs and repeated words omitted to increase readability and clarity (Roulston, 2010).

Methods of Data Analysis

The analysis of data for this phenomenological study was done by following the steps adapted by Moustakas (1994).

> Data analysis involves organizing what you have seen, heard, and read so that you can figure out what you have learned and make sense of what you have experienced. Working with data, you describe, compare, create explanations, link your story to other stories, and possibly pose hypotheses or develop theories. (Glesne, 2011, p. 184)

The first step in data analysis was to read each of the transcripts multiple times to gain a deeper understanding of the data. Horizontalization was then done by listing every expression relevant to the experience. Each statement was treated as having equal value (Moustakas, 1994).

The second step was the "reduction and elimination" of the data (Moustakas, 1994, p. 21). Each statement was considered to determine if it "contains a moment of the experience that is necessary . . . for understanding it" (Moustakas, 1994, p. 121). If the statement was necessary, it was then determined if the statement could be conceptualized and labeled. The statements that could be conceptualized and labeled were considered a horizon experience. Any repetitive and vague statements were eliminated. The remaining horizons were the invariant constituents (Moustakas, 1994). The students' horizons were grouped together and the teachers' horizons were grouped together.

The third step involved "clustering and thematizing the invariant constituents" (Moustakas, 1994, p. 121). In this step, each related horizon was clustered together. The clusters were grouped separately into core themes of the high-ability learners' and core themes of the teachers' core experiences of the phenomenon (Moustakas, 1994). The core themes for the students were selected when at least a majority of the students agreed on the idea. The core themes for the teachers were selected when all the teachers agreed on the idea. The result was three core themes for the high-ability learners and three core themes for the teachers.

The fourth step in analyzing the data was to create composite textural descriptions of the experiences for both the high-ability learners and teachers. The textural descriptions incorporated the invariant constituents and themes to impart a complete description of what the participants experienced (Moustakas, 1994). For the students, the three themes identified were math is easy, they preferred to work independently, and they preferred a traditional mathematics classroom. For the teachers, the three themes identified were math is easy, the students preferred to work independently, and the use of technology in the classroom was important.

The fifth step was to create structural descriptions of the experiences for both the students and teachers. The structural descriptions were descriptions of the “context or setting that influenced how the participants experienced the phenomenon” (Creswell, 2007, p. 61). For the students, their structure was provided by the teachers and participation in activities. For the teachers, they saw the students’ structure was due to school influences, student activities influences, and parental influences.

Epoche

The Epoche was a reflection by the researcher on personal experiences in regard to classroom experiences in mathematics. The “Epoche process increases one’s competency in achieving a presuppositionless state and in being open to receive whatever appears in consciousness . . . false notions of truth and reality can be . . . put out of action” (Moustakas, 1994, p. 92). Through this process, the researcher was able to identify and describe her own previous experiences and beliefs in regard to gifted and talented education.

While in elementary school, the researcher was identified as gifted and talented. As a result, the researcher was pulled out of the general education classroom where supplemental services were provided. The supplemental services were in a separate classroom where a teacher provided challenging activities and projects for the researcher to work on. Generally, there were only five to six students in the room working on projects, sometimes working as a group and sometimes working independently. We helped each other and were always trying to learn more.

These services were no longer provided once the researcher was in sixth grade and attending middle school. As a result, the researcher was in the general education mathematics classroom for the next 7 years. While in middle school and high school, there were many times the researcher was bored in the mathematics classroom. The researcher was able to learn new material quickly and found the repetition needed by most students to grasp the material a waste of time. To be challenged, the researcher would do the challenge problems at the end of the sections in the book and any extra credit work the teachers offered. Once the extra credit was added into the researcher's grade, the percentage was often over 100%.

The ease with which the researcher learned, a grade over 100%, and the eagerness to do additional work resulted in strained peer relationships. The researcher was often called a curve breaker, nerd, and teacher's pet. Any time the researcher would get one wrong on a test, it would be quickly pointed out by the teachers while handing back tests. The teachers would use the researcher as an example of the difficulty of the material as demonstrated that the researcher even got one wrong. Then, once class was dismissed, the researcher would often hear comments of "you're not perfect after all" and "all that studying didn't get you a perfect score, did it?" However, whenever there was a group project, most students in the classroom would select the researcher to be their partner. This was a very stressful time for the researcher; before a project nobody wanted to be her friend; but during a project, everyone wanted to be her friend. Plus, the researcher always found herself doing most of the work for a project, with little help from her partner(s). The biggest issue in school for the researcher was when teachers would ask the researcher to help other students with their homework. The researcher was often done early with an assignment and understood the material, so the teachers would ask her to help her peers. The researcher always felt this was unfair; it was the teachers' responsibility to teach the students in the classroom, not the researcher's.

All of these experiences left the researcher with a negative attitude toward a general education mathematics classroom. The researcher always believed that high-ability learners should be in pull-out programs, allowing students to learn at an accelerated pace in a safe environment where exploration and trying were encouraged. However, when the researcher accepted her first teaching position, a gifted and talented program was not offered and would not be an option because of funding and school class size. As a result, the researcher devoted time and effort to providing challenging activities in the classroom where all students could be challenged. In addition, the researcher made it a point not to ask high-ability students teach other students and to be aware of the amount of repetition given, enough for all students to learn, but not too much for the high-ability learner to become bored.

Validity

There were procedures used in this study to add to its validity. The first procedure used was multiple data collection methods, also called methodological triangulation. Interviews were conducted with six graduated students and four high school mathematics teachers. By requiring participants to be from different schools and different counties, specific school anomalies were reduced and a more complete picture of educational experiences of students was obtained (Roulston, 2010).

Second, multiple people were involved in verifying the results of this study. This study included a peer review where a peer read through an interview transcript to check transcription accuracy (Glesne, 2011). The study also included member checking which was completed by sending a copy of the results section to all participants involved. Participants were asked to provide feedback on the results. In addition, participants were able to make sure their ideas were represented accurately, thus adding credibility to the information (Glesne, 2011; Roulston, 2010).

A third procedure used to increase the validity of this study was for the researcher to clarify her background and personal interest in the study. The researcher's background provided expertise in the area of mathematics education in one-section and two-section rural Minnesota schools. And, by stating her personal interest in the study, the researcher was able to reflect on her own subjectivity, and how it would be monitored (Glesne, 2011; Roulston, 2010).

Thick, rich description was a fourth procedure used to add to the validity of data obtained. Results written included many quotes and details. The goal of the results section was to use a rich description type of writing to help the “reader to enter the research context” (Glesne, 2011, p. 49).

A fifth procedure used to add to the validity of the study was negative case analysis. Real life includes many different perspectives. Therefore, adding information that was contradictory or different added credibility to the study (Bloomberg & Volpe, 2008). Information that was contradictory was examined to determine if “it is more plausible to retain or modify the conclusion . . . in particularly difficult cases, the best you may be able to do is to report the discrepant evidence and allow readers to evaluate this and draw their own conclusions” (Maxwell, 2005, p. 112). All information was analyzed and data used to identify the educational experiences of high-ability mathematics learners from rural one-section and two-section high schools.

Finally, a research journal was maintained throughout the study. One of the reasons for maintaining a journal was to record personal behaviors and emotions of the researcher. The research journal was a place to record assumptions, personal positions on topics, possible stereotypes (Glesne, 2011), questions, ideas, and thoughts (Roulston, 2010). The research journal was available for discussion with the dissertation committee to ensure the validity of the study.

Ethical Considerations

An Institutional Review Board (IRB) training was completed by the researcher. A human subject’s review form was filed with the University of North Dakota’s Institutional Review Board (IRB) to obtain approval to conduct the research once the dissertation committee approved the topic proposal. To obtain IRB approval, the proposal showed the study would be conducted in an ethical manner and the consent forms were completed correctly (Biklen & Casella, 2007). An IRB's goal is to protect participants of a study (Moon, 2011).

The researcher also implemented the following procedures to minimize any ethical issues or concerns during the study (Creswell, 2007). First, the superintendent of each school district was contacted regarding the study and to determine his willingness to participate in the study. After initial approval had been obtained, each superintendent received a letter describing the study. Each superintendent was then requested to return a signed letter, on school letterhead, indicating their understanding of their involvement in the study, the purpose of the study, and the research methods involved in the study.

Prior to the interview with each participant, the consent form was explained and there was an opportunity for all questions to be answered (Moon, 2011). Participants were reminded that they were not obligated to participate, and they were not required to answer any questions if they chose not to. Participation in the study was completely voluntary and choosing not to participate would not have any negative consequences (Biklen & Casella, 2007; Moon, 2011). Interviews were only conducted after participants signed the consent form. A copy of the signed consent form was provided to each participant for their own records (Biklen & Casella, 2007).

The consent form given to participants explained the purpose of the study. It also included the beginning and ending dates of the study, the researcher's and advisor's name and contact information, a participant's role in the study, potential risks and benefits of participating in the study, and procedures to protect the identity of participants. Signed consent forms were kept in a locked file cabinet separate from participant data for a minimum of 3 years after completion of the study, at the researcher's school office. Only the researcher, her advisor, and University of North Dakota IRB audit personnel had access to the data. After 3 years, the researcher will have shredded the consent forms.

While working with participants, each one was treated with respect and dignity (Moon, 2011). Each participant was listened to carefully and any information clarified to ensure the interpretation of information was correct. Identities of each participant were carefully protected by removing any identifiable information from transcripts and using pseudonyms. Providing participants with anonymity allowed them to be open and honest with information without fear of retribution (Glesne, 2011).

After completion of the study, research materials were maintained according to law. Audio recordings were kept on a password protected computer at the researcher's home for 3 years. After 3 years, the researcher will have deleted the files and shredded paper data. Only the researcher will have had access to a list where each school district and participant was recorded with their pseudonym. After the completion of the study, this list was kept in a file cabinet at the researcher's home and after 3 years, the list was also to be shredded. Finally, all personal identification information was removed from the study report to protect the identity of participants.

When working with data, all results were reported. Data that contradicted the researcher's ideas or the ideas of others in the study was not excluded from the findings. The researcher did not manipulate the data to show a particular case (Moon, 2011).

Summary

Chapter III provided the qualitative research design of the study. This chapter discussed topic selection and participant selection. It also provided a description of interview methods used with graduated high-ability learners in mathematics and mathematics teachers. Chapter III also described the methods of analysis that were used in this study. Finally, validity of the data and ethical considerations while conducting the study were discussed.

The final two chapters present the findings and conclusion of the study. Chapter IV presents the themes developed from analyzing data from interviews with students and teachers involving their educational experiences in mathematics classrooms. Chapter V provides a discussion and implication of results for the study including recommendations for educational practices in educational settings involving students identified as gifted and talented in mathematics.

CHAPTER IV

DATA ANALYSIS

For this study, public school districts in three counties in Minnesota were asked to participate. School districts selected needed to be either one-section or two-section schools. In addition, according to the National School Clearinghouse Data, the school district needed to be classified as rural. In the three counties participating in this study, five school districts met the selection criteria; however, one school district did not have any high-ability mathematics students. Of the four school districts with student participants, two school districts had one student, one school district had two students, and one school district had five students meeting the criteria of high-ability mathematics learners – students receiving a 30 or higher on the ACT mathematics subtest. Of nine eligible students, six students agreed to participate in the study. The six students included at least one student from each of four school districts. Plus, one teacher from each district consented to participate in this study.

For the study, six students and four teachers were interviewed, with equal numbers of males and females for both students and teachers. The purpose of the interviews was to identify and obtain a deeper understanding of educational experiences of high-ability learners in four rural Minnesota school districts that did not provide gifted and talented programming for their students. After the interviews were transcribed, three common themes were identified in data from students and teachers. The following textural and structural descriptions were the result.

Student Textural Descriptions

From students' experiences in mathematics classrooms, the three basic themes developed from students' interviews were: math is easy, students prefer to work independently on assignments which have a large effect on their grade, and they prefer a more traditional mathematics classroom. All six students felt math was easy throughout their secondary school careers. In addition, while in a mathematics classroom, the six students stated they preferred to work independently on projects or assignments that would have a major impact on their classroom mathematics grade. Plus, students preferred a traditional mathematics classroom where problems were numeric and quick to solve.

Students also talked about three influences on their experiences in a mathematics classroom. The first influence was their personal qualities of being highly motivated and wanting to learn and be challenged in mathematics classrooms. The second influence was their parents who were there to support them in their academics and activities. The final influence was their peers.

Math is Easy

Mathematics was a subject the six students found to be easy. Homework was something they had to do to get a good grade, not something they felt they needed to do to understand the material. They rarely studied for a mathematics test. And, most of them even craved an opportunity to do challenging problems which were a way to test their skills.

The students interviewed described homework as a common practice in mathematics classrooms. The students felt homework is good for practice, if it is needed. However, for many of the concepts covered in high school mathematics classes, the high-ability students felt problems did not require students to do multiple homework problems to gain an understanding of a concept, since math was easy. Students understood material after a couple of problems and the rest of the problems were busy work. Natalee said:

> I always liked the teachers that gave out problems and said do as many as you need to. I found that a lot of the time they'd give you 30 of the same problem. And after five, you have it down, and then it's just robotic after that.

Generally, students would complete their assignments because their teacher told them to, and because doing assignments affected their grade; but, they found little value in doing lots of math homework. The students interviewed, however, said they understood other students needed practice. Brenda said, “The homework was a nice little practice. However, if I don't have to do it, I won't. But that is not to say that other people shouldn't do it.” Participating students felt average ability students needed to practice problems multiple times to understand them and be able to apply mathematical concepts in a variety of situations.

If the six student participants were not able to solve a problem, sometimes it was “frustrating” as Douglas said. However, the students recognized they had a variety of strategies to answer their questions. One of the strategies students used was to work out a similar problem they had the answer to. Victor said,

> I would struggle with it for a little bit. Then, if there was a problem like it, I would try that one. And if I couldn't get that one, I would actually look up the answer to another problem and try and do it backwards.

In addition to working out a similar problem, the students would also ask a friend or a family member. Natalee stated she would:

> Ask my friends if any of them figured it out. My dad is a total math nerd, so I'd ask him about stuff sometimes. My sister was really good at math, so we would have a little family conference about math problems.

Family members were a resource for the students struggling to solve a problem. However, all the students expressed similar sentiments as Brenda when she said "Try, try, try again." "I would just do everything I could do to manipulate the problem," as Douglas said. And, as Victor declared, "If all else fails, I go to the teacher for help." Asking a teacher was the last resource for five of the students. They would try all their other strategies first and when their strategies did not work, the students would ask a teacher. The sixth student was more willing to ask a teacher for help and considered asking a teacher one strategy for solving problems.

To test their learning, teachers gave their students tests. Tests did not concern the six students in the study because math was "easy." They rarely studied for mathematics tests; and sometimes, they looked forward to tests. Natalee said, "I remember I would always be really excited for math tests because it was the one test I didn't have to study for. I wouldn't even look at anything." The students understood the material and as a result, the students felt tests were easy, not causing them any concerns or reason to study.

Work Independently

The six student participants were quite social, most having multiple friends. They liked to work with someone on their homework, being willing to work in a group. Connel said, "I liked working with my peers. I like to be able to socialize with people and that's always kind of a key." They liked to be able to be with their peers; they could talk to them. Some of the students even liked helping their peers. Felicia said, "I always loved helping others. I still love that to this day." She enjoyed working with other students, helping them learn mathematics. Other students, like Douglas, did not like helping his peers with their homework, "That was one thing that I couldn't stand, and I would not want to be a teacher because I have very little patience for people who don't understand things." However, Douglas liked being with his peers; he just did not like helping his peers.

For participants, working with someone on a homework assignment was very different than working on a project. For homework assignments, the students said they could go home and finish an assignment on their own; therefore, they were not concerned about finishing their assignment in class. Also, one daily assignment would not affect their grade very much, resulting in the students being less concerned about one assignment. However, the students had a very different perspective when asked about working on projects with a partner; the six students were not excited about that. When it came to projects, which would affect their grade more than homework, the students preferred to work alone and worry about themselves. Four of them would try to find ways to get out of working with a partner while the other two students would go forward, but still preferred to do projects independently. Douglas said, “I'd try to get out of it, first of all, just ’cause I just prefer to be accountable for myself.” The students did not want to do all the work for someone else. Nicole said,

> In high school, I didn't really like [group projects] in general because a lot of the time people wouldn't do any work; and if they did, it was not up to par. So, I found myself doing all the work. So, it was like this might as well be an individual project.

The students suggested they did not want their own grade to be affected by work done by their partner. As a result, the students preferred to work independently.

When forced to work with a partner, the students interviewed reported choosing their friends first. Natalee said, “I would just pick a friend.” Picking a friend made it easier for the students because while they were working on projects they could talk to their friends. Victor said, “I would have a good time talking to them.” The focus was taken off the projects and put onto the friends. However, Connel found that it did not matter who the partner was, it was difficult to work with someone because everyone learns at a different rate and understands math differently. He said:

> I think math is a hard thing to work with a partner on, especially because everyone learns at a different rate and everyone understands things differently. Even if two people understand how to do something, the way they understand it

could be completely different, and it could be hard to communicate it. So, I would much rather work individually.

The six students in this study felt other students in their mathematics classes did not learn at the same rate, understood things differently, and some were not producing work that was “up to par” to meet their high standards. The students did not want to have their A grade affected by a partner not doing a project. As a result, the students preferred to work independently and be responsible for their own grade.

Traditional Mathematics Classroom

A third theme the six students interviewed agreed on was their preference for being in a traditional mathematics classroom. The students stated they preferred traditional numeric math problems for homework which were quick and easy for them to solve over longer and involved word problems. And, the students preferred “old school” chalk boards and graphing calculators over interactive whiteboards and PowerPoint presentations.

In a mathematics classroom, the students described their preference for doing straight forward numeric math problems, where they are given a math problem and asked to solve it. They could do these problems quickly because they were easy. Douglas said, “You want to do it quick. You want to see 2 times 2, 4 times 8, whatever. You just want to see the numbers and do the numbers.” Numeric problems were quick and could be done robotically by the students. And, because the students were involved in many activities and time was important, they suggested being able to do assignments quickly was important to them.

When it came to word problems, the students felt they were required to think. Natalee said she really liked word problems. “It's like a little puzzle. I think they're good too because, it's more pertinent to real life situations.” The students said they liked applications of word problems. However, to figure out word problems, the students said they had to slow down and take a couple minutes to solve the problems. However, while in high school, the students wanted to hurry and get done because they had other things to do, like sports and being with family and friends. Douglas said, “Having to go through the word problem takes longer, and I read a paragraph and all I have to do is this multiplication and add this.” He felt it was much easier and quicker to just have a math problem to solve because time was a factor. For this reason, the students preferred straight forward numeric math problems, while finding word problems were beneficial as they related to life and were like a puzzle.

In regard to teachers’ use of technology in mathematics classrooms, the students did not find much value in its use, other than graphing calculators. The students firmly believed all math should be learned first through paper and pencil and then through graphing calculators. They did not see a need for teachers using SMART Board interactive whiteboards, PowerPoint presentations, or other technology in a mathematics classroom. Natalee summed up the sentiments of the six student participants when she said:

> Honestly, I like old school when it comes to math. For all my other classes, I'm good with PowerPoints, all that stuff. But for math classes, I like chalkboards. I remember when we got SMART Boards in high school. Everyone thought it was

> really cool, but not for math. I just like the old school. I don't think technology is super important except for calculators obviously are fantastic.

Even though the students interviewed grew up in a generation using computers, Smartphones, iPads, etc. and have continued their mathematics education in college, they did not see the value of a variety of technologies in mathematics classrooms. In other subject areas, the students could see the value of SMART Board interactive whiteboards, PowerPoint presentations, etc. but in mathematics classrooms, old school chalkboards were preferred. The students wanted to see an entire problem, without scrolling up and down continuously to see a diagram or the rest of a problem. Plus, the students felt they did not need graphics or videos or special effects which technology could provide; they just wanted to do math. Their graphing calculators were able to graph and solve equations which all the students felt was necessary in mathematics classrooms. The rest of the technology used in a classroom was extra and good for other students, but students participating in this study did not feel most technologies were necessary for them.

Personal Qualities

Personal motivation by each of the students to do well was an influence on the experiences the students had in their mathematics classrooms. Most of the students were highly motivated to work hard and do well on their homework, tests, and classroom work. They also wanted to learn and be challenged in their mathematics classrooms.

Personal motivation to do well was important to the students. The students believed it was their responsibility to learn. It was not the responsibility of their teachers, parents, or friends. They were the sole controller of their academics. The students were not expecting teachers to change. Felicia said, “A teacher has other kids to worry about in the classroom, and he obviously cannot bump up the work load to my level and leave other students behind, that's not fair.” The high-ability students were thinking of others in their mathematics classrooms, not just themselves.

A second motivation for the students to do well was when the school offered advanced mathematics classes. Two schools offered college credit classes at their high school; one school offered Advanced Placement (AP) classes, and one school offered Algebra II as their most advanced math class. Participating students felt it was important to offer advanced courses, and if necessary, to accelerate a student by advancing through the grades faster. If advanced classes were not offered, the students understood their schools could not offer classes just for them. However, three students attended post secondary enrollment options (PSEO) classes at Bemidji State University for their final two years of high school. This resulted in the students leaving their high school and their peers, to enroll in challenging courses for college credit. Felicia was one student that attended PSEO. She said students need “higher level classes”; however, she understands it is difficult in a small school.

> At the time I was at school, Algebra II was as high as we could go. They offered pre-calculus the year before that. And it was just because of the small numbers. Students did not want to take it, if they did not need to take it. So, I don't blame [the school] for that. If you have three kids who want to take pre-calculus, that's kind of a waste of an hour of a teacher's time that could be doing something else that a lot more kids will want to take. But, for me, that was very important.

Felicia wanted to continue taking mathematics classes beyond Algebra II. As a result, Felicia decided to attend PSEO. Schools that offered college credit courses in high school and AP classes were more likely to keep the students in school than those schools without advanced mathematics classes. The students wanted to take additional mathematics courses to advance their learning and offer them a challenge. Students interviewed enjoyed math and wanted to do more. As a result, if a school did not offer additional classes, students were more likely to attend PSEO.

Parental Influences

Parental support was a second influence on experiences the students had in their mathematics classrooms. The students said their parents encouraged them to try new things, helped them with their school work when they could, and generally supported them in their activities. Their parents were a large part of why they felt they were successful in high school.

Brenda felt her family was very supportive of her. She said, ‘They were very supportive of everything, academics, extracurricular, everything.” Victor said, “My parents are my rock. They're behind me on everything; but at the same time, they're not the parents who are like, my child does no wrong.” The students enjoyed being with their peers, but their parents were considered their support. Parents were the ones the students turned to in times of need.

When asked how important it was for their parents to be at their activities, the students felt it was very important. They wanted their parents there to see what they were doing, to support them. Felicia replied:

> You can tell on the court whose parents come to see them regularly and whose parents don't. It's not just the fact that they come to see them, it's the fact that they have an active role in their child's extracurricular school life or they don't.

Some parents went to home games and some went to all activities. It was important to the students to have their families at activities, supporting them and encouraging them to do their best and try anything.

Outside of school and school activities, the students talked about their families traveling. The students felt it was important to spend time with their family members. Traveling gave them this opportunity; plus it gave the students in the study the opportunity to see people and places outside Minnesota. Douglas said, “It did put things in perspective as far as my position in relation to other things.” Douglas learned how big the world is and about many opportunities that existed outside Minnesota.

In addition to having supportive families and having families with the financial means to travel and provide for their needs, the students also had stable families. Four of the students attended the same school from Grades K-12, one attended the same school from Grades 3-12, and one student attended the same school from Grades K-12 except for 1.5 years. Three of the students chose to attend PSEO their junior and senior years; however, they still returned to their high school to participate in co-curricular activities. When asked if they had it to do over again, would they attend the same school, one student said she would prefer a larger school where there were more students and more opportunities for involvement.

The other five students said yes, they would go back to the same school. Douglas said, "I really like the small town setting. For academic purposes you get more direct time with the teachers. You can build better relationships with them and that helps the learning process." While relationships with teachers were important, Felicia also stated co-curricular activities were very important.

> Definitely. 100%. I want to send my kids there. I think the best thing that you can have for your children are opportunities for them to do anything and everything and enjoy themselves. For me that was being able to play three varsity sports and act in the play and things like that.

Five students were very happy with their school experiences. Connel said he would go back to his high school. By attending a small school, Connel said, "I don't really think it hurt me in any way. I don't feel like I'm behind in math at college. I don't feel like I'm behind socially at college." The students did not feel their experiences at a small rural Minnesota school hurt them at college. They were prepared academically and socially for college. At the time of this report, student participants were currently attending colleges in four states – Maryland, Massachusetts, Minnesota, and South Dakota – with one student taking a year off to work and earn enough money to return to college.

Peer Influences

Student participants suggested a third influence on their experience in mathematics classrooms was their relationships with their peers. Five students had predominately positive peer interactions while one student reported mostly negative interactions with peers. However, through it all, the high-ability mathematics students felt peers were generally a positive influence on their school experiences.

The students said the small size of the high school they attended allowed them to know students in multiple grades, which was a bonus. They also said their participation in extracurricular activities helped them have positive peer interactions in classrooms. Connel said the major difference for him was “the fact that it was such a small high school that the kids who excelled academically were the same kids who excelled socially and athletically which is different from a larger school.” In the rural schools these students attended, the students suggested that the same students who had high academic ability were the same as those that participated in sports, music, art, etc.

Felicia was a three sport athlete. As a result, members of the community and her peers saw her more in an athletic role than an academic role. Her academics were kept quiet and basically hidden behind her athletic ability. Felicia said,

> They didn't look at me much differently than they did on the basketball court or anywhere else. I think a lot of that I would say has to do with the fact that I've never wanted to be known as the smart kid or anything like that. I would love to be known as the hard working kid. I never said my test scores, I never said how well I did on something. I think that makes a huge difference.

Hiding their academic ability was common for other students in the study. People would see the high-ability students involved in activities, which allowed the high-ability students to keep their academics quiet.

To cope with her negative peer interactions, Natalee relied on her family for support. She was able to see the success her sister was having and used her sister's example to focus on improving her own (Natalee's) future. Plus, her parents were encouraging her to keep going.

> I could see where my sister had gone, and I wanted to succeed. I was like if I just brush this off, I'll be fine once I am done with high school. She went to a good school, and I wanted to go to a good school, so I knew it was gonna be worth it. My mom said they're just stupid girls. Girls are stupid in high school. Girls are stupid always. My dad said that it will be worth it, stay strong you're awesome.

With her family's support, Natalee was able to focus on her future. She also acknowledged that dealing with peer relationships is different for each student. But, the advice she would give to others is, "Definitely don't dumb yourself down because of what people are saying because someday you'll look back and wish you had done your best." This was a value that her family was able to instill in her throughout her life.

Student Structural Experiences

The students' experiences in mathematics classrooms indicated that math was easy for them, they preferred to work alone, and they preferred being in a traditional mathematics classroom. There were two primary influences the students mentioned in regard to school environment and their experiences in mathematics classrooms. The first influence was the teacher in a classroom. The second influence was the activities students were involved in. Activities may not have a direct effect on experiences of high-ability mathematics students' in mathematics classrooms, but it made them into a more well-rounded person.

Teacher Influences

Teachers played a large role in the students' classroom experiences according to views of students interviewed. The students wanted a teacher who was caring, liked math, and was a facilitator of their learning, and someone who would challenge them. Connel said a teacher should be "there as a resource and be willing to help you when you come across trouble and when you have trouble figuring something out."

Even though all the students interviewed had supportive teachers while in high school and could share their experiences about their teachers, not all experiences were the same. Felicia said she wanted a teacher who enjoys being with students. In addition, a teacher would need to be a good communicator. By being a good communicator, a teacher would be able to understand how to help each individual student, because each student learns differently. A teacher would be someone who

> Really enjoys being with students and someone who enjoys talking or otherwise listening. Talking and listening with students even if it's not about math or anything like that. . . . You need a teacher in math that gets to know the students very well. Because, Bobby needs a different explanation than Joey needs, and Stacy needs a different explanation than the both of them. And you have to know how their mind works in order to be able to explain it to each of them in a way that will work best for them.

Being able to listen and talk to students, to learn how students learn individually, was vital for Felicia. In addition, Natalee pointed out even if some teachers are “great at math, that doesn't make them a good teacher. I've had so many teachers that are so good at what they do, but they just can't convey it to other people.” Douglas continued, “You don't necessarily want the smartest person out there because they can know everything there is about math; but if they don't speak the same language, metaphorically or literally, they are no help to a classroom full of students.” Some people love their subject area, but they are unable to relate to students. The student participants wanted a teacher who cared about them, knew mathematics, and could communicate with them.

Participation in Activities

Participation in activities during high school was very valuable according to students interviewed. They may not have learned math by participating in an activity, but they felt they became better people and learned many skills through their involvement in all activities which helped them in their classrooms. Most activities the students participated in were offered at their school, but some students also participated in church, community, and other activities outside their school system. Natalee said students should “join things that you’re actually going to get something out of, that you’re going to enjoy. . . . Sometimes, if you look outside of school, you can find a lot of other things.” Student participants felt activities should be something students enjoyed. It did not have to be a school activity.

There were a variety of opportunities for students to participate in various activities and to learn skills. Connel felt sports were valuable; they were like the real world. They taught him to work hard and to be self disciplined. Connel said,

> If you're not getting the job done, you won't play as much which is just like in the work place. If you're not getting your job done, they're gonna bring in someone who will get the job done. That's kind of what high school sports taught you is you have to work hard; and if you don't work hard, you are at risk of losing your spot essentially.

Student participants felt activities taught them to work hard, to strive for a goal. Felicia said sports helped her learn to work with a team to achieve a goal. “My favorite sport was volleyball, because there can’t be a ball hog in volleyball. It's impossible when working hard towards the same goal with someone who wants it just as badly as you do, hopefully and pushing myself.” It was the team’s goal and everyone worked toward the same goal. At college, Felicia said she can tell who participated in activities and who did not participate in activities.

> There are a lot of very, very intelligent people around me, and it is very easy to see which ones did participate in other activities. You can even kind of tell which activities they participated in. There are certainly the students who are incredibly intelligent, and you know can probably do any math problem you set in front of them. However, getting it out of their head and into somebody else's head is just about impossible, because they don't have those communication skills, and they don't have those people skills. Then, you see the other students who have played

> sports; they have done drama or something like that where they had to interact with people. They are definitely much more personable, and I think it will be easier for them to go farther in life because they can communicate and interact with people.

Skills in mathematics are important, but the student participants acknowledged knowledge is only part of the equation. The other important parts were being able to communicate, working hard, and being able to work toward a goal.

Teacher Textural Descriptions

The teachers' perspectives of the educational experiences of high-ability mathematics students in a mathematics classroom follow quite closely to the perspectives of students interviewed, except for their views on technology. For this study, four teachers, one from each of four school districts, were interviewed. The four teachers said math came easily for high-ability students, high-ability students preferred to work independently, and technology in a mathematics classroom was very important. Furthermore, from the teacher participants' interviews, two main influences on high-ability students' experiences in a mathematics classroom: personal qualities of the high-ability students and peer influences were identified.

Math is Easy

The teachers interviewed all said math comes easily to high-ability mathematics students and such students find solving problems fun and engaging. The teachers said students were usually able to work through a problem, showing a minimum amount of work and asking for very little help. Daniel described high-ability students the following way:

> I think some of the kids just have that more analytical brain mind set, and they are wired a little different so the concepts come really easily. They more easily grasp abstract concepts of the algebra and the trigonometry and the calculus, so they only need to see it a few times, and it clicks.

High-ability students found math easy and after a few examples, the students learned the mathematical concepts being presented. However, the number of problems students needed to complete to learn information presented depends on a student and the concept being studied. For some students, Daniel would encourage them to complete challenge problems rather than complete additional homework problems. Nicole concurred that some students do not need as many problems to understand a concept as other students when she said, “Some kids need 10 problems to practice. . . . Your top kids, they need less problems.”

However, because math was easy, the teachers felt many students did not know how to study for tests. High ability students never struggled or needed to learn how to study. High-ability students could go to class and do the assignments, and they got As in their mathematics classes. Daniel said,

> I try to make sure to emphasize ways that they can study for tests because those high flyers, especially until they hit that wall where it just doesn't come naturally anymore, the idea of studying for math doesn't make sense to them at all.

The teachers suggested that studying is something other students did for tests, not something high-ability mathematics students did for mathematics tests. However, the teachers were concerned there would be a time when math did not come easily any longer and students would need to learn how to study. As a result, Daniel made a point of teaching studying strategies to students for their future success.

Work Independently

Another mathematics classroom experience high-ability mathematics students had was working in a group. In a mathematics classroom, the teachers said high-ability students may be asked to work with a partner, help another student by answering a question, or work on a group project. The teachers described high-ability students as willing to do what they were asked, but preferring to work independently. Nicole said:

> Another thing is I realized that a lot of those kids that are really good at math still have a hard time explaining it, and they have a hard time talking about it. And they have a hard time helping others. A lot of them are very independent. . . . Some of them still don't want to work in groups. They don't want to pair up with anybody, even if it's someone who is the same skill level. They want to independently work on their own. They don't want to have any kind of input from anybody. They begged me not to have to work with anybody.

High-ability students wanted to work independently. It did not matter who the other students were, even if a partner was someone with the same ability, they wanted to work by themselves.

If high-ability students were required to work with a partner, Nicole found students preferred their friends. They would choose someone they could work with, but not have to explain things to or really communicate with while working on a project.

> Usually they choose their friends, even if they're not on the same level with them; but, usually their friends are. They usually stick together. They don't usually stray out from their group, like, there's a group within a group. They want to work with someone that can help them, but not have to do much explaining. It's almost like they're working together, but not working together because they're not having to talk.

When working in a group, high-ability students preferred working with their friends. Doreen reminds her students that teaching someone else helps them remember concepts better.

> I always tell them you remember 10% of what you hear, 50% of what you do, and 90% of what you teach someone. So, if you teach it to someone you'll remember it, and do better on your tests, which is what you want to do. So they tend to want to then teach someone.

The teachers felt high-ability students were more willing to help others when high-ability students were given a way it would benefit them personally. The benefit could be learning the material themselves, extra credit or something else; however, a high-ability student needed to know whatever they were doing was going to benefit them.

The teachers gave two explanations for high-ability students' preferences for working independently. First, Nicole felt high-ability students preferred to work independently because they see things differently than other students.

> I feel like higher ability kids see things differently. They tend to do a lot of stuff in their heads. So, when they try and work with someone else, they don't connect; that could be why they tend to want to work independently. They can't explain it themselves, how they are doing it. Because they see it in a different manner, or they see it in a different light, or they solved something in a completely different way.

She said high-ability students cannot explain the processes they follow; they can just do it. Therefore, high-ability students work independently because they are not able to explain it so that others can understand which frustrates both students. Second, Robert felt high-ability students wanted to work at a faster rate than most of their peers resulting in a desire to work independently. He said, "The gifted and talented, they're worried about, I want to explore it myself, and I want to move faster than the others." By working independently, high-ability students can move at their own pace and focus on their own learning, not that of their peers.

To try and encourage students to work together, Nicole asks students to help other students when they are finished with their own work. She found when high-ability students helped their peers, they learned how to communicate. Initially, high-ability students were very reluctant to work with other students. However, as high-ability students became more accepting of talking to their peers, Nicole heard high-ability students repeating things she had said. The result was Nicole helped high-ability students accept input from their peers and learn to communicate with others.

> It's funny because I hear my words come out of their mouth, which is very ironic. . . . I hear them talk, and they are getting better at it. They are just missing the practice of how to communicate mathematically because they don't want to. . . . They are leaving out words that are important because in their mind they are thinking, I know what I'm saying.

Nicole found high-ability students lacked practice at communicating mathematically. When she had students working in groups, she would observe high-ability students repeating the same things she had said as they learned to communicate in a mathematics classroom.

Technology

In a mathematics classroom, use of technology is becoming more common. Some of the technologies teachers described as being used on a daily basis were SMART Board interactive whiteboards and graphing calculators. Daniel said, “I think technology is becoming more and more crucial in almost any classroom simply because it's the world that our students live in.” Outside a classroom, students are using iPhones, watching YouTube, and playing video games. As a result, Doreen says, “I like to grab their attention lots of times with something pop culturish. Anything that speaks to them . . . not a traditional old school type teacher.” By using technology, the teachers feel they are able to relate to students and form connections that otherwise would not form between teachers and students.

The views of the teachers participating in this study on experiences of high-ability mathematics students in a mathematics classroom were very similar to the views of the high-ability students participating in this study, except in the area of technology. In this area, the students and the teachers had opposing views. The teachers said technology was important, a way to keep students engaged, and they did not want to be a traditional old school type teacher. The students liked an old school atmosphere with chalkboards and not all the distractions of technology.

Personal Qualities

The first influence identified by teachers participating in the study as affecting experiences of high-ability mathematics students was students' personal qualities. The teachers felt behaviors of high-ability mathematics students can be challenging for some teachers. Some behaviors the teachers observed in high-ability mathematics students included high-ability students struggling to acknowledge when they are wrong, wanting to give answers, and being highly motivated in all areas of life. The teachers felt sometimes dealing with behaviors of high-ability students can be as challenging as dealing with disruptive behaviors from students identified for special education services.

One of the biggest issues for Robert was the idea that some high-ability students never thought they were wrong. He said, "Never thinking that they are wrong is one of the biggest things." Robert stated if a high-ability student was wrong, that meant they had a weakness and for a high-ability student, that is not possible in mathematics. Robert suggested that for high-ability students, math was supposed to always be easy, and they were always supposed to know the answer. Robert felt some high-ability students had always been right and if a time occurred when they might be wrong, people would not think of them as smart or good at math anymore, if they made a mistake.

A second behavior Robert noticed was high-ability students liked to answer questions. High ability students could think quickly and therefore come up with answers before other students, quite frequently. Robert said, “The students were always wanting to answer every question all the time, right away, blurt it out.” As a result, Robert felt it was challenging to adjust to high ability students, so all students in a classroom had an opportunity to participate and give an answer.

A third behavior noted by Daniel was high-ability students are highly motivated. Daniel said, “I think some of it is just motivation in general. The students that are motivated in life sometimes tend to be motivated in everything they do. And so, they are motivated in sports; they are motivated in academics.” Daniel felt high-ability mathematics students wanted to do well in a mathematics classroom, as well as, outside the classroom. They were motivated to do well in many aspects of their lives.

However, the teachers felt dealing with all these behaviors can be challenging for a teacher. Patience when working with high-ability students is very important. Robert said,

> The biggest thing I think is patience with 'em. You have to have patience at different levels. You have patience for some other type of students where you're dealing with behaviors that are disruptive. But, dealing with behaviors of gifted and talented [students] and getting to know how they are thinking, it takes time.

> Don't think you're gonna have an answer overnight. It may take years to get really comfortable in how to deal with them.

Classroom teachers are often trained on how to handle disruptive student behaviors, like those displayed by students identified for special education services under the emotionally, behaviorally disturbed (EBD) criteria. However, in the state of Minnesota, there is no requirement for teachers to be trained on working with high-ability students. As a result, teachers must learn on their own in their classroom through trial and error how to handle behaviors of high-ability mathematics students.

Peer Influences

Teachers participants felt peer interactions affect high-ability students. Each student has their own experiences with their peers. Depending on those experiences, the teachers felt high-ability mathematics students have different experiences in a mathematics classroom.

For Doreen, she was not concerned about high-ability students being isolated by their peers. Students at Doreen's school knew each other and the same students that were good at academics were also involved in activities. Doreen said, "It is such a small school that we don't have the clicks you might see in a bigger school like the nerds and the jocks. The nerds are the jocks are the musicians." The students that excelled in a classroom were the same students who excelled in after school activities. As a result, students worked together and got along.

Daniel felt negative peer interactions with name calling was the worst when high-ability students were in junior high. Daniel said,

> I heard it more when I taught junior high. I feel like our senior high, at least at the moment, has matured quite a bit. . . . When it [name calling] does happen, the kids that are doing that kind of thing are sneaky, they're not doing it in front of the teachers. It is all under their breathe in the hallways, somewhere else, you hear about it secondhand when it finally comes to the surface. Most of what goes on doesn't happen out in the open.

Daniel said if there is name calling, teachers do not hear it very often because it is done in a hallway, outside of school, or in other unsupervised areas. By the time high-ability students are in high school, they have matured and made life choices of being a high-ability student and other students have started to accept them for who they are.

For some high-ability students, peer interactions are so negative a high-ability student may choose to leave their school building. Daniel noted that some high-ability students choose to attend PSEO due to conflicts with peers. Daniel said, “Some of them leave for social reasons. Maybe there has been some social conflicts they have had with their peers and it allows them a way to kind of escape that.” By attending PSEO, high-ability students are able to escape stress and conflicts caused by negative peer interactions.

Teacher Structural Descriptions

Experiences of high-ability mathematics students in a mathematics classroom are the result of three factors: school influences, activities influences, and parental influences. However, teachers in this study attributed many experiences their high-ability students had in a mathematics classroom to school influences because their schools were one-section or two-section rural schools. The other two factors were secondary to a school's size according to the four teachers interviewed.

School Influences

The four teachers interviewed said a school's size had an influence on mathematics experiences of high-ability students. One reason given was high-ability students had a limited number of classes to choose from, due to the small number of staff. Another way a school influenced high-ability mathematics students was through the students' involvement in a variety of activities.

The four schools attended by the high-ability students participating in this study were all one-section or two-section schools. As a result, the schools had between one and three mathematics teachers. The schools with one mathematics teacher grouped all students together in one classroom by grade. There were no options for elective mathematics classes or advanced mathematics classes beyond Algebra II at these high schools. The schools with two or three teachers had two tracks for mathematics and had some advanced mathematics class electives such as AP calculus or college in the high school classes such as College Algebra, Pre-calculus, and/or Calculus I. As Nicole said,

> It comes down to scheduling. We don't have room to have two tracks. If we had an accelerated path, it would be awesome. But, with a school our size, we don't have the funding or the money to have more than one math teacher for high school. I'm it.

With all the students in one classroom, based on grade level, Nicole said it makes it more difficult to address the needs of individual students. This is especially true with No Child

Left Behind legislation which requires school districts to test students. The results of tests rank schools across the state, resulting in many teachers focusing on helping students achieve a "meets standard" level on the Minnesota Comprehensive Assessments, rather than challenging all students. Doreen said, "It is tricky though, and I feel like sometimes they [high-ability mathematics students] are kind of being left out. There is such a focus on bringing up that lower half or helping that middle out. . . . I guess that is tough in the small schools." With two tracks, teachers would be able to divide students into two groups and focus more on individual needs of students.

When high-ability students do not have an opportunity to take advanced mathematics classes or feel like they are not being challenged in their high school mathematics classes, some high-ability students chose to participate in post secondary enrollment options (PSEO). To prevent students from choosing PSEO and leaving school buildings, schools were starting to offer additional options for students through college in the high school classes and online classes. Daniel felt there were two primary reasons students participate in PSEO, wanting to finish college faster and wanting more challenging classes. He said,

> They are trying to fast track themselves through college. And a lot of them are those high flyers that want more and more advanced classes. But, as a small school, we are limited in what we can offer; and sometimes, they can find a few things through PSEO that we just don't have the capability to offer as a small school.

By attending PSEO, students have an opportunity to earn college credits while still in high school. The credits are free to students because their school district of enrollment either pays a college directly through a contract agreement or the state pays the tuition for students by reducing their school district's general funding. By earning college credits while in high school, students are able to "fast track" through college, sometimes finishing college in 2 or 3 years rather than the traditional 4 years. Plus, by reducing the number of years required to earn a degree, students save money on college costs and can enter master degree programs or the work force sooner.

In addition, some students are interested in advanced mathematics classes. Those students want challenging mathematics classes. As a result, schools have begun offering online classes. Doreen said, "Getting that online college curriculum keeps them here, too. Sometimes, they have a tendency to want to leave the high school, and understandably to go PSEO their senior year. But there are other options." The other options are primarily online courses through a variety of colleges and universities in the state of Minnesota. Teachers want high-ability students to remain in high school. Nicole explained the effect on a school and classroom when high-ability students leave high school to participate in PSEO.

> Those are your kids that catch on to things really quick. They're bright, and they're usually more driven, and they're usually the ones that are involved in everything. They're on student council and then when they're not there, it affects school spirit; it affects everything. It just changes the dynamics of the classroom. It's similar to when you have a class and you have those kids that are always

> misbehaving. When they leave the room, things totally change. The same thing happens.

Nicole points out the effects high-ability students have when they leave their school building. She makes a comparison between high-ability students leaving and students with behavior disorders leaving a classroom. Both groups of students are noticed, and when one leaves, a classroom atmosphere changes considerably. Therefore, teachers would prefer high-ability students remain in the high school building and not attend PSEO. However, to keep high-ability mathematics students in their school building, the teachers acknowledge that schools need to adjust and offer options for students to take advanced courses and college credit courses while in high school.

Activities Influences

According to teacher participants, a second main influence on high-ability students was their involvement in activities. The teachers felt high-ability mathematics students were very involved in activities. The teachers noted involvement of high-ability students in activities was very good for the students as it taught them many important life skills. However, the teachers were also concerned about high-ability students becoming overly involved and stressed. Daniel noted a strong correlation between student grades and participation in activities. He said,

> There is a very strong correlation between those that are doing well academically and those that are involved in extracurriculars. We just looked at the numbers. Look at those that are on the A and B honor roll. We asked: what percent of those students are involved in extracurricular activities? It was nothing real formal.

> Just looking at that list and there is one or two on that list that weren't involved in something.

Students that were involved in activities had good grades. At his school, Daniel's administration found a positive correlation between students involved in activities and those doing well academically.

Doreen noted some skills high-ability students learned while participating in activities. She noted that high-ability students learned how to work hard, how to work in groups, and how to speak publicly. She also expressed her concern for high-ability students being too involved because it was difficult for them as they become stressed and tired. Doreen said,

> When they are involved in school, they want to do well in school. They learn hard work. They learn cooperative skills. I just worry about some of these kids being too involved. They get run down. They have jobs. Our FCCLA [Family, Career, Community Leaders of America] program here is huge, and I love it, because these kids can speak publicly, but there is just so much going on. Then they are in sports, knowledge bowl, and more. It's very difficult I think sometimes for them.

Doreen was concerned about high-ability students being run down and tired. However, she also saw the value of activities in the lives of high-ability students. Through activities, high-ability students were able to learn many life skills.

Parental Influences

Parents have an influence on their children. Parents of high-ability students are often very involved in the lives of their children. Involved parents attend conferences, contact teachers, and attend student activities. Nicole said,

> They are the ones that show up at conferences, all the time. They are the ones that send me e-mails and they are the ones that have no problem calling me up. It is not all of them, but for the most part, those are the ones that show up. Their parents are actively involved in everything.

The four teachers in this study felt parents of high-ability students were generally very involved in their children's lives. Involved parents attend conferences, attend extracurricular events, and stay in contact with teachers. The teachers said parents send teachers e-mails to find out information. Involved parents know what their children are doing, who their children's teachers are, what their children's schedules are, both in school and in their activities, and involved parents know what their children are doing in their classrooms.

Doreen felt parents of high-ability students will also advocate for their children and help where needed. Sometimes teachers feel they are unable to challenge students to their fullest potential. As a result, teachers may need to rely on parents who may be able to offer ideas or assistance in challenging students. Doreen recalled conferencing with a parent of a high-ability student when she was concerned about not challenging the student. Doreen said, "We had a lot of talks at conferences, with mom and dad, about what we can do to make sure [their child] is being challenged. I would give [the student] little challenges." Mom and Dad offered ideas and suggestions. There were continuous conversations between the parents and teacher to help the student be challenged in mathematics.

Summary

Chapter IV presented themes developed from analyzing data obtained from interviewing six students and four teachers. The three themes developed from the interviewing high-ability students were: math is easy, they preferred to work independently rather than in groups, and they preferred a more traditional classroom setting. The three influences described by the high-ability students interviewed were their personal qualities, parental influences, and peer influences. The themes developed from interviewing the four teachers were: math is easy for high-ability student, high-ability students prefer to work independently, and using technology in a classroom was very important. The two main influences noted by the teachers participating in this study were high-ability students' personal qualities and their peer interactions.

The final chapter begins with a discussion of the study. Chapter V also includes implications and recommendations for educational practices in one-section and two-section public schools. Finally, Chapter V discusses recommendations for future studies.

CHAPTER V

DISCUSSION AND IMPLICATIONS OF RESULTS

Chapter V includes: a discussion of results, implications and recommendations for public schools, and recommendations for further studies. The discussion of results includes three sections: of participants, interviews, and results. The implications and recommendations for public schools section includes four subsections: offering more challenging electives; encouraging teacher training in teaching high-ability students; when hiring new teachers, encouraging school district hiring committees to consider teachers with interests in working with high-ability students; and finding ways to encourage more student participation in activities. Finally, five recommendations for further research studies are discussed.

Discussion of Results

In the first subsection of the discussion of results, the participants' graduation years, genders, and attendance at post secondary enrollment options (PSEO) is discussed. Next, the format for interviews is discussed. Finally, the results section includes a discussion about the use of technology in mathematics classrooms, the high-ability students' views of wanting their children to attend the same school student participants attended, the idea that special programming for high ability learners is not needed, and the importance of student participation in activities.

Participants

Due to the fact that participating high-ability students graduated in 2011 or 2012, all student participants had attended at least one year of college. As a result, all student participants had experienced attending a post-secondary school and had met people from educational institutions other than their high school prior to their interviews. In addition, because student participants graduated in 2011 or 2012, all students had lived either 18 or 30 months between their high school graduation day and their interview. By interviewing recent high school graduates, a minimal amount of time between graduation and interviews may have allowed students to remember more details about their experiences while in high school than if interviewees had graduated earlier and were, say, 5 to10 years out of high school.

A balance in gender of participants was an unplanned benefit. An equal number of males and females for both teacher and student participants provided perspectives of both genders to the study. A comparison of answers by gender showed both males and females had similar views.

Finally, high-ability student participants were equally divided between those attending PSEO and those remaining at their high school during their junior and senior year. With an equal division between those attending PSEO and those staying in high school, both options available to Minnesota students were presented in the study. Plus, high-ability students' perspectives on why they did attend PSEO were given, allowing school districts additional insight into future planning for high-ability students if a school district would like to keep high-ability students in the high school building through their senior year.

Interviews

Technology was utilized for most interviews. Due to Minnesota weather conditions in December and January and travel distances, most participants preferred their interviews be done with the use of technology. Four interviews were conducted using FaceTime, three interviews were conducted using Skype, and one interview used Google Talk. Two interviews were conducted in person, at a place chosen by participants. In-person interviews were preferred; however, technology allowed this study to include participants living in Maryland and Massachusetts.

For this study, qualitative research was very valuable. Interviews offered an opportunity for the researcher to get to the essence of high-ability mathematics students' experiences in high school. Quantitative research would not have provided the students with opportunities to tell their stories and experiences.

Results

One theme student and teacher participants did not agree on was the use of technology in a mathematics classroom, other than graphing calculators. The teachers felt technology was very important. The high-ability students, however, did not see a need for SMART Board interactive whiteboards, projectors, PowerPoint presentations, or other technology. The students felt chalkboards and lectures were the best way to learn math, even though the students liked technology in other subject areas and used technology in their daily lives.

One finding in the study was that student participants wanted their children to attend the same one-section or two-section schools participants had attended. The researcher was a high-ability mathematics student in high school and had been identified at an early age; and therefore, given special programming at a larger school. With this background and a trend toward offering specialized gifted and talented programming at the time of this study, the idea that high-ability student participants were very happy with their high school experiences and would want their children to attend the same schools was surprising. The high-ability students who participated in this study were attending college at Harvard University in Cambridge, Massachusetts, Johns Hopkins University in Baltimore, Maryland, South Dakota School of Mines and Technology in Rapids City, South Dakota, Bethel University in St. Paul, Minnesota, and Bemidji State University in Bemidji, Minnesota. In addition, student participants traveled on several occasions, all of which allowed the students to see and learn about opportunities available outside their rural Minnesota high school setting. However, high ability student participants did not feel they were behind or negatively impacted in any way by attending their one-section or two-section high school. In fact, they loved it. This result supported findings by Fan and Chen (1999) where they found students who attended rural schools performed as well as their non-rural peers.

High-ability student participants also felt they grew in many directions as a person through their involvement in a variety of activities at their one-section or two-section schools, something they felt they would not have had by attending a larger school due to the number of students competing for positions available in a large school. Felicia even mentioned how she could tell those college students who had been involved in high school activities and those students who had not been.

Results of this study show high-ability students attending one-section or two-section high schools can be successful without special programming. High-ability students interviewed from one-section and two-section schools did not feel like they were behind academically when they entered college and the high-ability students felt they had more opportunities at a one-section or two-section school. Students in this study have gone to Ivy League schools and have been doing well and still want to return to their rural Minnesota childhood home towns for their own children to have similar school experiences as student participants had. This result supports findings by Adelson et al. (2012), which stated the mathematics achievement of students participating in gifted programming was not statistically significant compared to the mathematics achievement of students not participating in special programming.

High-ability student participants attributed much of their positive experiences to teachers, parents, and activities. This aspect of the study followed closely with previous research which has found teachers, parents, and activities influence a students' life. High-ability student participants said teachers added support at their schools. Teachers knew students personally, student likes and dislikes, and student learning styles. Teachers also knew students' parents and kept open communication with them. Parents were the high-ability students' support at home. Parents were there to answer questions, listen, and encourage their children. Plus, parents were very involved in the students' lives. Finally, high-ability student participants felt activities helped form them into well-rounded people. Activities were a way to learn many skills; and for people looking at high-ability learners, activities were an alternative to focus on rather than a student's academics.

Implications and Recommendations for Public Schools

Heller (2004) described four dimensions of giftedness: intellectual ability, personality characteristics, environmental conditions such as quality of instruction and classroom climate, and mathematics performance. Implications discovered in this study for school districts are supported by Heller and the whole child approach to education (Association for Supervision and Curriculum Development, 2014). School districts need to offer challenging curriculum if students are to grow intellectually and reach their mathematics potential. Teachers need professional development to learn how to work with high-ability students' personality characteristics. School districts need to hire teachers who enjoy working with high-ability students so classroom climate is a positive one for high-ability students. Plus, all teachers need training in differentiated instruction so they are able to offer quality instruction to all students. Finally, students need to be encouraged to participate in a variety of activities, another environmental condition addressed by Heller and the whole child approach to education.

Offering Challenging Electives

For high-ability students attending one-section and two-section schools, school districts should explore options for electives which challenge high-ability students academically. In the state of Minnesota, school districts can offer college in the high school classes (CIHS) if a high school teacher applies for acceptance and meets the requirements of a partnering college, which generally means a teacher needs a masters degree in the content area. The CIHS option allows multiple students to take a class for one fee. There is a cost to the school district to offer a college in the high school class, dependent on the partnering college. There is also an additional cost incurred to pay teachers with masters degrees over teachers with bachelors degrees. However, school districts should encourage all teachers to obtain their masters degree in their content area. This would not only help high-ability students, it would help all students. It may cost a school district additional money, but it is in the students' best interest.

A second option school districts have to offer challenging elective classes is offering online college credit classes. In this situation, students select classes of interest from a college or university and then enroll online through the PSEO process. Again, a school district pays a fee for their students to enroll in college classes. Generally, this option is more costly then CIHS because a school district pays per credit, must have internet access for their students, and provides students with a computer and books.

Both CIHS and online college credit classes allow high-ability students to enroll in challenging elective classes, while keeping high-ability students inside their high school building with their cohorts. High-ability students in this study did not want to leave their school buildings; however, they felt forced to leave if they wanted to take challenging classes. These two options would allow students to obtain college credits and challenge their learning. Plus, students would not have to travel to a college or university which means high schools keep high-ability students in the school building where high-ability students generally have a positive impact in mathematics classrooms and on their school environment. Furthermore, the financial cost of the CIHS and online college classes is generally less than the cost of students attending PSEO classes.

Training Teachers

A second recommendation for school districts is to require all teachers to receive professional development in working with high-ability students, with a preference for taking college credit classes or attending a gifted and talented conference. In the state of Minnesota, teacher re-licensure requires teachers to participate in continuing education hours in accommodations and modifications for students. Generally, these hours are spent focusing on needs of students receiving special education services. However, it would be beneficial for high-ability students if some continuing education hours were devoted to working with high-ability students. At the time of this study, there were two annual conferences and one symposium held each year in Minnesota. Plus, teachers could attend a national gifted and talented conference.

At least one teacher in each school district should have, at minimum, a graduate certificate in gifted and talented education. At the time of this study, there were four universities offering graduate certificates in gifted and talented education. For one-section and two-section school districts with a limited number of teachers, school districts could participate in a cooperative agreement with one or more other school districts to share a teacher with a gifted and talented graduate certificate.

Each high-ability student in this study pointed to one teacher that “was there” for them, showing the importance teachers have in lives of high-ability students. In addition, high-ability students have specific emotional needs. As Robert said, high-ability students can be as challenging as some students with special needs, not in the same way, but they have special needs. As a result, additional teacher training is very important for high-ability students to see continued growth and reach their potential.

Hiring Teachers

A third recommendation for school districts is when hiring teachers, committees should consider two aspects. First, teachers being hired should be knowledgeable in their content area. High-ability students can be challenging for teachers because the students often question and probe for additional information as Robert stated. To assist high-ability students, teachers need to be competent in their content area.

Second, teachers should enjoy working with high-ability students. This idea may seem obvious, except teachers have a variety of personalities. Some teachers enjoy working with students with special needs. Some teachers enjoy students, but do not appreciate students challenging or questioning them about material. And, some teachers enjoy their content area more than they enjoy teaching students. As a result, finding teachers who enjoy working with high-ability students can be difficult in a one-section and two-section school.

Oftentimes, needs in a school district focus on teachers being able to work with students with special needs and general education students who account for 95% of a school's student population. At the time of this study, teachers had a tendency to focus on students at risk for not passing the Minnesota Comprehensive Assessment (MCA) tests, because the teachers themselves and administration were putting pressure on teachers to raise student scores and keep schools from failing to make Adequate Yearly

Progress (AYP). Many teachers and administrators believed high-ability students would achieve a passing score on MCA tests no matter what. Because of federal and state legislation that requires schools to make AYP and "leave no child behind," challenging high-ability students to reach their full potential becomes a goal secondary to making sure all students pass their MCA tests. With nothing to challenge them, high-ability students also become helpers in classrooms. Both are situations where high-ability students are not challenged to reach their own potential. This is when school districts need to focus even more on funding and training for teachers. The focus for teacher training should be on differentiated instruction. The idea behind differentiated instruction is to personalize each student's learning. Teachers challenge each student by meeting them where they are and focusing a learning regimen on each student individually, to challenge them and help them reach their potential.

Students Participation in Activities

A fourth recommendation is school districts should encourage all students to be involved in activities. This can be difficult as some students need after school transportation and some may have difficulty paying for student participation activities fees if they are charged. School districts should be creative in finding funds to help students pay for participation fees. This could include booster clubs or using donation funds. School districts also can be creative in helping students find transportation home. Riding a city bus or other means of public transportation is generally not an option for students attending rural one-section or two-section schools. However, schools could offer late buses or help students arrange transportation with a teammate. In addition, school districts can be creative with scheduling practices to allow more students to participate. Some schools have an activity hour during the last period of the day. This can be especially helpful for junior high students who are unable to drive, allowing students to ride a bus home after school. Some practices could be scheduled before school to allow students to still have an after-school job. Each school district needs to look at needs of students, in addition to needs of schools and activity advisors/coaches.

Recommendations for Further Study

After completing this study, the researcher could see several recommendations for future studies. The more the researcher learned in this study, the greater the number of questions that developed in her mind. Even though multiple questions still exist in the mind of the researcher, they all revolve around school size and location. There needs to be more research involving students attending rural one-section and two-section schools. This study involved six high-ability students from four school districts. Additional high-ability students, in additional school districts, in a variety of locations need to be included in future research to verify this study's findings.

The first idea needing additional research is to determine if students attending rural one-section and two-section schools are academically behind their peers when they attend college. The six high-ability students in this study said they were not academically behind. In additional studies, would high-ability students from other schools also view themselves as not being behind academically at college? Would they want their own children to attend the same school they did as a child? Or, were the six students in this study outliers to the views of other students?

The second idea needing additional research is the value of technology in a mathematics classroom. High-ability students in this study said they did not care for using SMART Board interactive whiteboards, PowerPoint presentations and other technology in a mathematics classroom, other than a graphing calculator. They wanted to learn mathematics the old fashioned way, with a chalkboard. Will this view change in the future as technology becomes more widely used in society and more integrated into classrooms? Or, do high-ability students really feel that technology is not necessary in a mathematics classroom? One reason technology is promoted in mathematics classrooms is to engage students and keep their interest. High-ability students are already engaged in mathematics and their interest is high, so how valuable is technology for these students?

A third area needing additional research is determining the value of high-ability students participating in activities on the social, emotional, and academic life of students. How does the experience of participating in activities change student outcomes for students attending one-section or two-section schools versus students attending larger school districts? What value is there in high-ability students participating in multiple activities if they are interested versus participating in one or two activities?

A fourth area needing additional research is a longitudinal study involving high-ability students attending rural one-section or two-section schools. A future research study could add more information on peer interactions among students. A study on peer interactions could show how resilient high-ability students are as they interact with peers and teachers. A longitudinal study could also study ways schools, teachers, peers, and parents support high-ability students as they grow and learn. Future research could also focus on personal qualities of high-ability students and how those qualities affect experiences high-ability students have in a mathematics classroom.

A fifth area for additional research is an in-depth look at specific schools. Another study could research why one school has five high-ability students in the same time period when another school has none. Does one school offer more opportunities for high-ability students academically which results in more high-ability students? What role does parents' educational background play in whether a student is high-ability or not? What role does financial status of a family have in the academic ability of a child?

Summary

This study involving six high-ability students in rural Minnesota one-section and two-section schools adds to the current body of knowledge regarding rural school students and high-ability students. However, additional research involving high-ability students is still needed. With additional information, school district personnel will be able to better assist and guide high-ability students during their high school years.

APPENDICES

Appendix A
Gifted and Talented Definitions by State

State	Gifted and Talented Definition/Citation
Alabama	"Intellectually gifted children and youth are those who perform at high levels in academic or creative fields when compared with others of their age, experience, or environment. These children and youth require services not ordinarily provided by the regular school program. Children and youth possessing these abilities can be found in all populations, across all economic strata, and in all areas of human endeavor." (Special Education Services, Gifted Rule, 2013, AAC § 290-8-9-.12)
Alaska	"'Gifted' means exhibiting outstanding intellect, ability, or creative talent." (Education and Early Development, 2012, 4 AAC § 52.890)
Arizona	"'Gifted pupil' means a child who is of lawful school age, who due to superior intellect or advanced learning ability, or both, is not afforded an opportunity for otherwise attainable progress and development in regular classroom instruction and who needs appropriate gifted education services, to achieve at levels commensurate with the child's intellect and ability." (Education: Gifted Education for Gifted Children, 2014, ARS § 15-779.2)
Arkansas	"Gifted and talented children and youth are those of high potential or ability whose learning characteristics and educational needs require qualitatively differentiated educational experiences and/or services. Possession of these talents and gifts, or the potential for their development, will be evidenced through an interaction of above average intellectual ability, task commitment and/or motivation, and creative ability." (Arkansas Department of Education, 2009, p. 6)
California	"Each district shall use one or more of these categories in identifying pupils as gifted and talented. In all categories, identification of a pupil's extraordinary capability shall be in relation to the pupil's chronological peers. (a) Intellectual Ability: A pupil demonstrates extraordinary or potential for extraordinary intellectual development. (b) Creative Ability: A pupil characteristically:

Appendix A. cont.

State	**Gifted and Talented Definition/Citation**
California (Continued)	(1) Perceives unusual relationships among aspects of the pupil's environment and among ideas; (2) Overcomes obstacles to thinking and doing; (3) Produces unique solutions to problems. (c) Specific Academic Ability: A pupil functions at highly advanced economic levels in particular subject areas. (d) Leadership Ability: A pupil displays the characteristic behaviors necessary for extraordinary leadership. (e) High Achievement: A pupil consistently produces advanced ideas and products and/or attains exceptionally high scores on achievement tests. (f) Visual and Performing Arts Talent: A pupil originates, performs, produces, or responds at extraordinarily high levels in the arts. (g) Any other category which meets the standards set forth in these regulations." (Gifted and Talented Program, Categories for Identification, 2014, 5 CCR § 3822)
Colorado	"'Gifted child' means a person from four to twenty-one years of age whose aptitude or competence in abilities and talents and potential for accomplishments in one or more domains, as defined by state board rule, are so outstanding that he or she requires special provisions to meet his or her educational needs." (Education of Gifted Children, Definitions, C.R.S. § 22-20-202) "'Gifted and Talented Children' means those persons between the ages of four and twenty-one whose abilities, talents, and potential for accomplishment are so exceptional or developmentally advanced that they require special provisions to meet their educational programming needs. Gifted and talented children are hereafter referred to as gifted students. Children under five who are gifted may also be provided with early childhood special educational services. Gifted students include gifted students with disabilities (i.e. twice exceptional) and students with exceptional abilities or potential from all socioeconomic and ethnic, cultural populations. Gifted students are capable of high performance, exceptional production, or exceptional learning behavior by virtue of any or a combination of these areas of giftedness:

Appendix A. cont.

State	Gifted and Talented Definition/Citation
Colorado (Continued)	(a) General or specific intellectual ability. Intellectual ability is exceptional capability or potential recognized through cognitive processes (e.g., memory, reasoning, rate of learning, spatial reasoning, ability to find and solve problems, ability to manipulate abstract ideas and make connections, etc.). Intellectual ability is demonstrated by advanced level on performance assessments or ninety-fifth percentile and above on standardized cognitive tests. (b) Specific Academic Aptitude. Specific academic aptitude is exceptional capability or potential in an academic content area(s) (e.g., a strong knowledge base or the ability to ask insightful, pertinent questions within the discipline, etc.). Specific academic aptitude is demonstrated by advanced level on performance assessments or ninety-fifth percentile and above on standardized achievement tests. (c) Creative or Productive Thinking. Creative or productive thinking is exceptional capability or potential in mental processes (e.g., critical thinking, creative problem solving, humor, independent/original thinking, and/or products, etc.). Creative or productive thinking is demonstrated by advanced level on performance assessments or ninety-fifth percentile and above on standardized tests of creative/critical skills or creativity/critical thinking. (d) Leadership Abilities. Leadership is the exceptional capability or potential to influence and empower people (e.g., social perceptiveness, visionary ability, communication skills, problem solving, inter- and intra-personal skills and a sense of responsibility, etc.). Leadership is demonstrated by advanced level on performance assessments or ninety-fifth percentile and above on standardized leadership tests. (e) Visual Arts, Performing Arts, Musical or Psychomotor Abilities. Visual arts, performing arts, musical or psychomotor abilities are exceptional capabilities or potential in talent areas (e.g., art, drama, music, dance, body awareness, coordination and physical skills, etc.). Visual arts, performing arts, musical or psychomotor abilities are demonstrated by advanced level on performance talent-assessments or ninety-fifth percentile and above on standardized talent-tests." (Colorado Department of Education, 2013, pp. 104-105)

Appendix A. cont.

State	Gifted and Talented Definition/Citation
Connecticut	"'Extraordinary learning ability' and 'outstanding creative talent' shall be defined by regulation by the commissioner." (Education and Culture, Educational Opportunities, 2013, 164 CGS § 10-76a) "(1) 'Extraordinary learning ability' means a child identified by the planning and placement team as gifted and talented on the basis of either performance on relevant standardized measuring instruments, or demonstrated or potential achievement or intellectual creativity or both. The term shall refer to the top five percent of children so identified" (Education and Culture, Children Requiring Special Education, 2013, 10 RCSA § 10-76a-2). "(Note: The term means 5% of the children so identified as gifted and talented within the district.)" (Connecticut Department of Education, 2010, para. 7) "(2) 'Gifted and talented' means a child identified by the planning and placement team as (1) possessing demonstrated or potential abilities that give evidence of very superior intellectual, creative or specific academic capability and (2) needing differentiated instruction or services beyond those being provided in the regular school program in order to realize their intellectual, creative or specific academic potential. The term shall include children with extraordinary learning ability and children with outstanding talent in the creative arts as defined by these regulations" (Education and Culture, Children Requiring Special Education, 2013, 10 RCSA § 10-76a-2). "(3) 'Outstanding talent in the creative arts' means a child identified by the planning and placement team as gifted and talented on the basis of demonstrated or potential achievement in music, the visual arts or the performing arts. The term shall refer to the top five percent of children so identified" (Education and Culture, Children Requiring Special Education, 2013, 10 RCSA § 10-76a-2). (Note: The term means 5% of the children so identified as gifted and talented within the district.)." (Connecticut Department of Education, 2010, para. 8)

Appendix A. cont.

State	Gifted and Talented Definition/Citation
Delaware	"'Gifted or talented child' means a child in the chronological age group 4 through the end of the school year in which the child attains the age of 21 or until receipt of a regular high school diploma, whichever occurs first, who by virtue of certain outstanding abilities is capable of a high performance in an identified field. Such an individual, identified by professionally qualified persons, may require differentiated educational programs or services beyond those normally provided by the regular school program in order to realize that individual's full contribution to self and society. A child capable of high performance as herein defined includes one with demonstrated achievement and/or potential ability in any of the following areas, singularly or in combination: a. General intellectual ability; b. Specific academic aptitude; c. Creative or productive thinking; d. Leadership ability; e. Visual and performing arts ability; f. Psychomotor ability." (Education: Free Public Schools: Exceptional Children, 2014, 14 Del. C. § 3101)
Florida	"(1) Gifted. One who has superior intellectual development and is capable of high performance. (2) Criteria for eligibility. A student is eligible for special instructional programs for the gifted if the student meets the criteria under paragraph (2)(a) or (b) of this rule. (a) The student demonstrates: 1. Need for a special program. 2. A majority of characteristics of gifted students according to a standard scale or checklist, and 3. Superior intellectual development as measured by an intelligence quotient of two (2) standard deviations or more above the mean on an individually administered standardized test of intelligence." (Special Instructional Programs for Students who are Gifted, 2002, FAC § 6A-6.03019)
Georgia	Gifted Student – "one who demonstrates a high degree of intellectual and/or creative ability(ies), exhibits an exceptionally high degree of motivation, and/or excels in specific academic fields, and who need special instruction and/or special ancillary services to achieve at levels commensurate with his or her abilities. The abilities manifest in a collection of traits, aptitudes

Appendix A. cont.

State	Gifted and Talented Definition/Citation
Georgia (Continued)	and behaviors that, when taken together, are indicative of gifted potential." (Georgia Department of Education, 2014, p. 23) "To be eligible for gifted education services, a student must either (a) score at the 99th percentile (for grades K-2) or the 96th percentile (for grades 3-12) on the composite or full scale score of a norm-referenced test of mental ability and meet one of the achievement criteria." (Education for Gifted Students Rule, SBOE § 160-4-2-.38-2-d-1.)
Hawaii	"'Gifted students' means students with test scores or performances substantially and consistently above average and who also meet other multiple identification and selection criteria of the school. . . . 'Intellectual ability' means ability to perform or accomplish cognitive operations at two standard deviations above the norm as measured on a department approved standardized ability test or other evaluation measures." (Provision of Appropriate Educational Programs and Opportunities for Exceptional Children Who are Gifted and Talented, 2014, HAR § 8-51-2)
Idaho	"'Gifted/talented children means those students who are identified as possessing demonstrated or potential abilities that give evidence of high performing capabilities in intellectual, creative, specific academic or leadership areas, or ability in the performing or visual arts and who require services or activities not ordinarily provided by the school in order to fully develop such capabilities." (Education of Exceptional Children, 2014, Idaho Statutes § 33-2001)
Illinois	"Gifted and talented children. For purposes of this Article, 'gifted and talented children' means children and youth with outstanding talent who perform or show the potential for performing at remarkably high levels of accomplishment when compared with other children and youth of their age, experience, and environment. A child shall be considered gifted and talented in any area of aptitude, and, specifically, in language arts and mathematics, by scoring in the top 5% locally in that area of aptitude." (Gifted and Talented Children, 2013, ILCS §§ 105-5/14A-20)

Appendix A. cont.

State	**Gifted and Talented Definition/Citation**
Indiana	"'High ability student' means a student who: (1) performs at or shows the potential for performing at an outstanding level of accomplishment in at least one (1) domain when compared with other students of the same age, experience, or environment; and (2) is characterized by exceptional gifts, talents, motivation, or interests." (Education: High Ability Students, 2014, IC § 20-36-1-3) "'Domain' includes the following areas of aptitude and talent: (1) General intellectual. (2) General creative. (3) Specific academic. (4) Technical and practical arts. (5) Visual and performing arts. (6) Interpersonal." (Education: High Ability Students, 2014, IC § 20-36-1-2)
Iowa	"'*Gifted and talented children*' refers to those students, distinguished from the total K-12 student population, who are identified as possessing outstanding ability and who are capable of high performance. Gifted and talented children are children who require appropriate instruction and educational services commensurate with their abilities and needs beyond those provided by the regular school program. Gifted and talented children include those children with demonstrated achievement or potential ability, or both, in any of the following areas or in combination: general intellectual ability, creative thinking, leadership ability, visual and performing arts ability, or specific ability aptitude." (Education Department: Gifted and Talented Programs, 2014, IAC 281—59.2(257))
Kansas	"'Gifted' means performing or demonstrating the potential for performing at significantly higher levels of accomplishment in one or more academic fields due to intellectual ability, when compared to others of similar age, experience, and environment" (Special Education, 2009, K.A.R. § 91-40-1(bb)). One indicator of exceptionality is a "rank of not less than the 95th percentile on national norms on a standardized, norm-referenced achievement test in one or more of the academic fields (mathematics, language arts (including reading), science, and social science)" (Kansas State Department of Education, 2012a, p. 15).

Appendix A. cont.

State	Gifted and Talented Definition/Citation
Kentucky	"(19) 'High potential learners' means those students who typically represent the top quartile (twenty-five (25) percent) of the entire student population in terms of the degree of demonstrated gifted characteristics and behaviors and require differentiated service experiences to further develop their interests and abilities." (Programs for the Gifted and Talented, 2014, 704 KAR § 3:285.1) "(30) 'Specific academic aptitude' means possessing either potential or demonstrated ability to perform at an exceptionally high level in one (1), or very few related, specific academic areas significantly beyond the age, experience or environment of one's chronological peers." (Programs for the Gifted and Talented, 2014, 704 KAR § 3:285.1) "(12)(b) Specific academic aptitude shall be determined by composite scores in the ninth stanine on one (1) or more subject test scores of an achievement test." (Programs for the Gifted and Talented, 2014, 704 KAR § 3:285.3) (ninth stanine is 96th percentile) "(n) 'Gifted and talented student' means a pupil identified as possessing demonstrated or potential ability to perform at an exceptionally high level in general intellectual aptitude, specific academic aptitude, creative or divergent thinking, psychosocial or leadership skills, or in the visual or performing arts." (State Support of Education, XIII KRS § 157.200(1)(n))
Louisiana	"Gifted children and youth are students who demonstrate abilities that give evidence of high performance in academic and intellectual aptitude." (Title 28 Education: Part CI. Bulletin 1508—Pupil Appraisal Handbook, 2009, 28 LAC § 9-901.A) The criteria for gifted and talented includes: "obtain a score of at least two standard deviations above the mean on an individually or group administered test of intellectual abilities appropriately standardized on students of this age and administered by a certified school psychologist or licensed psychologist." (Title 28 Education: Part CI. Bulletin 1508—Pupil Appraisal Handbook, 2009, 28 LAC § 9-901.C.2.a)

Appendix A. cont.

State	Gifted and Talented Definition/Citation
Maine	"Gifted and Talented Children: 'Gifted and talented children' shall mean those children in grades K-12 who excel, or have the potential to excel, beyond their age peers, in the regular school program, to the extent that they need and can benefit from programs for the gifted and talented. Gifted and talented children shall receive specialized instruction through these programs if they have exceptional ability, aptitude, skill, or creativity in one or more of the following categories: 1. General Intellectual Ability as shown by demonstrated significant achievement or potential for significant accomplishment above their age peers in all academic areas 2. Specific Academic Aptitude as shown by demonstrated significant achievement or potential for significant accomplishment above their age peers in one of more academic area(s) 3. Artistic Ability as shown by demonstrated significant achievement or potential for significant accomplishment above their age peers in the literary, performing, and/or visual arts NOTE: Children with exceptional General Intellectual Ability and/or exceptional Specific Academic Aptitude usually comprise five percent of the school population. Students with exceptional Artistic Ability usually comprise five percent of the school population. Children in the top two percent of the school population may be considered highly gifted." (Educational Programs for Gifted and Talented Children, 1996, 05-071 CMR § 104.02)
Maryland	"In this subtitle, 'gifted and talented student' means an elementary or secondary student who is identified by professionally qualified individuals as: (1) Having outstanding talent and performing, or showing the potential for performing, at remarkably high levels of accomplishment when compared with other students of a similar age, experience, or environment; (2) Exhibiting high performance capability in intellectual, creative, or artistic areas; (3) Possessing an unusual leadership capacity; or (4) Excelling in specific academic fields." (Special Programs for Exceptional Children, 2003, Md. Code Ann., Education § 8-201)

Appendix A. cont.

State	Gifted and Talented Definition/Citation
Massachusetts	No definition found.
Michigan	"(a) The 'gifted and/or academically talented' means elementary and/or secondary school students who may be considered to be (1) intellectually gifted, (2) outstanding in school achievement, and/or (3) those who have outstanding abilities in particular areas of human endeavor, including the arts and humanities." (Education for the Gifted and/or Academically Talented Act of 1974, 2009, MCL § 388.1092)
Minnesota	"GIFTED/TALENTED PARTICIPATION is included in the federal civil rights reports. Gifted and Talented programs, by design, capitalize on the special cognitive needs of students and should be distinguished from enrichment activities available to all learners. Gifted and talented children and youth are those students with outstanding abilities, identified at preschool, elementary, and secondary levels. These students are capable of high performance when compared to others of similar age, experience, and environment, and represent the diverse populations of our communities. These are students whose potential requires differentiated and challenging educational programs and/or services beyond those provided in the general school program. Students capable of high performance include those with demonstrated achievement or potential ability in any one or more of the following areas: general intellectual, specific academic subjects, creativity, leadership and visual and performing arts. Definitions: General intellectual ability: Students who demonstrate a high aptitude for abstract reasoning and conceptualization, who master skills and concepts quickly, and/or exhibit advanced critical thinking capability. Specific academic aptitude: Students who evidence extraordinary learning ability in one or more specific disciplines. Creative and critical thinking: Students who are highly insightful, imaginative, and innovative, who consistently assimilate and synthesize seemingly unrelated information to create new and

Appendix A. cont.

State	Gifted and Talented Definition/Citation
Minnesota (Continued)	novel solutions for conventional tasks, and who can interpret, analyze and evaluate information. Leadership ability: Students who emerge as leaders, and who demonstrate high ability to accomplish group goals by working with and through others." (Minnesota Department of Education, 2011, p. 33)
Mississippi	"'Gifted children' shall mean children who are found to have an exceptionally high degree of intellect, and/or academic, creative or artistic ability." (Exceptional Children: Gifted Education, 2013, MS Code § 37-23-175)
Missouri	"'Gifted children', children who exhibit precocious development of mental capacity and learning potential as determined by competent professional evaluation to the extent that continued educational growth and stimulation could best be served by an academic environment beyond that offered through a standard grade level curriculum." (School Districts, RSMo § 162.675.) "If achievement test scores are used for formal evaluation and placement, they must be derived from a norm-referenced test and the cut-off score must be set at the 95th percentile or higher." (Missouri Department of Elementary and Secondary Education, 2014, p. 6)
Montana	"'Gifted and talented children' means children of outstanding abilities who are capable of high performance and require differentiated educational programs beyond those normally offered in public schools in order to fully achieve their potential contribution to self and society. The children so identified include those with demonstrated achievement or potential ability in a variety of worthwhile human endeavors." (Education: School Instruction and Special Programs, 2014, 20 MCA § 20-7-901)
Nebraska	"Learner with high ability means a student who gives evidence of high performance capability in such areas as intellectual, creative, or artistic capacity or in specific academic fields and who requires accelerated or differentiated curriculum programs in order to develop those capabilities fully." (Schools: Learners With High Ability; Terms, Defined, n.d., NRS § 79-1107(3))

Appendix A. cont.

State	Gifted and Talented Definition/Citation
Nevada	"'Gifted and talented' means a person who possesses or demonstrates outstanding ability in one or more of the following: 1. General intelligence; 2. Academic aptitude in a specific area; 3. Creative thinking; 4. Productive thinking; 5. Leadership; 6. The visual arts; or 7. The performing arts." (System of Public Instruction, 2014, NAC § 388.043) "1. A pupil who is gifted and talented is eligible for special services and programs of instruction if a team, comprised of persons selected by the public agency, concludes that the pupil has: (a) General intellectual ability or academic aptitude in a specific area that is demonstrated by a score at or above the 98th percentile." (System of Public Instruction, 2014, NAC § 388.435)
New Hampshire	No definition found.
New Jersey	"'Gifted and talented students' means students who possess or demonstrate high levels of ability in one or more content areas when compared to their chronological peers in the local school district and who require modifications of their educational program if they are to achieve in accordance with their capabilities." (Standards and Assessment, 2014, 6A N.J.A.C. § 8-1.3)
New Mexico	"A. Gifted child defined. As used in 6.31.2.12 NMAC, 'gifted child' means a school-age person as defined in Sec. 22-13-6(D) NMSA 1978 whose intellectual ability paired with subject matter aptitude/achievement, creativity/divergent thinking, or problem-solving/critical thinking meets the eligibility criteria in 6.31.2.12 NMAC and for whom a properly constituted IEP team determines that special education services are required to meet the child's educational needs.

Appendix A. cont.

State	Gifted and Talented Definition/Citation
New Mexico (Continued)	B. Qualifying areas defined. (1) 'Intellectual ability' means a score two standard deviations above the mean as defined by the test author on a properly administered intelligence measure. The test administrator must also consider the standard error of measure (SEM) in the determination of whether or not criteria have been met in this area. (2) 'Subject matter aptitude/achievement' means superior academic performance on a total subject area score on a standardized measure, or as documented by information from other sources as specified in Paragraph (2) of Subsection C of 6.31.2.12 NMAC. (3) 'Creativity/divergent thinking' means outstanding performance on a test of creativity/ divergent thinking, or in creativity/divergent thinking as documented by information from other sources as specified in Paragraph (2) of Subsection C of 6.31.2.12 NMAC. (4) "Problem-solving/critical thinking' means outstanding performance on a test of problem-solving/critical thinking, or in problem-solving/critical thinking as documented by information from other sources as specified in Paragraph (2) of Subsection B of 6.31.2.12 NMAC." (Special Education: Children With Disabilities/Gifted Children, 2014, NMAC § 6.31.2.12)
New York	"The term 'gifted pupils' shall mean those pupils who show evidence of high performance capability and exceptional potential in areas such as general intellectual ability, special academic aptitude and outstanding ability in visual and performing arts. Such definition shall include those pupils who require educational programs or services beyond those normally provided by the regular school program in order to realize their full potential." (Gifted Education, 2014, 6 NY EDN Law § 90-4452.1.a)
North Carolina	"The General Assembly believes the public schools should challenge all students to aim for academic excellence and that academically or intellectually gifted students perform or show the potential to perform at substantially high levels of accomplishment when compared to others of their age, experience or environment. Academically or intellectually gifted students exhibit high performance capability in intellectual areas, specific academic fields, or in both intellectual areas and specific academic fields. Academically or intellectually gifted students

Appendix A. cont.

State	Gifted and Talented Definition/Citation
North Carolina (Continued)	require differentiated educational services beyond those ordinarily provided by the regular educational program. Outstanding abilities are present in students from all cultural groups, across all economic strata, and in all areas of human endeavor." (Academically or Intellectually Gifted Students, 1996, NCGS § 115C-150.5)
North Dakota	"'Student who is gifted' means an individual who is identified by qualified professionals as being capable of high performance and who needs educational programs and services beyond those normally provided in a regular education program." (Special Education, 2014, NDCC § 15.1-32-01.3)
Ohio	"'Gifted' means students who perform or show potential for performing at remarkably high levels of accomplishment when compared to others of their age, experience, or environment and who are identified under division (A), (B), (C), or (D) of section 3324.03 of the Revised Code. 'Specific academic ability field' means one or more of the following areas of instruction: (1) Mathematics; (2) Science; (3) Reading, writing, or a combination of these skills; (4) Social studies." (Education-Libraries: Gifted Students, 2014, 33 ORC § 3324.01) "(A) A student shall be identified as exhibiting 'superior cognitive ability' if the student did either of the following within the preceding twenty-four months: (1) Scored two standard deviations above the mean . . . on an approved individual standardized intelligence test administered by a licensed school psychologist or licensed psychologist; (2) Accomplished any one of the following: . . . (b) Performed at or above the ninety-fifth percentile on an approved individual or group standardized basic or composite battery of a nationally normed achievement test. . . .

Appendix A. cont.

State	Gifted and Talented Definition/Citation
Ohio (Continued)	(B) A student shall be identified as exhibiting 'specific academic ability' superior to that of children of similar age in a specific academic ability field if within the preceding twenty-four months the student performs at or above the ninety-fifth percentile at the national level on an approved individual or group standardized achievement test of specific academic ability in that field." (Education-Libraries: Gifted Students, 2014, 33 ORC § 3324.03)
Oklahoma	"'Gifted and talented children' means those children identified at the preschool, elementary and secondary level as having demonstrated potential abilities of high performance capability and needing differentiated or accelerated education or services. For the purpose of this definition, 'demonstrated abilities of high performance capability' means those identified students who score in the top three percent (3%) on any national standardized test of intellectual ability. Said definition may also include students who excel in one or more of the following areas: a. creative thinking ability, b. leadership ability, c. visual and performing arts ability, and d. specific academic ability." (Gifted and Talented Children, 2013, 70 OS § 20-1210.301)
Oregon	"(4) Talented and gifted children means those children who require special educational programs or services, or both, beyond those normally provided by the regular school program in order to realize their contribution to self and society and who demonstrate outstanding ability or potential in one or more of the following areas: (a) General intellectual ability as commonly measured by measures of intelligence and aptitude. (b) Unusual academic ability in one or more academic areas. (c) Creative ability in using original or nontraditional methods in thinking and producing. (d) Leadership ability in motivating the performance of others either in educational or noneducational settings. (e) Ability in the visual or performing arts, such as dance, music or art." (Special Education and Other Specialized Education Services, 2013, 30 ORS § 343.395)

Appendix A. cont.

State	Gifted and Talented Definition/Citation
Pennsylvania	"*Mentally gifted*—Outstanding intellectual and creative ability the development of which requires specifically designed programs or support services, or both, not ordinarily provided in the regular education program." (Special Education for Gifted Students, 2014, 22 Pa. Code § 16.1) "This term [mentally gifted] includes a person who has an IQ of 130 or higher." (Special Education for Gifted Students, 2014, 22 Pa. Code § 16.21(d))
Rhode Island	"Gifted and talented elementary or secondary level students: (b) (1) Requires an educational program and/or service which is different from that normally provided in the standard school program and which is educationally, personally, and socially beneficial; and (2) requires that programs developed serve students who demonstrate unique talents and/or superior capabilities in areas such as specific academic aptitude, creative thinking, intelligence, visual, performing and industrial arts, and leadership." (Education: Education of Gifted Children, 2013, RI Gen. Laws § 16-42-1)
South Carolina	"1. Gifted and talented students are those who are identified in grades one through twelve as demonstrating high performance ability or potential in academic and/or artistic areas and therefore require educational programming beyond that normally provided by the general school programming in order to achieve their potential. 2. Gifted and talented abilities for these regulations include (a) Academic and Intellectual Ability: Students who have the academic and/or intellectual potential to function at a high level in one or more academic areas. (b) Visual and Performing Arts: Students who have the artistic potential to function at a high performance level in one or more of the fine arts." (Gifted and Talented, 2013, SCCR § 43-220)
South Dakota	No definition found.

Appendix A. cont.

State	Gifted and Talented Definition/Citation
Tennessee	"'Intellectually Gifted' means a child whose intellectual abilities and potential for achievement are so outstanding that the child's educational performance is adversely affected. 'Adverse affect' means the general curriculum alone is inadequate to appropriately meet the student's educational needs." (Special Education Programs and Services, 2014, TRR § 0520-01-09-.02(11))
Texas	"'Gifted and talented student' means a child or youth who performs at or shows the potential for performing at a remarkably high level of accomplishment when compared to others of the same age, experience, or environment and who: (1) exhibits high performance capability in an intellectual, creative, or artistic area; (2) possesses an unusual capacity for leadership; or (3) excels in a specific academic field." (Educational Programs for Gifted and Talented Students, 1995, 2 TS § 29.121)
Utah	"'Accelerated students' means children and youth whose superior performance or potential for accomplishment requires a differentiated and challenging instructional model that may include the following: (1) Advanced placement courses. . . . (2) Gifted and talented programs: programs to assist individual students to develop their high potential and enhance their academic growth and identify students with outstanding abilities who are capable of high performance in the following areas: (a) general intellectual ability; (b) specific academic aptitude; and (c) creative or productive thinking." (Enhancement for Accelerated Students Program, 2014, UAC § Rule R277-707-1)
Vermont	"'Gifted and talented children' means children identified by professionally qualified persons who, when compared to others of their age, experience, or environment, exhibit capability of high performance in intellectual, creative, or artistic areas, possess an unusual capacity for leadership, or excel in specific academic fields." (Education: Gifted and Talented Children, 2014, 16 V.S.A. § 1-13)

Appendix A. cont.

State	**Gifted and Talented Definition/Citation**
Virginia	"'Gifted students' means those students in public elementary, middle, and secondary schools beginning with kindergarten through twelfth grade who demonstrate high levels of accomplishment or who show the potential for higher levels of accomplishment when compared to others of the same age, experience, or environment. Their aptitudes and potential for accomplishment are so outstanding that they require special programs to meet their educational needs. These students will be identified by professionally qualified persons through the use of multiple criteria as having potential or demonstrated aptitudes in one or more of the following areas: 1. General intellectual aptitude. Such students demonstrate or have the potential to demonstrate superior reasoning; persistent intellectual curiosity; advanced use of language; exceptional problem solving; rapid acquisition and mastery of facts, concepts, and principles; and creative and imaginative expression across a broad range of intellectual disciplines beyond their age-level peers. 2. Specific academic aptitude. Such students demonstrate or have the potential to demonstrate superior reasoning; persistent intellectual curiosity; advanced use of language; exceptional problem solving; rapid acquisition and mastery of facts, concepts, and principles; and creative and imaginative expression beyond their age-level peers in selected academic areas that include English, history and social science, mathematics, or science. 3. Career and technical aptitude. Such students demonstrate or have the potential to demonstrate superior reasoning; persistent technical curiosity; advanced use of technical language; exceptional problem solving; rapid acquisition and mastery of facts, concepts, and principles; and creative and imaginative expression beyond their age-level peers in career and technical fields. 4. Visual or performing arts aptitude. Such students demonstrate or have the potential to demonstrate superior creative reasoning and imaginative expression; persistent artistic curiosity; and advanced acquisition and mastery of techniques, perspectives, concepts, and principles beyond their age-level peers in visual or performing arts." (Regulations Governing Educational Services for Gifted Students, 2014, 8 VAC § 20-40-20)

Appendix A. cont.

State	Gifted and Talented Definition/Citation
Washington	“Highly capable students are students who perform or show potential for performing at significantly advanced academic levels when compared with others of their age, experiences, or environments. Outstanding abilities are seen within students’ general intellectual aptitudes, specific academic abilities, and/or creative productivities within a specific domain.” (Special Services Program – Highly Capable Students, 2014, WAC § 392-170-035)
West Virginia	“Giftedness is exceptional intellectual abilities and potential for achievement that requires specially designed instruction and/or services beyond those normally provided in the general classroom instruction. (Regulations for the Education of Students With Exceptionalities (2419), 2014, 126 WV CSR § 126.16-4-3.G; West Virginia Department of Education, 2012, p. 25) An eligibility committee will determine that a student is eligible for special education services as a gifted student in grades one through eight when the following criteria are met: 1. General intellectual ability score at the 97th percentile rank or higher on a comprehensive test of intellectual ability in consideration of 1.0 standard error of measurement . . . ; 2. At least one of the four core curriculum areas of academic achievement at the 90th percentile rank or higher as measured by an individual standardized achievement test, or at least one of the four core curriculum areas of classroom performance demonstrating exceptional functioning as determined during the multidisciplinary evaluation; and 3. The need for specially designed, differentiated instruction and/or services beyond those normally provided in the general classroom. Differentiated instruction for gifted students may include enrichment of the content emphasizing the development of higher-level thinking, including critical thinking, creative thinking, and problem solving skills and/or acceleration of content while the student remains in the chronologically appropriate grade. Related services may include, for example, guidance and counseling, independent study and distance learning. This is not an all-inclusive list.” (Regulations for the Education of Students With Exceptionalities (2419), 2014, 126 WV CSR § 126.16-4-3.G; West Virginia Department of Education, 2012, pp. 25-26)

Appendix A. cont.

State	Gifted and Talented Definition/Citation
Wisconsin	"'Gifted and talented pupils' means pupils enrolled in public schools who give evidence of high performance capability in intellectual, creative, artistic, leadership or specific academic areas and who need services or activities not ordinarily provided in a regular school program in order to fully develop such capabilities." (General School Operations: Programs for Gifted and Talented Pupils, 2011, Wis. Stat. § 118.35)
Wyoming	"Gifted and talented students identified by professionals and other qualified individuals as having outstanding abilities, who are capable of high performance and whose abilities, talents and potential require qualitatively differentiated educational programs and services beyond those normally provided by the regular school program in order to realize their contribution to self and society." (Education: Courses of Study, Textbooks, Supplies, 2014, W.S. § 21-9-101(c)(ii))

Appendix B
Identification and Programming Requirements for High-Ability Students by State

State	Identification Required	Programming Required	Reference
Alabama	Yes	Yes	Alabama Association for Gifted Children, 2013, p. 3
Alaska	Yes	Yes	District Responsibility for Gifted Education, 2006, 4 AAC § 52.800
Arizona	Yes	Yes	Arizona Department of Education (2013)
Arkansas	Yes	Yes	Arkansas Department of Education (2013)
California	No	No	California Department of Education (2013)
Colorado	No	No	R. Rose (personal communication, December 1, 2013)
Connecticut	Yes	No	Connecticut State Department of Education (2010)
Delaware	No	No	State of Delaware Legislative Task Force for Gifted & Talented Education (2013)
Florida	Yes	Yes	Florida Department of Education (2013)
Georgia	Yes	Yes	Georgia Department of Education (2014)
Hawaii	Yes	Yes	Department of Education State of Hawaii (2007)
Idaho	Yes	Yes	Idaho State Department of Education (n.d.)
Illinois	No	No	Gifted and Talented Children, 2013, ILCS § 105-5/14A-10

Appendix B. cont.

State	**Identification Required**	**Programming Required**	**Reference**
Indiana	Yes	Yes	Indiana Department of Education (2013)
Iowa	Yes	Yes	Iowa Department of Education (2014)
Kansas	Yes	Yes	Kansas Department of Education (2012b)
Kentucky	Yes	Yes	Kentucky Department of Education (n.d.)
Louisiana	Yes	Yes	Association for Gifted and Talented Students Louisiana (2013)
Maine	Yes	Yes	Educational Programs for Gifted and Talented Children, 1996, 05-071 CMR § 104.01-25
Maryland	Yes	Yes	Paynter & Zenker (2012)
Massachusetts	No	No	Massachusetts Department of Education (2002)
Michigan	No	No	J. K. Becker (personal communication, November 30, 2013)
Minnesota	No	No	Gifted and Talented Students Programs, 2014, MS § 120B.15, and Minnesota Department of Education (2013b)
Mississippi	Yes	Yes	Mississippi Department of Education (2013)
Missouri	No	No	Missouri Department of Elementary and Secondary Education (2014)
Montana	Yes	Yes	Montana State Board of Public Education (n.d.)
Nebraska	Yes	No	Nebraska Department of Education (1997)
Nevada	Yes	Yes	Educational Services and Programs, 2013, NRS § 388.450

Appendix B. cont.

State	Identification Required	Programming Required	Reference
New Hampshire	No	No	New Hampshire Department of Education (2012)
New Jersey	Yes	Yes	State of New Jersey Department of Education (2010)
New Mexico	Yes	Yes	New Mexico Public Education Department (2011)
New York	Yes	No	New York State Department of Education (2009)
North Carolina	Yes	Yes	Public Schools of North Carolina, State Board of Education, Department of Public Instruction (n.d.)
North Dakota	No	No	Special Education, 2014, NDCC § 15.1-32-10
Ohio	Yes	Yes	Operating Standards for Identifying and Serving Gifted Students, 2008, OAC § 3301-51-15
Oklahoma	Yes	Yes	Oklahoma State Department of Education (2013)
Oregon	Yes	Yes	Oregon Department of Education (2014)
Pennsylvania	Yes	Yes	Pennsylvania Department of Education (2014)
Rhode Island	No	No	Rhode Island Department of Education (2014)
South Carolina	Yes	Yes	Gifted and Talented, 2013, SBE § R43-220
South Dakota	No	No	B. Nelson (personal communication, January 21, 2014)
Tennessee	Yes	Yes	Tennessee Department of Education (2010)
Texas	Yes	Yes	Texas Education Agency (2014)

Appendix B. cont.

State	Identification Required	Programming Required	Reference
Utah	Yes	Yes	Utah State Office of Education (2013)
Vermont	Yes	Yes	Education: General Policy, 2014, 16 V.S.A. § 99-2902
Virginia	Yes	Yes	Virginia Department of Education (2012)
Washington	Yes	Yes	Special Service Program – Highly Capable Students, 2014, WAC § 392-170
West Virginia	Yes	Yes	West Virginia Department of Education (n.d.)
Wisconsin	Yes	Yes	Wisconsin Department of Public Instruction (n.d.)
Wyoming	Yes	Yes	Education: Courses of Study, Textbooks, Supplies, 2014, W.S. § 21-9-101

Appendix C
High-Ability Learners in Mathematics Interview Protocol

Interviewer: Jodi Sandmeyer

Consent: Review signed consent form and ask if there are any questions. Inform the participant they are under no obligation to participate in the project and may end the interview at any time they choose. Inform the participant the interview will take approximately 1 hour.

QUESTIONS

<u>School Context</u>

- Please start by telling me about which math classes you took while in high school.
  - What are your thoughts on college in the high school classes?
  - If additional math classes were offered, would you have taken them? Which ones should be offered?
  - How do you think students should be selected for advanced mathematics classes?
- Describe your favorite mathematics class.
- If I walked into your senior math class, what would you be doing?
- Describe a math activity where you felt challenged.
- What are your thoughts on competition/games in the classroom?
- What value is there in doing math homework?
- If you did not know how to do a math problem, what did you do?
- If you were going to be part of a hiring team for a new math teacher, what five qualities would you look for in the candidates?

Appendix C. cont.

- If I was your math teacher, describe what I should do to challenge you in math class?
- What are your strengths as a learner (visual, auditory)?
- If I was your math teacher and you could tell me how to teach, what would you say?
- What were your grades in math classes while in high school?
- How much effort did you put into your math class (homework, studying for tests)?
- What was your ACT score?

<u>Student Context</u>

- Describe an experience (good or bad) you had while helping a peer with math homework?
- If I was going to assign you to work on a group project in math class, what is your first reaction?
- Describe your relationships with your peers.
- Describe the perfect partner for a math project.
- Describe a group project that you enjoyed in math.
- If we went back in time, and I watched you with your peers in math class, what would I observe (quiet, shy, loud)?
- If I asked a peer to describe you in five words or less, what would they tell me?
- What else would you like to share?

Appendix D
Teachers of High-Ability Learners in Mathematics Interview Protocol

Interviewer: Jodi Sandmeyer

Consent: Review signed consent form and ask if there are any questions. Inform the participant they are under no obligation to participate in the project and may end the interview at any time they choose. Inform the participant the interview will take approximately 1 hour.

QUESTIONS

<u>School Context</u>

- Describe your teaching experiences (number of years teaching, grade levels taught, and subjects taught).
- Describe your formal education.
- Describe the math curriculum at your school.
- How do students select the mathematics classes they will take?
    - How do you think students should select their mathematics classes?
- Why did you become a teacher?
- Using five adjectives, describe yourself as a teacher.
- What are five adjectives your colleagues would use to describe you?
- What are five adjectives your administration would use to describe you?
- What are five adjectives your students would use to describe you?
- What is your greatest challenge as a teacher?
- How do you know that students are learning?
- Describe a typical day in your classroom.

Appendix D. cont.

- As a mathematics teacher, what do you think is the best way to challenge high-ability learners in mathematics?
    - What are your thoughts on competition/games in the classroom?
    - What are your thoughts on college in the high school classes?
    - What is the value of math homework?
- What do you do to encourage/motivate students to excel in the math classroom?
- If you were part of a hiring team for a new math teacher, what qualities would you be looking for in the candidates?
- Tell me a classroom experience that captures what you do.

Student Context

- How are students selected to work in groups?
- What else would you like to share?

Appendix E
Letter of Introduction to Superintendent of School District

3350 Turgi Hill Road NW
Bemidji, MN 56601

June 6, 2013

Participant Name
Participant Address

Dear Participant:

I am following up on our phone conversation regarding your participation in a research study that I will conduct under the direction of Dr. Brenda Kallio, my advisor, at the University of North Dakota. The purpose of this study will be to use phenomenological qualitative research methods to identify educational experiences of high-ability mathematics learners and mathematics teachers from rural one-section and two-section high schools.

As part of the study, I am requesting that you or your designee, provide me the number of students who graduated in 2010, 2011, and 2012 who scored 30 or higher on the mathematics subtest of the ACT. Once the students have been determined and final approval has been granted for the study, I will be requesting you or your designee mail a letter to the students, in the postage paid envelopes provided. The letter will request the students participate in my study involving the educational experiences of high-ability learners in mathematics. The students will be asked to participate in an interview which will last approximately 1 hour. The interviews will be conducted via Skype or Google Circles or in person at a time and location of their convenience.

For a second part of the study, I am requesting permission to interview one mathematics teacher at the high school. The teacher will be asked to participate in an interview which will last approximately 1 hour. The interview will be in person or via Skype or Google Circles.

Please return a letter printed on your school letterhead indicating your understanding of your involvement with the study, a description of the school district's involvement in my research, and an agreement to participate in the study. I have enclosed a template for you to use in writing your letter of agreement as well as copies of the student introductory letter and interview questions. You may return the letter of agreement and signed consent form in the enclosed self-addressed, stamped envelope.

Appendix E. cont.

If you have any questions regarding this research project, please contact my advisor, Dr. Brenda Kallio, or me at the phone numbers or email addresses listed below. Thank you for your time.

Sincerely,

Jodi Sandmeyer
Doctoral Student
University of North Dakota
218-759-9684 home
218-766-0423 cell
jsandmeyer@nevis.k12.mn.us

Brenda Kallio, Ed.D.
Associate Professor
University of North Dakota
701-777-3249
brenda.kallio@email.und.edu

Appendix F
Template for Superintendent Approval Letter

Jodi Sandmeyer
3350 Turgi Hill Road NW
Bemidji, MN 56601

Dear Mrs. Sandmeyer;

As superintendent of schools for the (Name) Public School District, I give you permission to conduct your research within the (Name) Public School setting. The nature of your research has been explained to me. I understand that you will be requesting the number of students who graduated in 2010, 2011, and 2012 who scored 30 or higher on the mathematics subtest of the ACT. Once the students have been determined and final approval of the study has been granted, I understand that you will be requesting I mail a copy of the enclosed letter to the students, in the postage-paid envelopes which you provide. The letter will request the student participate in a study involving the educational experiences of high-ability learners in mathematics. The students will be asked to participate in an interview which will last approximately 1 hour. The interviews will be in person or via Skype or Google Circles. I also understand that you will be requesting to conduct an interview with a high school mathematics teacher. The interview may be conducted in person or via Skype or Google Circles.

I understand that data collected will be used to identify educational experiences of students and teachers in rural one-section and two-section mathematics classrooms. I also understand that I may request a copy of your research study following its completion to be used for educational purposes by school district personnel.

I have voluntarily signed this letter.

Sincerely,

Superintendent Name
Superintendent of Schools
(Name) Public School District

Appendix G
Letter of Introduction to Students

3350 Turgi Hill Road NW
Bemidji, MN 56601

July 1, 2013

Dear Student:

You are invited to participate in a research study conducted by Jodi Sandmeyer in the Educational Leadership Department, under the supervision of her advisor, Dr. Brenda Kallio, at the University of North Dakota. The study examines the educational experiences of students who scored a 30 or higher on the mathematics portion of their ACT. You are invited to participate in this study because you achieved this score and your opinions and knowledge about this issue are valuable. Your participation is voluntary. Approximately six students will take part in this study. The study will be completed by May 1, 2014.

If you decide to participate in this study, you will be interviewed about your educational experiences in school. The interviews will typically last about 1 hour.

You will be asked if voice recordings can be made of your interview. Such recordings will be used only for transcribing exactly what you say. Being recorded is voluntary. You may still participate without being recorded. Your name will remain secret. Tapes will be stored in a locked cabinet after use.

Enclosed is a consent form to participate in the study. This form will need to be signed and returned to me before the interview. If you are willing to participate, please contact me so that we can arrange a time and place for the interview. If you have any questions regarding this research project, please contact my advisor, Dr. Brenda Kallio, or me at the phone numbers or email addresses listed below. Thank you for your time.

Appendix G. cont.

Sincerely,

Jodi Sandmeyer
Doctoral Student
University of North Dakota
218-759-9684
jsandmeyer@nevis.k12.mn.us

Brenda Kallio, Ed.D.
Associate Professor
University of North Dakota
701-777-3249
brenda.kallio@email.und.edu

Appendix H
Graduated Student Consent Form

Title of Study: Educational Experiences of Rural Minnesota Teachers and High-Ability Mathematics Students

Study Researcher: Jodi Sandmeyer

INVITATION

You are invited to participate in a research study conducted by Jodi Sandmeyer in the Educational Leadership Department, under the supervision of her advisor, Dr. Brenda Kallio, at the University of North Dakota. The study examines the educational experiences of students who scored a 30 or higher on the mathematics portion of their ACT. You are invited to participate in this study because you achieved this score and your opinions and knowledge about this issue are valuable. Your participation is voluntary. Approximately six students will take part in this study. The study will be completed by May 1, 2014.

STATEMENT OF RESEARCH

A person who is to participate in the research must give his or her informed consent to such participation. This consent must be based on an understanding of the nature and risks of the research. This document provides information that is important for this understanding. Research projects include only subjects who choose to take part. Please take your time in making your decision as to whether to participate. If you have questions at any time, please ask.

WHAT IS THE PURPOSE OF THE STUDY?

The purpose of this study will be to use phenomenological qualitative research methods to identify educational experiences of high-ability mathematics learners and mathematics teachers from rural one-section and two-section high schools. The researcher will use this information to write scholarly articles about high-ability learners in mathematics in one-section and two-section schools in rural Minnesota.

HOW LONG WILL I BE IN THIS STUDY?

If you decide to participate in this study, you will be interviewed about your educational experiences in high school. The interviews will typically last about 1 hour.

Appendix H. cont.

WHAT WILL HAPPEN DURING THIS STUDY?
You will be asked if voice recordings can be made of your interview. Such recordings will be used only for transcribing exactly what you say. Your name will remain secret. Tapes will be stored in a locked cabinet after use. Being recorded is voluntary. You may still participate without being recorded.

WILL MY CONFIDENTIALITY BE PROTECTED?
The records of this study will be kept private to the extent permitted by law. In any report about this study that might be published, you will not be identified. Your study record may be reviewed by government agencies, the University of North Dakota Research Development and Compliance Office, and the University of North Dakota Institutional Review Board.

Any information that is obtained in this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. Confidentiality will be maintained by means of a code assigned to each participant to protect their identity. The code will be in a locked file in the researcher's school office and will be kept separate from data collected. All data and consent forms will be kept in separate locked file cabinets for 3 years after the completion of this study. After 3 years, the researcher will shred the paper data and delete the word-processed data from the stored jump drives.

The recordings from interviews will be transcribed by a transcriptionist. The transcriptionist has signed a confidentiality notice. After 3 years, recordings from interviews will be deleted from the researcher's computer.

If a report or article is written about this study, results will be summarized in a manner so that you cannot be identified. Any information from the data that could identify you will be removed.

WHAT ARE THE RISKS OF THE STUDY?
Possible risks involved with this study include the possibility of loss of confidentiality. Though I take many steps to ensure secrecy, the identity of participants might accidentally become known. This may cause embarrassment or discomfort. Some questions I ask about your experiences and opinions might cause worry, embarrassment, discomfort, or sadness. You may choose not to answer such questions. Referrals to counseling will be available should you experience bad feelings, but no money is available from the study to pay for such services.

Appendix H. cont.

WHAT ARE THE BENEFITS OF THIS STUDY?

Your participation in this research may benefit you or other people in the future by helping educators learn about the educational experiences of rural Minnesota high-ability learners in mathematics. However, I cannot guarantee or promise that you will receive any direct benefits from participating in this study.

WILL IT COST ME ANYTHING TO BE IN THIS STUDY?

The only costs for participating in this study would be traveling to the location of the interviews. You will not have any other costs for being in this research study.

WILL I BE PAID FOR PARTICIPATING IN THE STUDY?

You will not be paid for your participation in this study.

IS THIS STUDY VOLUNTARY?

Your participation is voluntary. You may choose not to participate or you may discontinue your participation at any time without penalty or loss of benefits to which you are otherwise entitled. Your decision whether or not to participate will not affect your current or future relations with the Department of Educational Leadership or the University of North Dakota. If you do decide to take part, you may change your mind at any time without penalty.

WHAT IF I HAVE QUESTIONS?

If you have questions about this research in the future, please contact the researcher, Jodi Sandmeyer, at (218) 759-9684 or by e-mail (jsandmeyer@nevis.k12.mn.us) or her advisor, Dr. Brenda Kallio, at (701) 777-3249 or by e-mail (brenda.kallio@email.und.edu).

If you have questions regarding your rights as a research participant, or if you have any concerns or complaints about the research, you may contact the University of North Dakota Institutional Review Board at (701) 777-4279. Please call this number if you cannot reach research staff, or if you wish to talk with someone else.

AUTHORIZATION TO PARTICIPATE IN THE RESEARCH STUDY:

I have read the information in this consent form, any questions have been answered, and I voluntarily agree to participate in this study. I understand that I am encouraged to ask any questions that I may have concerning this study in the future. I have received a copy of this consent form for future reference.

Appendix H. cont.

____

Participant's Name (please print)

____

Participant's Signature Date

I have discussed the above points with the participant.

____

Researcher's Signature Date

Appendix I
Teacher Consent Form

Title of Study: Educational Experiences of Rural Minnesota Teachers and High-Ability Mathematics Students

Study Researcher: Jodi Sandmeyer

INVITATION
You are invited to participate in a research study conducted by Jodi Sandmeyer in the Educational Leadership Department, under the supervision of her advisor, Dr. Brenda Kallio, at the University of North Dakota. The study examines the educational experiences of high-ability learners in mathematics and mathematics teachers. You are invited because you are a high school teacher with knowledge about the educational experiences of high-ability mathematics learners. Your participation is voluntary. Approximately six teachers will take part in this study. The study will be completed by May 1, 2014.

STATEMENT OF RESEARCH
A person who is to participate in the research must give his or her informed consent to such participation. This consent must be based on an understanding of the nature and risks of the research. This document provides information that is important for this understanding. Research projects include only subjects who choose to take part. Please take your time in making your decision as to whether to participate. If you have questions at any time, please ask.

WHAT IS THE PURPOSE OF THE STUDY?
The purpose of this study will be to use phenomenological qualitative research methods to identify educational experiences of high-ability mathematics learners and mathematics teachers from rural one-section and two-section high schools. The researcher will use this information to write scholarly articles about high-ability learners in mathematics in one-section and two-section rural schools in Minnesota.

HOW LONG WILL I BE IN THIS STUDY?
If you decide to participate in this study, you will be interviewed about your perspectives on educational experiences of high-ability learners of mathematics while they were in high school. The interviews will typically last about 1 hour.

Appendix I. cont.

WHAT WILL HAPPEN DURING THIS STUDY?
You will be asked if voice recordings can be made of your interview. Such recordings will be used only for transcribing exactly what you say. Your name will remain secret. Tapes will be stored in a locked cabinet after use. Being recorded is voluntary. You may still participate without being recorded.

WILL MY CONFIDENTIALITY BE PROTECTED?
The records of this study will be kept private to the extent permitted by law. In any report about this study that might be published, you will not be identified. Your study record may be reviewed by government agencies, the University of North Dakota Research Development and Compliance Office, and the University of North Dakota Institutional Review Board.

Any information that is obtained in this study that can be used to identify you will remain confidential and will be disclosed only with your permission or as required by law. Confidentiality will be maintained by means of a code assigned to each participant to protect their identity. The code will be in a locked file in the researcher's school office and will be kept separate from data collected. All data and consent forms will be kept in separate locked file cabinets for 3 years after the completion of this study. After 3 years, the researcher will shred paper data and delete word-processed data from stored jump drives.

The recordings from interviews will be transcribed by a transcriptionist. The transcriptionist has signed a confidentiality notice. After 3 years, recordings from interviews will be deleted from the researcher's computer.

If a report or article is written about this study, results will be summarized in such a manner that you cannot be identified. Any information from data that could identify you will be removed.

WHAT ARE THE RISKS OF THE STUDY?
Potential risks involved with this study include the possibility of loss of confidentiality. Though I take many steps to ensure secrecy, the identity of participants might accidentally become known. This may cause embarrassment or discomfort. Some questions I ask about your experiences and opinions might cause worry, embarrassment, discomfort, or sadness. You may choose not to answer such questions. Referrals to counseling will be available should you experience bad feelings, but no money is available from the study to pay for such services.

Appendix I. cont.

WHAT ARE THE BENEFITS OF THIS STUDY?
Your participation in this research may benefit you or other people in the future by helping educators learn about the educational experiences of rural Minnesota high-ability learners in mathematics. However, I cannot guarantee or promise that you will receive any direct benefits from participating in this study.

WILL IT COST ME ANYTHING TO BE IN THIS STUDY?
The only costs for participating in this study would be traveling to the location of the interviews. You will not have any other costs for being in this research study.

WILL I BE PAID FOR PARTICIPATING IN THE STUDY?
You will not be paid for your participation in this study.

IS THIS STUDY VOLUNTARY?
Your participation is voluntary. You may choose not to participate or you may discontinue your participation at any time without penalty or loss of benefits to which you are otherwise entitled. Your decision whether or not to participate will not affect your current or future relations with the Department of Educational Leadership or the University of North Dakota. If you do decide to take part, you may change your mind at any time without penalty.

WHAT IF I HAVE QUESTIONS?
If you have questions about this research in the future, please contact the researcher, Jodi Sandmeyer, at (218) 759-9684 or by e-mail (jsandmeyer@nevis.k12.mn.us) or her advisor, Dr. Brenda Kallio, at (701) 777-3249 or by e-mail (brenda.kallio@email.und.edu).

If you have questions regarding your rights as a research participant, or if you have any concerns or complaints about the research, you may contact the University of North Dakota Institutional Review Board at (701) 777-4279. Please call this number if you cannot reach research staff, or if you wish to talk with someone else.

AUTHORIZATION TO PARTICIPATE IN THE RESEARCH STUDY:
I have read the information in this consent form, any questions have been answered, and I voluntarily agree to participate in this study. I understand that I am encouraged to ask any questions that I may have concerning this study in the future. I have received a copy of this consent form for future reference.

Appendix I. cont.

Participant's Name (please print)

Participant's Signature Date

I have discussed the above points with the participant.

Researcher's Signature Date

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