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The Relationship between the Curriculum, Instruction, and Assessment Provided by Wyoming High School Mathematics Teachers and the Performance of Wyoming 11th Grade Students on the Adequate Yearly Progress of Wyoming Schools

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THE RELATIONSHIP BETWEEN THE CURRICULUM, INSTRUCTION, AND ASSESSMENT PROVIDED BY WYOMING HIGH SCHOOL MATHEMATICS TEACHERS AND THE PERFORMANCE OF WYOMING 11TH GRADE STUDENTS ON THE ADEQUATE YEARLY PROGRESS OF WYOMING SCHOOLS

by

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A DISSERTATION

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This research study investigated the mathematics teachers’ classroom practices in curriculum, instruction, and assessments by a self-reporting questionnaire. The questionnaire was sent to all 295 Wyoming high school mathematics teachers in February of 2007. There were 164 questionnaires completed by 67 out of the 75 schools contacted.

It also investigated how those practices related to the mathematics portion of school’s Adequate Yearly Progress (AYP) on state standards with the federally mandated No Child Left Behind Act of 2001. The researcher calculated scaled average scores on 13 variables related to a 32-question questionnaire. The groups analyzed were sorted into three levels based on the mathematical content of a selected target course that the teachers taught and two different school groups based on the school’s adequate yearly progress calculated from the 2006 PAWS statewide test. The statistical tests performed were ANOVA, a t significance test, and Cohen’s D calculation of effect size.

The results showed a mean difference in the instruction questions between the lowest and highest level of courses; in the instruction questions between the middle and highest levels of courses; and in the assessment questions between the lowest and highest level of courses. There were two variables which had a large effect size between the lowest and highest level of courses. The two variables were related to instruction and assessment questions. One variable dealt with time preparation for testing and the other with the teacher’s perceived readiness to teach various mathematics topics. There were eight moderate effect sizes between the levels of courses. The majority of the effects were related to instruction questions. There were three moderate effect sizes between schools that made AYP and schools that did not make AYP related to instruction and curriculum questions.
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CHAPTER ONE: INTRODUCTION

Problem Statement

During the 1980s and 1990s, the content, instruction, and assessment of mathematics education changed dramatically as did the mathematics knowledge, process skills, and the results that these high school students had demonstrated. These changes occurred due to the national standards movement, technology advances, and a desire for higher student achievement levels on international and national assessments. The culmination of these changes came following the United States government mandated No Child Left Behind (NCLB) Act of 2001.

Significance of the Problem

Before the 1990s, a teacher’s classroom accountability was based mainly on the number of students passing the mathematics class. That record was part of the school’s state accreditation report. Currently, classroom and state assessments are accountability records for the teacher’s classroom grades, for student graduation requirements, and for the school’s achievement of adequate yearly progress, AYP.

According to the mandates of NCLB, teachers are also accountable for how much mathematics knowledge and how many mathematics skills students can demonstrate on PAWS, Performance Assessment of Wyoming Students, the state-mandated test. Presently, accountability is demanded not only at the state level with accreditation, but also on a national level with the National Report Card. A school’s student achievement level on a statewide assessment system is the main part of the school’s AYP. The determination of AYP, adequate yearly progress, is derived from both student participation rates and performance scores on the PAWS, Performance Assessment of
Wyoming Students. In addition, if any one of the nine subgroups of students reported from a school’s PAWS scores does not reach the state determined target score, then the school has not made AYP. The nine subgroups are “all students,” “free/reduced lunch,” “Native American,” “Hispanic,” “Asian,” “African American,” “White,” “Individual Education Plan (IEP),” and “Limited English Proficiency (LEP)” (US Department of Education, 2005, p. 21). If a school does not meet the State’s definition for AYP for “two or more consecutive years,” the school is then given three years of interventions labeled “school improvement,” “corrective action,” and “restructuring” (NCLB Annual Report, 2005, p. 10-11).

It is important to know the critical factors of Wyoming high school students’ mathematics education that must be present in order for students to be proficient as defined in NCLB. Teachers must be aware of what the students already know and what skills they need to learn in order to be proficient. These factors are embedded within the Wyoming State statues Title 21, called the Wyoming Education Code of 1969, (Title 21, 2006). Under the NCLB Act, the state determines which schools make AYP based on students’ proficiency scores on a statewide assessment of the state standards. Schools have yearly increasing AYP targets that all student subgroups in a school must achieve. By 2014, all students in all subgroups must be 100% proficient (NCLB Annual Report, 2005, p. 1).

**Purpose Statement**

Accountability of teachers has moved from the classroom level to the national level. The accountability measure on the standards for schools has become the AYP, adequate yearly progress. Did the school make AYP or not make AYP? The important
question is what teachers’ practices in curriculum, instruction, and assessment are related to the schools making AYP. In Wyoming high school mathematics courses, are teacher practices in curriculum, instruction, and assessments related to their schools’ making AYP? The purpose of this study is to determine and to highlight key findings of these relationships for consideration by Wyoming school districts and teachers while they are striving to improve the teaching of mathematics and student learning of mathematics in the state’s high schools. Higher performance by students taking the grade 11 mathematics portion of PAWS, Performance Assessment of Wyoming Students, assists the school to make AYP. It is, therefore, imperative to know what critical parts in curriculum, instruction, and assessment should be in place in order for students to demonstrate proficiency on PAWS and for the schools to make AYP. The school should be on target toward achieving the goal of 100% proficiency by 2014 as outlined in the NCLB Act.

Between 2000 and 2006, two dissertations had surveyed Wyoming elementary teachers in grades two through four. One dissertation looked at instructional issues and achievement on the mathematics portion of the statewide assessments. The other focused on the leadership skills of the principal and the achievement on the mathematics portion of the statewide assessments. No dissertation on record had surveyed high school mathematics teachers before the 2006-2007 school year. A self-reporting survey of high school mathematics teachers in the state of Wyoming was conducted in the 2006-2007 school year.
Research Questions

A survey was given to the high school mathematics teachers in Wyoming. The survey was designed and created to answer the questions, “Are mathematics teachers’ practices in curriculum, instruction, and assessment related to their schools making adequate yearly progress, AYP?” and “Does the mathematics course level affect the practices in curriculum, instruction, and assessment?” AYP is the accountability measure in the NCLB Act used to determine if the school is achieving proficiency on the state standards. The course level deals with the mathematical content for a targeted class. The teachers’ responses were stratified into three levels based on the target class chosen. If the target class covered curriculum below Algebra 1 topics, then this teacher was assigned to level one, a lower level. If the curriculum for the target was accelerated from the normal progression as deemed by the teacher, then the teacher was assigned to level three, an honors level. The remaining teachers were assigned to level two, a regular level.

The purpose of this study was to answer the following research questions:

1. What is the relationship between a school’s chosen mathematics curriculum and the school’s making AYP, adequate yearly progress, in Grade 11 mathematics as measured by PAWS, Performance Assessment of Wyoming Students?
2. What is the relationship between the type of mathematics instruction given and the school’s making AYP in Grade 11 mathematics as measured by PAWS?
3. What is the relationship between the type of classroom assessments given and the school’s making AYP in Grade 11 mathematics as measured by PAWS?
4. How did the responses compare on mathematics curriculum questions from the teachers of the three levels of mathematics courses?

5. How did the responses compare on mathematical instructional questions from the teachers of the three levels of mathematics courses?

6. How did the responses compare on mathematical assessment questions from the teachers of the three levels of mathematics courses?
CHAPTER TWO: REVIEW OF THE LITERATURE

Introduction

This chapter will review research available on the reforms in education that have resulted from the standards movement and the effects of the standards movement on the content, instruction, and assessment that Wyoming students might experience in high school. The term “standards” usually refers to the content, including knowledge, processes, and performance level in a subject area that students are to learn in school. The standards movement is a label for all of the actions taken in the attempt to set benchmarks in the content areas. The first part of the chapter will highlight the literature of factors that brought about both the standards movement and an increase in accountability. The second part will highlight research on reforms in instruction and the professional development needed to implement these reforms. The third part will highlight investigations of school and classroom assessments and the adequate yearly progress (AYP) requirements resulting from the No Child Left Behind (NCLB) Act.

Even with high standards, exemplary textbooks, and powerful assessments, what really matters for mathematics learning are the interactions that take place in classrooms. The literature on mathematics education, perhaps surprisingly, contains little reliable data about those interactions. (National Research Council, 2001, p. 45)

Curriculum Changes

Background

Inkeles (1977) listed the following factors that provided an environment hospitable to the idea of comparative, international surveys: strong criticism of
the American school system during the late 1950s and early 1960s, the launching of the first earth satellite by the Soviet Union, and widespread concern in the industrialized countries about the ever-escalating costs of providing free, universal public education. (Robitaille & Travers, 1992, p. 687)

The significant forces in society that contributed to the change in mathematics education after 1950 included technological advances, student achievement on national and international assessments, and the needs of business and industry. The Standards movement called for reforms in curriculum, instruction, and assessments. The demand for increased accountability for public schools was a major factor in the passage of the NCLB Act.

Technology has become a part of everyday life at home and at work. Advances in technology have led to smaller, more powerful technological tools that are accessible to everyone. Beginning with the October 4, 1957, launch of Sputnik, the first space satellite, technology continued to advance with the 1975 personal computer revolution exemplified in the release of the MITS Altair 8800 and advancing in 1977 with the Apple II (World Almanac and Book of Facts, 2002, p. 628). In the classroom, the availability of the computer and the graphing calculator have encouraged major influences in content and instruction. “Moses (2001) argues that those who are technologically literate will have access to jobs and economic enfranchisement, while those without such skills will not” (Schoenfeld, 2002, p. 13).

The first international mathematics study, “carried out in the early 1960s,” (Robitaille & Travers, 1992, p. 701) involved 12 participating countries. The second study, which included 20 countries, was done “in the early 1980s” (Robitaille & Travers,
The media usually reported the ranking of the countries, but the main purpose of evaluating these international students was “trying to determine the effects of particular variables on teaching and learning” (Robitaille & Travers, 1992, p. 688). Information from both the first and second studies, which was often overlooked by the media, indicated that “the highest ability students from almost all systems perform at about the same level on topics which they all have studied” (Robitaille & Travers, 1992, p. 689). Differences in achievement appear, therefore, to be “a function of opportunity to learn” (Robitaille & Travers, 1992, p. 689).

The Trends in International Mathematics and Science Study (TIMSS) was offered in 1995, 1999, 2003, and 2007. In a 1998 press release, the United States secondary students ranked below the international average in relationship to the 21 participating countries in the TIMSS twelfth-grade study (Math and Science Achievement, 1999, p. 205). “TIMSS is based on a model of curriculum that has three components: the intended curriculum, the implemented curriculum, and the achievement curriculum” (National Center for Education Statistics, 2006, FAQType=2, para. 1). “TIMSS is closely linked to the curricula of the participating countries, providing an indication of the degree to which students have learned concepts in mathematics and science they have encountered in school” (Gonzales et al., 2004, p. 1). The students answer the “same assessment and questionnaire items, albeit in the language of instruction. . . . [making it] possible to compare the performance of students in the United States on mathematics and science items to that of their peers around the world” (National Center for Education Statistics, 2006, FAQType=2, para. 5). The questionnaires gather data regarding the
students, teachers, principals, and school issues relating to learning, teaching, and types of behavior.

In the early to mid-1950s, businesses and the military attacked the public school systems “for graduating young adults who lacked basic computational skills” (Kilpatrick, 1992, p. 24). Colleges attacked the school systems for “failing to equip their entrants with a knowledge of mathematics adequate for college work” (Kilpatrick, 1992, p. 24). The public attacked the school systems “for having watered down the curriculum” (Kilpatrick, 1992, p. 24).

“By the end of the 1950s, widening discontinuities between the mathematics taught in universities and that taught in the lower schools” and the declining enrollments in university mathematics courses gave rise to “a flood of curriculum reform projects in various countries that collectively became known as ‘the new math’” (Kilpatrick, 1992, p. 23). Higher academic achievement and more rigorous courses in math and science were demanded for students. Congress responded by passing the “1958 National Defense Education Act, which provided fellowships, grants, and loans for students in higher education to study mathematics” (Ratvich, 2000, p. 362). One response to reform demands was “New Math.” Its change in instruction was “to meet the new demands made by science, industry, and government” (Adler, 1972, p. 217). The new math emphasized the teaching of different bases other than base 10, set theory, functions, and diagram drawings. Set theory was to be introduced early in the curriculum. “In the United States, 21 research and development centers and 20 regional educational laboratories were established between 1965 and 1967 as a consequence of the Elementary and Secondary Education Act of 1965” (Kilpatrick, 1992, p. 26). Parents and teachers
complained that this curriculum took time away from the basics. The “New Math” fell out of favor before the end of decade, though it continued to be taught for years thereafter in some school districts.

In 1968, Edward G. Begle reported “on the National Longitudinal Study of Mathematical Abilities (NLSMA) he was directing . . . [whose] purpose was to ascertain the effects of the new-math curriculum revision efforts” (Kilpatrick, 1992, p. 29). “Subsequent surveys of mathematical attainment were undertaken not to compare curricula but to describe and contrast levels of performance. These included the mathematics assessment conducted in the United States every 4 or 5 years since 1972-1973 by the National Assessment of Educational Progress [NAEP]” (Kilpatrick, 1992, p. 29). NAEP has tracked United States public school students’ progress in “reading, mathematics, science, writing, U.S. history, civics, geography, and the arts” (National Center for Education Statistics, 2006, NAEP Overview, para. 1). NAEP measures both public school and non-public school achievement in the listed subjects for students in grades 4, 8, and 12. Two reports given by NAEP relate to national trends and to students’ progress in their state toward national educational goals.

The state of Wyoming participates in NAEP “to serve as an external reference point when viewing a (sic) state’s academic testing program. Results from this year’s [2005] NAEP in Wyoming continued to track in roughly the same pattern as past WyCAS scores” (Wyoming Department of Education, 2005, para. 19). Both TIMSS and NAEP results indicate the general average scores in mathematics. NAEP “allows the development of proficiency benchmarks – what students should know by the end of eighth grade – against which to compare what students actually know at the end of eighth
grade” (Gonzales et al., 2004, p. 101). TIMSS allows comparisons of student populations with similar numbers of years of schooling. NAEP and TIMSS track the progress of the nation’s students with a single value for achievement.

Achievement levels on national and international tests and the level of student preparedness for continued academic achievement or for a job were indicators of the need for a change in the mathematics curriculum. “The reform curriculum, in contrast, calls for instruction that provides all students with the mathematical background for quantitative literacy for the workplace and for study at the college level” (Holloway, 2004, p. 85).

Before 1970 major issues relating to mathematics education in North America involved curriculum and instruction (Jones & Coxford, 1970, p. 2). “Throughout the decade of the seventies, the mathematics education community seemed to be groping for a clearer focus and sense of direction” (Hill, 1983, p. 1). The National Council of Teachers of Mathematics (NCTM) spoke to the shift from an industrialized society to an informational society. NCTM responded with a position paper, *Agenda for Action*, which recommended eight responsible actions to be addressed to change the direction of mathematics education (National Council of Teachers of Mathematics, 1980, p. 1).

In 1983, the National Commission on Excellence in Education published *A Nation at Risk*, a call for major educational reform. This report was written in lay terms and discussed the mediocre level of student achievement and the lack of student preparedness for further education (A Nation at Risk, 1983, p. 1; Ratvich, 2000, p. 411). The report looked at the numbers of students taking remedial and advanced classes. Unfortunately, Holloway (2004) found the situation had changed little for minorities. In “1997, 33 of
every 1,000 white 12th graders enrolled in this course [Advanced Placement Calculus], but only 7 of every 1,000 black students and 12 of every 1,000 Hispanic students took on this challenge” (p. 84). “The opportunity for all students to learn mathematics has been heralded as the new ‘civil right’” (Boaler, 2006, p. 364). “The evidence indicates that the traditional curriculum and instructional methods in the United States are not serving our students well” (Hiebert, 1999, p. 13). The National Research Council adds more evidence to the growing amount of literature that “demands substantial changes” (National Research Council, 2001, p. 407) in school mathematics programs and that all students have the opportunity to learn mathematics.

Standards Movement

In 1986, NCTM Board of Directors created a Commission on Standards for School Mathematics whose purpose was to “help improve the quality of school mathematics” (National Council of Teachers of Mathematics, 1989, p. v). Standards were adopted to ensure quality, to indicate goals, and to promote change (National Council of Teachers of Mathematics, 1989, p. 2). Professional mathematics educators responded with two major reports in 1989. The first was Everybody Counts from the Mathematical Science Education Board (MSEB), and the second was the NCTM Curriculum and Evaluation Standards for School Mathematics.

As a nation, we must encourage all students to take a quality mathematics curriculum in order to be contributing members of society. The new social goals include “(1) mathematically literate workers, (2) lifelong learning, (3) opportunity for all, and (4) an informed electorate” (National Council of Teachers of Mathematics, 1989, p. 3). The document sets new goals for all students in order to achieve mathematical literacy or
“mathematical power.” In a world “teeming with data,” (Baker & Leak, 2006, para. 10) the “mathematical modeling of humanity promises to be one of the great undertakings of the 21st century” (Baker & Leak, 2006, para. 11). “Math will be involved in students’ everyday lives more than ever before, and this means students must become familiar with it to succeed” (Franklin, 2006b, p. 12). “Many security-related jobs – from data analysis to cryptography – increasingly require the kinds of advanced math skills that American students aren’t learning” (Franklin, 2006, p. 11). School mathematics should not be “set in stone” (National Research Council, 2001, p. 407). Students need to be able “to deal with mathematics on a higher level than they did just 20 years ago” (National Research Council, 2001, p. 407). Managers and entrepreneurs “still must understand enough about math to question the assumptions behind the numbers” (Baker & Leak, 2006, para. 36). “The country must breed more top-notch mathematicians at home, . . . [and] must cultivate greater math savvy among the broader population” (Baker & Leak, 2006, para. 32). People have different views of mathematics, and “these diverse views of the nature of mathematics also have a pronounced impact on the ways in which our society conceives of mathematics and reacts to its ever-widening influence on our daily lives” (Dossey, 1992, p. 39).

revisited all these areas, in an effort to improve mathematics education, and placed all the reforms in one resource guide for the stakeholders. Schoenfeld (2002) states that the NCTM’s *Principles and Standards* calls for “equity . . .; coherent curricula . . .; teacher professionalism, . . .; and the effective use of assessment and technology in the service of mathematics learning” (p. 15).

Changed was required in mathematics education due to technological advances, student achievement on TIMSS and NAEP, and the economic demands of a global economy. The National Research Council (2001) stated that “experiences, discussions, and review of the literature have convinced us that school mathematics demands substantial change” (p. 407). “The impact of curriculum as a variable must be recognized and taken into account” (Robitaille & Travers, 1992, p. 689). Cohen (1995) found that “systemic reform has had significant effects” (p. 11). “Prevailing patterns of curriculum, teaching, and assessment in school mathematics are shaped by a combination of traditional practices, experience-based judgments by teachers, advisory standards from professional organizations, and guidelines based on theoretical and empirical research in mathematics education and cognate disciplines (including psychology, anthropology, and sociology)” (NCTM Research Committee, 2006, p. 76). Thus, it is likely that as these patterns continue, more significant effects will appear.

*Accountability*

A new assessment approach is evolving which “assumes that high public expectations can be set that every student can strive for and achieve, that different performances can and will meet agreed-on expectations, and that teachers can be fair and consistent judges of diverse student performances” (National Council of Teachers of
Mathematics, 1995, p. 1). NCTM called for reforms in curriculum, instruction, and assessments. At the same time, education is viewed “as an industry, with an increasing interest in applying principles of accountability to the field of education” (Robitaille & Travers, 1992, p. 688). The required reforms needed to involve all stakeholders including students, parents, teachers, administrators, school boards, state agencies, businesses and industries, and public policy people. Teachers “teach in a system that currently works against improvement. Unless other important players get involved, our country cannot implement a program that allows teachers to improve teaching” (Stigler & Hiebert, 1999, p. xii). “Teaching, as a cultural activity, fits within a variety of social, economic, and political forces in our society” (Stigler & Hiebert, 1997, para. 37).

**History of School Accountability**

In 1845 “Horace Mann, Secretary of the State Board of Education in Massachusetts, to show that the schools were doing the job the state expected of them in view of generous financial appropriations, undertook a comprehensive school survey” (Kilpatrick, 1992, p. 14). The ranking of schools, of evaluating “how much a student had learned”, and of judging “the effectiveness of a school’s program” all began with this survey (Kilpatrick, 1992, p. 14). The “written short-answer tests became the medium of choice” (Kilpatrick, 1992, p. 14). In 1892 Joseph Mayer Rice investigated various large city public school systems. Rice examined “factors that might account for the differences between the schools in arithmetic achievement” (Kilpatrick, 1992, p. 15). His method and inspection of “characteristics of high- and low-scoring schools, did not allow him to estimate the strength or shape of the relationship between some hypothesized factor and
the level of achievement” (Kilpatrick, 1992, p. 15). Rice summarized that schools should set “standards” in order to get the desired results (Kilpatrick, 1992, p. 15).

Over the next century, accountability was generally based on the achievement of students taking national tests.

Romberg describes a variety of forms of achievement testing, including norm-referenced standardized test, whose purpose is to identify a respondent’s position in a group; profile achievement tests, whose purpose is to give a variety of scores for groups of students; and objective-referenced tests, whose purpose is to compare scores on specific objectives to an a priori criterion. (Webb, 1992, p. 664)

“Stakeholders in the educational system have to understand the great variability inherent in testing” (Schoenfeld, 2002, p. 23).

Presently, assessment involves several accountability purposes used by students, teachers, schools, and the nation. For all student and their teachers, assessment provides comprehensive “evidence and feedback on what students know and are able to do” on the standards, and it provides information for “decision makers” and about the “effectiveness of the educational system as a whole” (Webb, 1992, p. 663; see also Lefkowits & Miller, 2006, p. 406).

*National Accountability – NCLB*

There was a higher lever of accountability after December 18, 2001, when Congress passed the *No Child Left Behind* Act. “Three days after taking office in January 2001 as the 43rd President of the United States, George W. Bush announced *No Child Left Behind*, his framework for bipartisan education reform” (NCLB Overview, 2006, para.
According to the NCLB Act of 2001, under Section 1111(h)(5) of the Elementary and Secondary Education Act (ESEA), the Secretary of Education is “required to transmit to the Committee on Education and the Workforce of the House of Representatives and the Committee on Health, Education, Labor, and Pensions of the Senate a report that provides State-level data for each State receiving assistance under Title I of ESEA” (NCLB Annual Report, 2005, p. 1). States, however, must determine if districts and schools – even those that do not receive Title I funds – makes AYP. Each state establishes its own definition of AYP for each year. This illustrates that while local education control is still a sensitive issue, the state must establish proficiency goals, statewide, based on assessment data from the 2001-2002 school year. These goals must increase progressively to reflect 100 percent proficiency for all students by 2013-2014 school year. NCLB “significantly raises expectations for States, local educational agencies, and schools . . . by the 2013-2014 school year” (NCLB Annual Report, 2005, p. 1). Every state is required to submit state-level assessment data disaggregated by poverty, race, ethnicity, disability, migrant students, gender, and limited English proficiency. Wyoming is in compliance with NCLB with the state statue Chapter 2, Article 3, #21-2-304 (b)(xiv), to “establish improvement goals for public schools for assessment of student progress based upon the national assessment of education progress testing program and the statewide assessment system established under paragraph (a) (v) of this section” (Title 21, 2006).

States must “describe how they will close the achievement gap and make sure all students, achieve academic proficiency” (NCLB Annual Report, 2005, p. 10). “Monitoring student progress and the impact of these curricula on the mathematics
performance . . . is consistent with the recommendations offered in . . . *No Child Left Behind* (2002)” (Reys, Reys, Tarr, & Chavez, 2006, p. 6). Test-based accountability “is the only tool our education system has to reassure the public that it is spending resources wisely and making progress on student achievement” (Lewis, 2006, p. 339). “The real blame . . . in response to testing lies not with teachers but with state and national policy makers who create accountability systems centered on ever-higher test scores (AYP) with little regard for how these scores relate to better learning” (Lederman & Burnstein, 2006, p. 430). “Because NCLB requires tracking substantial amounts of student performance data, teachers often find themselves stretched to handle both the various data-recording responsibilities that are required by law and their regular duties of preparing lessons and grading homework” (Franklin, 2006a, p. 6).

**State of Wyoming**

In 1990, the Wyoming Department of Education (WDE) released the Wyoming Standards of Excellence for Mathematics Education. This document called for “modification in the curriculum” (Wyoming Department of Education, 1990, p. 1). Its purposes are:

1. to assess current programs;
2. to suggest ways of strengthening current programs;
3. to plan and develop programs acceptable to the education profession and the public which reflect recent trends and technology; and
4. to stimulate communication among educators (p. 1).

The 9-12 grade recommendations were very concise and appeared on one single page beginning with the “dual purpose of the 9-12 mathematics program is preparation
for college entrance and job entry skills for students who do not continue formal study” (Wyoming Department of Education, 1990, p. 8). In Wyoming, during the 10 years following 1990, state accreditation was the driving force behind the reform and the creation of a standards based curriculum. “As of 1999, 49 states reported having content standards in mathematics. . . . These standards (sometimes called curriculum frameworks) describe what students should know and be able to do in mathematics” (National Research Council, 2001, p. 34). “Virtually every state in the nation . . . . [has] a growing commitment to the idea that clear and shared goals for student learning must provide a foundation on which to improve education and achievement” (Stigler & Hiebert, 1999, p. 1).

The state of Wyoming complied with the requirements set forth with the passage of NCLB. The Wyoming State Board of Education passed a state curriculum and clarified the mathematics requirements for high school graduation in the state statues called the “Wyoming Education Code of 1969” (Title 21, 2006, p. 1). The school districts have aligned their curriculum with the State Standards. The five Mathematics Content Standards for 9-12 grade students in the State of Wyoming are

1. students use numbers, number sense, and number relationships in a problem-solving situation,

2. students apply geometric concepts, properties, and relationships in a problem-solving situation,

3. students use a variety of tools and techniques of measurement in a problem-solving situation,
(4) students use algebraic methods to investigate, model, and interpret patterns and functions involving numbers, shapes, data, and graphs in a problem-solving situation,

(5) students use data analysis and probability to analyze given situations and the results of experiments (Wyoming Department of Education, 2003, pp. 7-16).

Curriculum Summary

“Outfitting students with the right quantitative skills is a crucial test facing school boards and education ministries worldwide” (Baker & Leak, 2006, para. 31). “The school mathematics curriculum needs to be organized within and across grades to support, in a coordinated fashion, all strands of mathematical proficiency” (National Research Council, 2001, p. 12). Systemic reform “attempts to align all parts of the educational system – curriculum, instruction, assessment, teacher preparation, and state and local policies such as graduation requirements – to promote change in the classroom and, ultimately, improve student performance (Smith and O’Day, 1991)” (Klein, Hamilton, McCaffrey, Stecher, Robyn & Burroughs, 2000, p. 1).

Instructional Changes

Instructional changes involve the teachers’ knowledge, background, beliefs, and actions. The actions discussed in this section are the expectations of the teacher about how students learn, the use of the textbook, the instructional strategies, the achievement of students, and the professional development required. Awareness of “research on teaching” and “on learning” (Koehler & Grouws, 1992, p. 117) is necessary.

What a teacher considers to be desirable goals of the mathematics program, his or her own role in teaching, the students’ role, appropriate classroom activities,
desirable instructional approaches and emphases, legitimate mathematical procedures, and acceptable outcomes of instruction are all part of the teacher’s conception of mathematics teaching. (Thompson, 1992, p. 135)

Schools need to refrain from filtering out students from mathematics, because “it not only filters students out of careers, but frequently out of school itself” (National Research Council, 1989, p. 7).

Teacher Knowledge, Background, and Beliefs

What is mathematics all about? Mathematics includes using rules to solve problems, being skillful in performing these rules, identifying basic concepts, considering competing theories, or discussing abstract and formal spheres of knowledge. Constructing alternate ways to conceptualize “the nature of mathematics” has implication for mathematics education (Dossey, 1992, p. 42). “Correlational techniques were often used to assess the relationships between teacher knowledge and student performance so that little is known about the directionality of any existing relationships” (Fennema & Franke, 1992, p. 149). “Studies investigating the role of teachers in mathematics classrooms commonly focus on the actions and instructional methods of teachers rather than on the mathematics being taught or the methods by which that mathematics is being learned” (Dossey, 1992, p. 43).

Teachers determine what content is taught in the classroom and how it is taught. They adjust the content or methods used as determined by the students’ understanding of the content and their performance of skills (Dossey, 1992, p. 44; Fennema & Franke, 1992, p. 158). Stigler and Hiebert (1999) state that teaching is “a complex cultural activity that is highly determined by beliefs and habits that work partly outside the realm
of consciousness” (p. 103; see also Nickson, 1992, p. 102). For effective reforms in curriculum and instruction, “these reforms must ultimately be adopted by teachers and must take hold in the classroom (Tyack and Cuban, 1995)” (Klein, Hamilton, McCaffrey, Stecher, Robyn & Burroughs, 2000, p. 3; see also National Council of Teachers of Mathematics, 1991, p. 2).


Expert and novice teachers consider mathematical concepts differently. The teachers’ knowledge is continually developing and changing (Fennema & Franke, 1992, p. 161). Expert teachers organize in a “hierarchical structure” with “detailed conceptual and procedural knowledge,” which has an impact: “(1) on agendas, . . . richer mental plans . . . ; (2) on scripts, . . . more representations and richer explanations; and (3) on teachers’ response to students’ comments and questions during instruction (Leinhardt et al., 1991)“ (Fennema & Franke, 1992, p. 161).
Teacher Practices

The actions of the teacher determine what happens in the classroom, the learning that occurs, and, ultimately, the achievement level of the students. “Teachers are the key to closing the gap” (Stigler & Hiebert, 1999, p. xii). “If we do not understand these processes [that lead to learning in the classroom], we have little chance of improving them” (Stigler & Hiebert, 1997, para. 5). “Analysis of classroom practice plays several important roles. . . . Attempts to implement reform without analysis of practice are not likely to succeed” (Stigler and Hiebert, 2004, p. 16).

Knowledge of mathematics teaching includes knowledge of pedagogy, as well as understanding the underlying processes of the mathematical concepts, knowing the relationship between different aspects of mathematical knowledge, being able to interpret that knowledge for teaching, knowing and understanding students’ thinking, and being able to assess student knowledge to make instructional decisions. (Fennema & Franke, 1992, p. 161)

Instruction can have more characteristics of traditional methods or reform strategies. Methods classified as traditional are usually “mathematical concepts and procedures [that] can either be simply stated by the teacher or be developed through examples, demonstrations, and discussions” (Stigler & Hiebert, 1997, para. 25). The reform teaching practices may be learner-focused, content-focused with an emphasis on conceptual understanding, content-focused with an emphasis on performance, or classroom-focused (Thompson, 1992, p. 136). “Likewise, the instructional approach suggested by the materials often influences teachers’ pedagogical strategies” (Reys, Reys, Lapan, Holliday, & Wasman, 2003, p. 75). Most decisions made by teachers occur
“during the preactive or planning phase,” (Fennema & Franke, 1992, p. 156) which greatly affect instruction. While the majority of teachers report that they are aware of and are using reform instructional methods, when the teachers were observed, the observations showed “that many secondary students are not being given the opportunity to learn through reform-based practices” (Wainwright, Morrell, Flick, & Schepige, 2004, p. 322; see also Stigler & Hiebert, 1999, p. 12).

“Education in the United States is marked by a diverse, mobile population of students and teachers, a variety of organizational structures, and minimal centralized control over policies and practices” (National Research Council, 2001, p. 32). The teacher must have knowledge about mathematics and since the United States is becoming multicultural, “he or she must understand the cultural diversity of the students” (Fennema & Franke, 1992, p. 147). “I would suggest that teachers need to develop not only such a profound understanding of mathematics but also a corresponding understanding of how children learn” (Marshall, 2006, p. 359).

Classroom Environment

“Efforts to improve student learning succeed or fail inside the classroom, a fact that has too often been ignored by would-be reformers” (Stigler & Hiebert, 1997, para. 4). The reform-minded teacher must set up “cognitively demanding tasks, plan the lesson by elaborating the mathematics that the students are to learn through those tasks, and allocate sufficient time for the students to engage in and spend time on the tasks” (National Research Council, 2001, p. 9) in order to create an environment that encourages students to engage in the learning of mathematics.
Effective teachers develop a community of learners with the students. “Students must be informed active partners in this endeavor” and “need explicit guidance in how to engage in complex tasks” (Flick & Lederman, 2005, p. 114). The teacher, using reform methods, actively involves the students in valuable learning activities using reflective inquiry, spends more time explaining and demonstrating materials, asks probing questions of the students when they are sharing their results and justifications of their inquiry methods. The students are also responsible for creating this community of learners by becoming good listeners and staying on task (Boaler, 2002, pp. 247-253; Boaler, 2006, pp. 365-367; Fennema & Franke, 1992, p. 151; Hiebert et al., 1996, pp. 16-17; Hufferd-Ackles, Fuson, & Sherin, 2004, p. 113; Klein, Hamilton, McCaffrey, Stecher, Robyn & Burroughs, 2000, p. 3; McCaffrey, Hamilton, Stecher, Klein, Bugliari, & Robyn, 2001, pp. 494-495; National Research Council, 2001, p. 9; Secada, 1992, p. 649). Teachers, encouraging this open communication with students, facilitate students’ “mathematical thinking as well as the students’ understanding” (Boaler, 2002, p. 249). “Teaching mathematics with understanding means creating experiences in which these interconnections can be made because, without them, there would be a real danger that questions put in isolation would make the learning process rather piecemeal and incoherent” (Marshall, 2006, p. 358). “The benefits of reflective inquiry lie . . . in the new relationships that are uncovered, the new aspects of the situation that are understood more deeply” (Hiebert et al., 1996, p. 15). Students need “to know what these things mean, where they come from, and how they fit into the grand scheme of things we call mathematics, one of mankind’s great intellectual achievements” (Marshall, 2006, p. 357).
“Skilled teachers are now challenged to develop ways to convey to students what it means to abstract and then generalize” (Flick & Lederman, 2005, p. 115). Successful classrooms are places “where students show[ed] a lot of satisfaction and enthusiasm for problem solving, and viewed themselves as autonomous learners” (McLeod, 1992, p. 589).

*Opportunity to Learn*

“The current mathematics curriculum reform movement . . . emphasizes the use of problem contexts to develop meaning” (Hiebert & Carpenter, 1992, p. 81). It is important in the way teachers provide situations and explore problems to help students learn worthwhile mathematical content in order to reach the new standards (Boaler, 2002, p. 249; National Research Council, 2001, p. 10; Stigler & Hiebert, 1999, p. 2). This is “consistent with the conception of mathematics teaching . . . reflected in . . . the *Curriculum and Evaluation Standards for School Mathematics* (National Council of Teachers of Mathematics [NCTM], 1989), and *Everybody Counts* (National Research Council, 1989)” (Thompson, 1992, p. 128). These reforms of using open-ended problems rather than direct instruction are “more difficult for a high school teacher than for an early elementary school teacher” (Schoen, Cebulla, Finn, & Fi, 2003, p. 231). Teachers need to allow students to “learn by creating mathematics through their own investigations of problematic situations” (Riordan & Noyce, 2001, p. 369; see also Koehler & Grouws, 1992, p. 119).

“Tyson-Bernstein and Woodward (1991) describe the role of textbooks . . . as a prominent, if not dominant, part of determining what children have an opportunity to learn” (Reys, Reys, Tarr, & Chavez, 2006, p. 5). “The greatest growth [in achievement]
seems to be associated with exposure to new content” (Secada, 1992, p. 645). Minority students or students taking “low-track mathematics courses” need to be exposed to more content with the teachers “expecting more, not less” student engagement (Davis, 1992, p. 730; Secada, 1992, pp. 646-47). “Students using the NSF mathematics curricula that were taught by teachers using standards-based instruction were the highest performing students” (Reys, Reys, Tarr, & Chavez, 2006, p. 4). “Two groups of students from Michigan [in 1999] participated in TIMSS-R. . . . indicating the positive effect of Standards-based reform efforts within these schools (Mullis et al., 2001)” (Reys, Reys, Lapan, Holliday, & Wasman, 2003, p. 76).

Constructivism

“Research in learning shows that students actually construct their own understanding based on new experiences that enlarge the intellectual framework in which ideas can be created” (National Research Council, 1989, p. 6). This implies that “each student’s knowledge of mathematics is uniquely personal” (National Council of Teachers of Mathematics, 1991, p. 2; see also Dossey, 1992, p. 44). The common phrase used is for students to become ‘constructivist’ of their learning by internally integrating the new knowledge with their prior mathematics relationships (Dossey, 1992, p. 45; Hiebert & Carpenter, 1992, p. 66; Klein, Hamilton, McCaffrey, Stecher, Robyn & Burroughs, 2000, p. 14; Koehler & Grouws, 1992, p. 119; McCaffrey, Hamilton, Stecher, Klein, Bugliari, & Robyn, 2001, p. 494; Schifter, 1996; Stigler & Hiebert, 1999, p. 91).

The traditional method of procedural knowledge is “a sequence of actions,” while the conceptual knowledge has a connected network “that is rich in relationships (Hiebert & Lefevre, 1986)” (Hiebert & Carpenter, 1992, p. 78). “When students develop methods
for constructing new procedures they are integrating their conceptual knowledge with their procedural skill” (Hiebert et al., 1996, p. 17). With conceptual knowledge and understanding, students are able to “apply them to each new situation they meet” (Marshall, 2006, p. 358; see also Hiebert & Carpenter, 1992, p. 74). “Research has shown that things our brain does not understand are more likely to be forgotten” (Marshall, 2006, p. 362).

Proper feedback helps students focus on the task rather than the answer, and personally guides students to eliminate gaps in their mathematics learning. “In teaching for understanding,” students need to experience a concept through the use of “real-world situations and concrete or pictorial representations” before the abstract ideas or symbolisms (Fennema & Franke, 1992, p. 154; Marshall, 2006, p. 359). “One has to counteract the very common misunderstanding that in mathematics students have to master skills before using them for applications and problem solving” (Schoenfeld, 2002, p. 23). When exploring and solving a problem, students have questions, experience confusion and frustrations before their understanding is reorganized into “more richly connected, cohesive networks” (Hiebert & Carpenter, 1992, p. 69).

Communicating with students and parents is vital if the reforms are to succeed. Parents need to be informed “about the broad spectrum of mathematical understandings that is appropriate for students to learn – for example that problem solving, reasoning, and communication are essential goals for the curriculum, and that they need to be assessed” (Schoenfeld, 2002, p. 23). Parents are open and willing “to accept poor performance in school mathematics, but they are not so willing to accept poor performance in other subjects” (McLeod, 1992, p. 575). “The improvement of
mathematics education will require changes in the affective responses of both children and adults” (McLeod, 1992, p. 575).

Teaching

Teaching is a system, which works “like a machine, with the parts operating together and reinforcing one another, driving the vehicle forward” (Stigler & Hiebert, 1999, p. 75). Each country has a system that looks “similar from lesson to lesson” (Stigler & Hiebert, 1999, p. 77). According to Stigler and Hiebert (1999) in the TIMSS videotapes, the German teachers are “developing advanced procedures;” the Japanese teachers are developing “structured problem solving,” and the United States teachers have students “learning terms and practicing procedures” (p. 27).

“Although most U.S. teachers report trying to improve their teaching with current reform recommendations in mind, the videos show little evidence that change is occurring” (Stigler & Hiebert, 1999, p. 12). “Over the past decade, numerous studies have investigated teachers’ attempt to change their mathematics instruction in light of the goals of reform. . . . in particular, the importance of providing opportunities for teachers to learn about student thinking (Fennema et al., 1996)” (Hufferd-Ackles, Fuson, & Sherin, 2004, pp. 81-82). “The evidence is beginning to accumulate to support the idea that when a teacher has a conceptual understanding of mathematics, it influences classroom instruction in a positive way” (Fennema & Franke, 1992, p. 151). The results of a three-year research project, Reys, Reys, Tarr and Chavez (2006) investigation of “the use of mathematics curriculum materials (textbooks) in the middle grades and their impact on student learning,” showed that “teachers using the NSF supported mathematics
curricula were most likely to use standards-based teaching” than those who used other types of textbooks (p. 3).

**Textbooks**

Few facts stand undisputed in educational research, but [two such facts are] the dependence of teachers on textbooks and of students on tests. . . . [E]specially in mathematics, teachers teach only what is in the textbook and students learn only what will be on the test. (National Research Council, 1989, p. 45)

“Robitalle and Travers (1992) argue, ‘Teachers decide what to teach, how to teach it, and what sorts of exercises to assign to their students largely on the basis of what is contained in the textbook authorized for their course’” (Reys, Reys, Tarr, & Chavez, 2006, p. 5).

“Curriculum materials (e.g., textbooks) provide guidance and structure to teachers as they enact the intended school mathematics curriculum” (Reys, Reys, Lapan, Holliday, & Wasman, 2003, p. 75).

Selecting a mathematics textbook is important and has consequences for students’ achievement. It has been said, “U.S. mathematics textbooks cover more topics, but more superficially, than their counterparts in other countries do” (National Research Council, 2001, p. 4). The National Science Foundation has funded “13 curriculum projects” to produce materials for “elementary, middle, or high school that embodied the ideas expressed in the standards documents (National Research Council, 2001, p. 34). The middle school project found that about “half of the teachers” use the order of the textbook to determine what is taught and when it is taught (Reys, Reys, Tarr, & Chavez, 2006, p. 9). “The other half of the teachers reported that their state or curriculum framework and mandated assessments are strong influences on what mathematics is presented” (Reys,

“Changes can affect classrooms on a large scale, particularly if passage through the steps can also be supported by reform-based curriculum materials (Ball & Cohen, 1996)” (Hufferd-Ackles, Fuson, & Sherin, 2004, p. 82). “Riodan and Noyce (2001) . . . indicated that students using Standards-based curriculum materials as their primary textbook performed significantly better on the state-mandated mathematics assessment than did students in schools using traditional textbooks” (Reys, Reys, Lapan, Holliday, & Wasman, 2003, pp. 75-76).

**Proficiency and Achievement by Students**

We assume that “understanding is the goal of mathematics instruction” (Hiebert et al., 1996, p. 15). Teaching is designed “specifically to facilitate students’ learning” (Stigler & Hiebert, 1999, para. 41). Teaching has the goal of “steady improvement in the mathematics learning of students” (Stigler & Hiebert, 1997, p. 6). “Research on teaching has often been restricted . . . rather than examining continued interactions among the teacher, the students, and the mathematical content.” (National Research Council, 2001, p. 9)

Students in classrooms exposed to reform instruction of “Standards-Based Learning Environment” have “outperformed students whose instruction emphasized procedures and memorization” (McCaffrey, Hamilton, Stecher, Klein, Bugliari, & Robyn, 2001, p. 495; Reys, Reys, Tarr, & Chavez, 2006, p. 11; Schoen, Cebulla, Finn, & Fi, 2003, p. 232). “The relationships between student achievement and teachers’ use of instructional practices supported by the SI reforms tend to be positive but small,
particularly in comparison with relationships between achievement and student background characteristics such as socioeconomic status and ethnicity (Klein, Hamilton, McCaffrey, Stecher, Robyn & Burroughs, 2000, p. 37).

With systemic reform, which “attempts to align” all parts: “curriculum, instruction, assessment, teacher preparation, and state and local policies such as graduation requirement” – the classroom changes are promoted and, ultimately, improve student performance (Klein, Hamilton, McCaffrey, Stecher, Robyn & Burroughs, 2000, p. 1; see also Cohen, 1995, p. 11). Success is measured by students’ achieving proficiency on state-mandated tests. “He [Begle (1979)] found that there was little correlation between the many teacher characteristics and variables identified and the effectiveness of teaching mathematics as measured by higher pupil achievement” (Nickson, 1992, p. 106). Higher achievement levels were found in classrooms with teachers who knew their students, “what their backgrounds are, and what they know” (National Research Council, 2001, p. 424; see also Fennema & Franke, 1992, p. 156). When teachers know their students, the teachers can intervene to reduce frustrations, reduce some of the “hidden social messages” and convey positive student “expectations” to help students become successful (McLeod, 1992, p. 590; Nickson, 1992, p. 110-111). There is an association between high student achievement and the implementation of Standards-based materials and reform instructional practices that support student learning (Reys, Reys, Lapan, Holliday, & Wasman, 2003, p. 87; Riodan & Noyce, 2001, p. 392; Schoen, Cebulla, Finn, & Fi, 2003, p. 229). Boaler (2006) found that “departmental collaboration, heterogeneous grouping, grouping worthy problems, block scheduling, and student responsibility” were “critical to the success of the students” (p. 369).
Some national studies found increased student achievement “while others do not” (Jennings & Rentner, 2006, p. 110). Schoenfeld (2002) found these results from large-scale implementation of curricula

(1) on “tests of basic skills,” there was “no significant performance differences between students who learn from traditional or reform curricula,” and

(2) on conceptual and problem solving tests, “students who learn from reform curricula consistently out-perform students who learn from traditional curricula by a wide margin” (p. 16).

“Curriculum type (NSF-funded vs. publisher-developed) was ultimately not a significant predictor of student achievement” (Reys, Reys, Tarr, & Chavez, 2006, p. 11).

“Two of the most powerful predictors of student achievement . . . have been increased time on mathematics and the taking of advanced coursework” (Secada, 1992, p. 645). Students who “complete higher-level mathematics courses usually earn bachelor’s degrees and, as a result, increase their earnings after college” (Franklin, 2006b, p. 12).

“Research has shown, for example, that an extra course in algebra or geometry can increase a student’s earnings by 6.3 percent (Rose & Betts, 2001)” (Franklin, 2006b, p. 12). The more mathematics a person knows, as when students “take higher level” mathematics classes, “the greater are his or her opportunities,” and this is an important variable in accounting for differences in achievement among students from different countries (Hawkins, Stancavage, & Dossey, 1998, pp. 62-63; see also Robitaille & Travers, 1992, pp. 688-689).
“Professional development and the promotion of good instructional practices are critical to the success of the initiatives” (Klein, Hamilton, McCaffrey, Stecher, Robyn & Burroughs, 2000, p. 5) especially when “implementing Standards-based mathematics curricula” (Reys, Reys, Lapan, Holliday, & Wasman, 2003, p. 80). Professional development includes the support of changes by teachers and principals, time to learn about the needed changes, and collaboration with colleagues. Collaboration allows teachers to reflect on what is working and to share the wisdom of experience.

“Advancing awareness of the particular learning practices that are required to make reform-oriented approaches accessible to all students” (Boaler, 2002, p. 254) is important. In Japan the collaborative study, observation, and refinement of lessons and curricula which take place in “lesson study” – are part of the teacher’s ongoing responsibilities (Stigler & Hiebert, 1999, p. 110; see also Schoenfeld, 2002, p. 20). In the United States, professional development is not as organized.

The principal must maintain a “long-term commitment” and “adequate resources” to the process of “improving teaching” which is a “most critical part of the school’s development” (National Council of Teachers of Mathematics, 1991, pp. 2-3; Stigler & Hiebert, 1999, p. 157). After returning from summer or intensive workshops, teachers need critical support and “considerable” (Boaler, 2002, p. 244) understanding in “realizing those possibilities in day-to-day instruction” (Schifter, 1996, para. 79).

Regularly scheduled time is “an essential requirement” for professional development of teacher groups to “make measurable progress in their efforts to improve lessons,” digest recommendations, and “develop their teaching proficiency” (National

Understanding the changes required for reform to succeed “requires a focus on the *practices* of teaching and learning” (Boaler, 2002, p. 244). Since change is difficult, networking, collaborating, and sharing with the mathematics department is “critical to the teachers’ morale and work” (Boaler, 2006, p. 369; Schifter, 1996, para. 84; Wainwright, Morrell, Flick, & Schepige, 2004, p. 327). A pivotal part of change in improving instruction is developing a “habit of reflecting” (Schifter, 1996, para. 93; Thompson, 1992, p. 139).

**Instructional Summary**

“Standards set the course, and assessments provide the benchmarks, but it is teaching that must be improved to push us along the path to success” (Stigler & Hiebert, 1999, p. 2). To ensure sustained improvements in mathematics instruction, schools must provide “a high-quality curriculum; a stable, knowledgeable, and professional teaching community; high-quality assessment aligned with the curriculum” (Holloway, 2004, p. 84; Schoenfeld, 2002, p. 13).

“No state [policymakers] that we know of regularly collects and uses data” to see if a program when implemented, is effective “in promoting student learning. If we wish to make wise decisions, we need to know what is going on in typical classrooms” (Stigler & Hiebert, 1999, p. 8).
Assessment Changes

Due to the Standards movement, assessment issues are just as important as curriculum and instructional issues. The NCLB Act has increased student and school accountability.

Classroom Assessments

The NCTM standards “provide criteria for judging the quality of mathematics assessments” (National Council of Teachers of Mathematics, 1995, p. 9). “Assessment is the process of gathering evidence about a student’s knowledge of, ability to use, and disposition toward, mathematics and of making inferences from that evidence for a variety of purposes” (National Council of Teachers of Mathematics, 1995, p. 3).

Teachers, now, reflect on the inter-connections of curriculum, instruction and assessment when planning, presenting, and assessing a day’s or unit’s lessons. “Conceiving of assessment as a process that is integral to instruction implies approaches to both assessment and instruction” (Webb, 1993, p. 2). “Because mathematical thinking is complex and has many aspects, the assessment of this thinking requires the use of different sources of information to ascertain students’ development in this thinking” (Webb, 1993, p. 2). Over a period of time, teachers must measure the students’ range of knowledge of mathematical content, the connections among the many ideas, and the application of mathematics. This requires a variety of assessments. Teachers should be aware that there is an “appropriateness of the form of assessment for the intended purpose of the assessment” (Porter, 1995, para. 9).
Any assessment “has five common features . . . [which] provide a framework for discussing . . . and for reflecting on the form of the assessment” (Webb, 1993, p. 3). The features are

(1) the assessment situation, task, or question;

(2) the response,

(3) the interpretation of the student’s response by the teacher or student (if a self-assessment),

(4) the assignment of some meaning to the response, and

(5) the reporting and recording of the results from the assessment (Webb, 1993, pp. 3-4).

These features are interactive and the “distinctions between them is blurred” (National Council of Teachers of Mathematics, 1995, p. 4). “Assessment is reported as one of the most complex and important tasks of teachers (Stiggins, Conklin, & Bridgeford, 1986)” (Webb, 1992, p. 677; see also Stiggins, 2001, pp. 25-26).

Assessments embedded in the curriculum materials are “an integral part of instruction,” and allow teachers to “optimize both quantity and quality of their assessment and their instruction and thereby optimize the learning of students” (Chambers, 1993, p. 25; Lederman & Burnstein, 2006, p. 431; Schoen, Cebulla, Finn, & Fi, 2003, p. 233; Turley, 2006, p. 441). These assessments occur through the teacher’s “observing and listening to students” during explorations, discussions and justifications of methods, and solutions to the problem situations (Schoen, Cebulla, Finn, & Fi, 2003, p. 233). Integrating assessment “is not easy and requires teachers to have training to use assessment to inform their instructional decisions” (Webb, 1992, p. 678).
Overall, there are two types of assessments – summative and formative. A summative assessment, at the end of a course, should evaluate the majority of all the past knowledge and skills learned. A formative assessment evaluates some or all the knowledge, processes, and interconnections in a unit (Lederman & Burnstein, 2006, p. 431). The formative assessments could be very brief or could cover the entire unit, depending on the purpose of the assessment.

Both of these assessments could use either a selected-response or a performance-based assessment. Selected-response formats are multiple choice, matching, and true-false questions. This format usually contains a single correct answer and assesses knowledge and skills rather than critical thinking or real-world problem (McTighe & Ferrara, 1994, p. 14; Porter, 1995, para. 18; Webb, 1992, p. 677). Performance-based assessment refers to “assessment activities that directly assess students’ understanding” (McTighe & Ferrara, 1994, p. 15) and proficiency, “performance skills, and product development capabilities” (Stiggins, 2001, p. 183). These assessments include constructed response forms, creating a product, performing, or understanding the cognitive processes used by the students (McTighe & Ferrara, 1994, p. 13; Stiggins, 2001, p. 185). “Performance-base assessment, portfolios, student-designed assessments, etc., are . . . more reflective of new curricular goals and methods of instruction” (Porter, 1995, para. 4).

Stiggins (1988) stated that “teachers may spend as much as 20 to 30% of their professional time directly involved in assessment-related activities” (Webb, 1992, p. 676). “Little up-to-date information is available on how U.S. teachers conduct internal assessments in mathematics, particularly those activities such as classroom questioning,

What “teachers teach” and prepare students for is greatly influenced by the content of the “large-scale” assessments especially for “the high-profile NCLB-mandated exams” (Lederman & Burnstein, 2006, p. 430; Toch, 2006, p. 5; Webb, 1992, p. 678).

“Students are taking many more tests as a result of NCLB” (Jennings & Rentner, 2006, p. 111; see also Toch, 2006, p. 5).

Using reform curricula and appropriate assessments; asking “thoughtful, reflective questions” with enough wait time for students to respond; giving specific and informative feedback on homework or activities which helps the learning of students “especially low-achieving students, including students with learning disabilities,” and “Whites and underrepresented minorities;” help narrow the students’ achievement gap (Black & Wiliam, 1998 para. 16, 18, 45; Boston, 2002, para. 8, 12; Schoenfeld, 2002, p. 16). Bracey (2006) states “NCLB has not helped the nation and states significantly narrow the achievement gap. . . .” (p. 153) while Jennings and Rentner (2006) state that the achievement gaps on the NCLB tests are “generally narrowing or staying the same” (p. 110). Each state gets to determine its own criteria for the barrier of achievement. By having the NCLB barriers in place, some students are jumping over the barrier, but “they don’t tell you how high the successful jumpers jumped. Worst, they can mask a widening achievement gap” (Bracey, 2006, p. 159). These comments reflect some concerns with the implementation of NCLB.
Adequate Yearly Progress

“The NCLB mandates for AYP (adequate yearly progress) and public reporting of results put enormous pressure on students, teachers, principals, and superintendents to raise test scores” (Lederman & Burnstein, 2006, p. 430). “NCLB poses the greatest challenge for those schools with many subgroups, because failure of a single subgroup to meet proficiency requirements can cause the entire school to be identified for improvement” (Sunderman, 2006, p. 121). “An even greater problem is that the states that are maintaining higher demands on students, such as South Carolina and Wyoming, have created problems for their schools” in making AYP (Lewis, 2006, p. 339). Challenges have occurred at the researcher’s school and the pressure to make AYP has been a constant for several years.

School districts and schools that fail to make AYP towards state proficiency goals will be subjected to improvement, corrective action, and restructuring to meet state standards. Schools that meet or exceed AYP or close achievement gaps will be eligible for State Academic Achievement Awards.

To make AYP, a school must demonstrate that it has met the State’s target for proficiency in reading/language arts and mathematics for the school as a whole and for each of its subgroups of students, ensure that at least 95 percent of all students and each subgroup of participated in the State’s . . . assessments, and that the school has met the State’s target for an additional academic indicator. At the high school level, this additional academic indicator must be the graduation rate (NCLB Annual Report, 2005, pp. 10-11).
If a school does not meet the State’s definition for AYP for “two or more consecutive years”, the school is then given three years of interventions labeled “school improvement,” “corrective action,” and “restructuring” (NCLB Annual Report, 2005, p. 10).

Schools identified as needing “improvement” under NCLB “enroll a disproportionately larger percentage of minority, low-income, and limited-English-proficient students, on average, than schools making AYP,” because each subgroup must reach a target score (Sunderman, 2006, p. 120). In schools that have not made AYP for two years, there is “greater alignment of curriculum and instruction with standards and assessments,” more use of test data in decisions on “instruction” and “professional development for teachers, and the provision of more intensive instruction to low-achieving students” (Jennings & Rentner, 2006, p. 111). “Programs that focused on individual student remediation but were not coordinated with the regular classroom curriculum were less successful” (Sunderman, 2006, p. 122).

With the adoption of NCLB, several negative trends are that high-stakes testing has not reduced “achievement gaps among students of different ethnicity;” and the AYP model used in NCLB “may not identify schools that are doing a good job of helping low performing students grow” (Cronin, Kingsbury, McCall, & Bowe, 2005, p. 11). Positive trends have also emerged. State-level tests tended to “improve observed achievement” and “improved student achievement” (Cronin, Kingsbury, McCall, & Bowe, 2005, p. 60).
Assessment Summary

If the “magnitude” in the achievement gap continues, “it won’t bring schools close to the requirement of 100% proficiency by 2014” and students in ethnic groups may “grow less than comparable European-American students” (Cronin, Kingsbury, McCall, & Bowe, 2005, p. 60).

Summary

The reforms of curriculum, instruction, and assessment suggested by the Standards movement can make a measurable difference in student achievement. These and other listed concerns need to be addressed in the reauthorization of NCLB for the goal of 100% proficiency by 2014 to be possible. If the reforms are implemented fully, then the schools could achieve the goal of NCLB of 100% proficiency.
CHAPTER THREE: METHODOLOGY

Background

Wyoming, with a “population density of 5.2” per square mile, is the least-populated state in the United States and “ranks 10th in total area of 97,814” square miles (World Almanac and Book of Facts 2006, 2006, p. 451). Even though the state is rural, the No Child Left Behind (NCLB) Act of 2001 requires that by 2014, 100% of the Wyoming students will be proficient on the state standards as measured by a statewide assessment system (No Child Left Behind Act 2001, 2002). “To be effective, these reforms must ultimately be adopted by teachers and must take hold in the classroom (Tyack and Cuban, 1995)” (Klein, Hamilton, McCaffrey, Stecher, Robyn & Burroughs, 2000, p. 3). Since the Wyoming school districts and teachers reside in this rural environment, the sharing of information on how schools are achieving proficiency in Wyoming is vital in order for this national goal to be achieved. The purpose of this research study was to provide key findings to consider for the 48 Wyoming school districts and for the nearly 300 high school mathematics teachers when trying to improve the teaching of and student learning of mathematics at the high school level.

Population

Every Wyoming 11th grade public school student is required to take PAWS, Performance Assessment of Wyoming Students, according to the Wyoming Education Code. The students’ performance on PAWS and the schools’ progress on the indicators of AYP, adequate yearly progress, affect every teacher in grades 9-12 (Title 21, 2006, article 3, #21-2-304, (a) (iii)). The target population was the group of Wyoming high school (grades 9-12) mathematics teachers who teach at a school that has an 11th grade
Performance Assessment of Wyoming Students, PAWS, score for 2006 in mathematics. AYP, adequate yearly progress, accountability data was gleaned from the Wyoming Department of Education website. There were 83 high schools in 48 school districts identified. The teachers’ responses were stratified into two groups, based on the schools’ AYP mathematics results. One group that made AYP in 2006 was comprised of 57 schools with 250 teachers. The second group that did not make AYP in 2006 had 8 schools with 87 teachers (Wyoming Department of Education, 2006, 2005-2006 AYP Results). For ease of tracking, the names of the groups were “making AYP” and “not making AYP,” respectively. The survey was sent to all high school mathematics teachers in the state of Wyoming.

Wyoming’s AYP is based on several indicators. The first indicator includes the test participation rate and the number of students scoring “proficient” and “above proficient” for language arts. The second indicator is the test participation rate and students scoring “proficient” or “above proficient” for mathematics. The third indicator for Wyoming is the school’s graduation rate. If any one of these indicators is not met, then the school has not met AYP. For this study, only the indicators for mathematics were used to determine making or not making AYP.

Besides the participation rate and proficiency level of students, each school must disaggregate the data into nine subgroups. If any of the nine subgroups in a school fail to meet the stated AYP participation rate or the percent needed as proficient and advanced for that school year, then the school does not make AYP. The nine subgroups in Wyoming include “all students,” “free/reduced lunch,” “Native American,” “Hispanic,”

The teachers were also stratified into three groups based on the target class chosen. If the target class covered curriculum below Algebra 1 topics, then this teacher was assigned to level one, a lower level. If the curriculum for the target was accelerated from the normal progression as deemed by the teacher, then the teacher was assigned to level three, an honors level. The remaining teachers were assigned to level two, a regular level.

**Sampling Techniques**

Surveys have been used in education to gather information about the schools since 1817 (Creswell, 2005, p. 354). This self-reporting survey focused on the performance of high school students and their high school classroom experiences as viewed through the eyes of high school mathematics teachers. In order to include as many educators as possible, a mail survey was designed.

A questionnaire is “a cost-effective and efficient technique for collecting large amounts of data from many respondents, but its limitations are well known” (Robitaille & Travers, 1992, p. 708). Biased answers and the number of non-responses are some limitations that must be taken into account. Another limitation is the validity of the responses. For example, do the frequencies and types of activities that the teacher reports on the survey really reflect what is happening in the classroom (Robitaille & Travers, 1992, p. 708)? Observing the frequency and type of instruction students receive over the course is a limitation of this research project. The teacher’s busy schedule and lack of time to respond may contribute to a low response rate (Chval, Reyes, Reys, Tarr, &
Chavez, 2006, p. 161). The timing of the mailing of the sample was critical. If the survey was sent near a major vacation or at the end of a semester, then the response rate would have decreased. From the beginning of January to the end of March, no state testing for 11th graders taking the PAWS during the 2006-2007 school year was given. During this time frame, most schools were in the early to middle part of the third quarter of the school year. Each teacher’s workload should have been as ‘normal’ as possible. The month of February was chosen to send the survey.

Further support of a mail survey to Wyoming teachers came from an on-line study. The University of Wyoming Professor, Dr. Alan Moore, conducted an on-line survey through the University of Wyoming’s Department of Educational Leadership with support from the Wyoming Department of Education. This study - “Instructionally Supportive Assessment: The implementation and effects of the new state assessment system in Wyoming” - based on 16 randomly selected districts, had a low response rate from teachers (no percentage was given). Dr. Moore’s survey letter was dated February 16, 2006. The superintendents and district curriculum coordinators had the highest response rate; then the building administrators; and finally the teachers (Moore, A. D., personal communications, July 14, 2006).

In February 2007, this research study’s design had three components: (1) a measure of curriculum, instruction, and assessment practices, and (2) the relationship between these teachers’ practices and the different content level of the target class, and (3) the relationship between these teachers’ practices and the schools’ making AYP (Klein, Hamilton, McCaffrey, Stecher, Robyn & Burroughs, 2000, p. xi). The questions on the survey were slightly modified from the teacher questionnaires written by Horizon
Research, Incorporated. Horizon Research, Incorporated was the subcontractor for several National Science Foundation grants that dealt with curriculum, instructional and assessment issues, and teacher preparation across the country (Chval, Grouws, Smith, Weiss, & Ziebarth, 2006, p. 1-2; Klein, Hamilton, McCaffrey, Stecher, Robyn & Burroughs, 2000, p. xi-xii; Horizon Research, 2000). “Horizon Research, Inc. (HRI), under a subcontract from RAND, had primary responsibility for designing and validating this questionnaire” (Klein, Hamilton, McCaffrey, Stecher, Robyn & Burroughs, 2000, p. xii). Permission to use teacher questionnaire questions from various National Science Foundation contracts was received from Iris Weiss of Horizon Research, Inc.; Brian Stecher of RAND, and Barbara Reys of University of Missouri on October 11-12, 2006.

Pilot Survey

A pilot survey was given to five mathematics teachers from three public schools in Casper, Wyoming, during the week of October 11-18, 2006. The first teacher was a retired high school mathematics teacher. The second was currently working as a junior high school mathematics instructor. The third and fourth pilot survey participants were former junior high mathematics teachers who have switched from teaching mathematics. One was teaching computer applications and the other was the school’s mathematics instructional facilitator. A fifth teacher, who holds an endorsement for middle-school mathematics, was currently teaching 6th grade mathematics. These participants suggested a few minor modifications in wording and the elimination of a repeated question. The suggestions were incorporated into the final questionnaire sent to the Institutional Board Review Panel in early November 2006. See Appendix A for approvals.
Permissions for Surveying Teachers

After the Institutional Board Review approved the project, permission from the superintendents was needed. See Appendix A for the approvals. The names of the high school mathematics teachers were acquired and they were sent the surveys by February 5, 2007.

Forty-six of the 48 superintendents were sent a letter requesting permission for the high school mathematics teachers to be surveyed. (The two school districts not contacted have no high schools.) The superintendents’ permission was forwarded to the Institutional Board Review in Lincoln, Nebraska. Forty-four of the 46 superintendents gave permission to conduct a research study with their high school mathematics teachers. Two of the smaller school districts did not give permission to send the surveys. See Appendix B for a copy of the letter, the permission letter, and a list of participating school districts. Immediately upon providing permission, the principals of all the high schools in each district were sent a letter requesting the names and email addresses for their 9-12 grade mathematics teachers. Telephone calls were made to principals to elicit this information when not provided by the requested deadlines. See Appendix C for the principal letter and name request. There were 295 teachers in 75 schools that were contacted by mail. See Appendix D for a copy of the teacher’s letter, the teacher’s instructions, and the questionnaire. The teacher questionnaire had 32 questions requiring about 30 minutes to complete.

The teachers received the questionnaire at their school addresses during the first full week of February. Teachers had three to four weeks to complete the questionnaire, and return it in self-addressed stamped envelope. The teachers were assigned a tracking
number when follow-up was needed to get completed surveys returned. The tracking number helped the researcher note the questionnaires not returned. A week before the deadline, an email to the school address was sent to those teachers who have not returned the survey. See Appendix E for the email reminder.

Through a random drawing, participating teachers were given the chance to win one of three VISA Gift cards as incentive to return the completed surveys by the stated deadline. The deadline for entry was one month following the surveys’ arrival at each school. Once the teachers completed and returned their surveys before the deadline, the bottom portion of the last page with the teachers’ names and telephone numbers was separated from the surveys. The tracking numbers were eliminated and the separated slips were placed in a random drawing. This process was followed to ensure response anonymity of the teachers, schools, and school districts. The drawing took place several days after the deadline to allow any remaining mail to be received. The first name drawn received a $100 VISA Gift card; the second receive a $75 card, and the third received a $50 card.

The names of the schools, teachers, and tracking numbers were kept in a secure data file. The responses were separated into the two groups based the school making or not making AYP. The responses were also separated into the three levels based on the target class taught. Schools making AYP were designated with a 1 and schools not making AYP with a 0. The level of the target class taught had a designation of 1 for content below Algebra 1 topics; a 2 for content of Algebra 1 and above; and a 3 for the content the teacher deemed as honors or accelerated to the normal progression.
Questionnaire

The questions on the questionnaire probed curriculum, instructional, and assessment issues that teachers dealt with throughout the school year. Systemic reform “attempts to align all parts of the educational system – curriculum, instruction, assessment, teacher preparation, and state and local policies such as graduation requirements – to promote change in the classroom and, ultimately, improve student performance” (Klein, Hamilton, McCaffrey, Stecher, Robyn & Burroughs, 2000, p. 1). The Center for the Study of Mathematics Curriculum conducted a cross-site study for three school districts and are using the results in the same manner as proposed in this study (Chval, Grouws, Smith, Weiss, & Ziebarth, 2006, p. 2).

Time constraints required that the data be limited in scope for analysis. The curriculum issues were addressed in questions 1, 2, 4, and 21.

- 1 - the use of state standards in lesson planning
- 2 - using PAWS results
- 4 - collaborating with colleagues
- 21 - using the textbook from the target class in planning lessons.

More schools have aligned the “curriculum and instruction with standards and assessments, [and making] more use of test data to modify instruction” (Jennings & Rentner, 2006 p. 111). The statistics used for analysis on each question was a single average. All of the subparts for each question, which used a Likert scale, were combined to create the single value. The more frequent the use of the topic, the higher the scale value given. If there was no response, then a value was not included in the average for the question. Analysis was done by combining the separate subparts of each question.
into a single average. For example, if a teacher’s response for question 1 – state standards - was “Often” for 1a – a scaled value of 4 was assigned; “Rarely” for 1b – a scaled value of 2 was assigned; and “Sometimes” for 1c – a scaled value of 3 was assigned; then the single average for the teacher on question 1 – state standards - was a 3. This value was calculated from \((4 + 2 + 3) / 3\) equaling \(9 / 3\) which gave question 1 a value of 3.

Each curriculum question was averaged to a single value. Each question on curriculum for all three levels of courses taught was averaged. Finally, each question on curriculum for the two groups of schools “making AYP” or “not making AYP” was averaged. If the curriculum did not affect the course the teachers were teaching or did not affect the schools’ making AYP, then the levels and groups should have had the same average as well as a small effect size and no significant difference between the levels of courses and groups of schools.

The instruction issues were the questions number 2, 4, 5 through 7, 14, 22 and 23.

- 2 - using PAWS results in planning
- 4 - collaborating with colleagues
- 5 - teacher readiness to teach a variety of mathematical content
- 6 - teaching the NCTM Curriculum Standards
- 7 - participating in a variety of professional development opportunities
- 22 - which was split into three variables,
  - instructional strategies used in the classroom (subpart a, b, c, d, f, j, o, and q)
  - creating a student centered learning environment (subpart e, g, h, i, k, m, and n)
  - teacher management issues classroom (subpart l, p, r, and s)
• 23 - amount of instructional time spent on mathematics instruction in the target class

The specific background knowledge about the NCTM content and process standards for grades 9-12 was asked in questions 5 and 6 (NCTM, 2000, pp. 287-364). The teachers’ instructional strategies or methods are “influenced significantly by their knowledge and beliefs” (Koehler & Grouws, 1992, p. 118; Thompson, 1992, p. 128). Professional development is paramount and a major requirement of NCLB, especially for schools not making AYP (Jennings & Rentner, 2006, p. 111). Question 7 - professional development opportunities - range from content knowledge, instructional strategies, assessment strategies, collaboration times and methods of collaboration, professional meetings, and national board certification. School schedules rarely allow regular collaborate time for teachers to discuss curriculum, instruction, and assessment issues. If the teachers do want to collaborate regularly, the time is scheduled before or after normal school hours. “Professional development and the promotion of good instructional practices are critical to the success of the initiatives” (Klein, Hamilton, McCaffrey, Stecher, Robyn & Burroughs, 2000, p. 5). Each question for the teachers’ responses on instruction was averaged together to a single value. Each instruction question for all the three levels of courses taught was averaged. Finally each instruction question for the two groups for schools making AYP or not making AYP were averaged. If the instruction did not affect the course the teachers were teaching or does not affect the schools’ making AYP, then the levels and groups should have had the same average as well as a small effect size and no significant difference between the levels of courses and groups of schools.
Jennings and Rentner (2006) found that “students are taking a lot more tests” (p. 111). Classroom assessments are addressed in questions 3, 4, and 24.

- 3 - was related to instructional time devoted to test preparation whether the test was a district, state, or national mandated test.
- 4 - collaborating with colleagues on creating and scoring assessments
- 24 - the type of classroom assessments given to students.

Each question for all the teachers’ responses on assessment was averaged together to a single value. Each assessment question for all the three levels of courses taught was averaged. Finally, each assessment question for the two groups for schools “making AYP” or “not AYP” was averaged. If the assessment used did not affect the course the teachers were teaching or did not affect the schools’ making AYP, then the levels and groups should have had the same average as well as a small effect size and no significant difference between the levels of courses and groups of schools.

The remaining questions of 8 through 21 and 25 through 31 were demographics about the teacher or the school. The topics covered the number of classes taught and the target class information relating to classroom time and textbook used. Questions also focused on the students in the target class and the school configuration. Finally, information on the years of experience of the teacher at the school and in the school district and the highest degree achieved by the teacher was gathered. Information about the target class placed the teacher’s responses in the appropriate course level for analysis. Information about the school placed the teacher’s responses in the appropriate “making AYP” group for analysis.
The questionnaire contained possible responses from both four- and five-point Likert scales.

- Question 1 – using standards
- Question 2 - using PAWS results
- Question 4 – teacher collaboration
- Question 21 – textbook driven
- Question 22 – instructional strategies
- Question 22 - student centered learning
- Question 22 - teacher management
- Question 24 – assessment all used the same five-point Likert scale responses.

The scaled responses were 1 for “Never”; 2 for “Rarely”; 3 for “Sometimes”; 4 for “Often”; and 5 for “Always.”

- Question 3- time preparation for testing, used the scaled numbers of 1 for “Does Not Apply,” 2 for “Decreased,” 3 for “Remained the Same,” and 4 for “Increased.”
- Questions 5 - teacher readiness and
- Question 7 - teacher professional development the scaled responses were 0 for “Does Not Apply,” 1 for “Not Interested,” 2 for “Somewhat Interested,” and 3 for “Very Interested.”
- Question 23 – The scaled responses for instructional time were 1 for “0-15%,” 2 for “16-30%,” 3 for “31-45%,” 4 for “46-60%,” 5 for “61-75%,” 6 for “76-100%.”
Research Questions

The questionnaire was designed to answer the questions, “Does the course level taught by the mathematics teacher affect the practices in curriculum, instruction, and assessment?” and “Are mathematics teachers’ practices in curriculum, instruction, and assessment related to their schools of making adequate yearly progress, AYP?” AYP is the accountability measure in the NCLB Act used to determine if the school is achieving proficiency on the state standards. The course level deals with the mathematical content for a targeted class. The teachers’ responses were stratified into three levels based on the target class chosen. If the target class covered curriculum below Algebra 1 topics, then this teacher was assigned to level one, a lower level. If the curriculum for the target was accelerated from the normal progression as deemed by the teacher, then the teacher was assigned to level three, an honors level. The remaining teachers were assigned to level two, a regular level.

These questions led to the following research questions:

1. What is the relationship between a school’s chosen mathematics curriculum and the school’s making AYP, adequate yearly progress, in Grade 11 mathematics as measured by PAWS, Performance Assessment of Wyoming Students?

2. What is the relationship between the type of mathematics instruction given and the school’s making AYP in Grade 11 mathematics as measured by PAWS?

3. What is the relationship between the type of classroom assessments given and the school’s making AYP in Grade 11 mathematics as measured by PAWS?

4. How did the responses compare on mathematics curriculum questions from the teachers of the three levels of mathematics courses?
5. How did the responses compare on mathematical instructional questions from the teachers of the three levels of mathematics courses?

6. How did the responses compare on mathematical assessment questions from the teachers of the three levels of mathematics courses?

Data Analysis

The variables were the questions on the curriculum, instruction, and assessment issues. There were 13 different questions analyzed.

The first step was to place all of the teachers’ responses together to figure the mean and standard deviation of the entire population of Wyoming high school mathematics teachers.

The second step was to sort the teachers’ responses by level of the target class chosen. The mean and standard deviations were calculated for each of the three levels. An effect size was figured for each of the three possible groupings between the lower level course and the regular level; between the lower level and between the honors level; and the regular level and honors level. An ANOVA test of independent groups was calculated at the 0.05 significance level in order to determine any relationship between the curriculum, instruction, and assessment questions among the three levels of mathematical courses.

The third step was to sort the teachers’ responses by the school’s performance on the 2006 statewide test by making AYP or not making AYP. The mean and standard deviations were calculated for each of the two groups. An effect size was figured for each of the two possible groupings between making AYP and not making AYP. A significance t-test of independent groups was also done at the 0.05 significance level to
determine any relationship between the curriculum, instruction, and assessment questions between these two groups of schools.
CHAPTER FOUR: RESULTS

Response Rate

By the end of the 2006-2007 school year, 164 questionnaires out of the 295 surveys were completed and returned. This was a 55.78% return response rate. One of the 295 teachers contacted me stating that she was a music teacher. She was eliminated from the original list of mathematics teachers to be analyzed. The three randomly selected teachers who received a VISA Gift card due to returning their questionnaire by the deadline were teachers from Horizon High School in Evanston, Jackson Hole High School in Jackson, and Saratoga High School in Saratoga. Of the 75 schools contacted 67 schools had a teacher respond. This included seven of the eight Wyoming schools that did not make AYP and 60 Wyoming schools that did make AYP for the 2006-2007 school year based on the 2006 statewide testing.

Reliability

The coefficient of reliability on the questionnaire was done using Cronbach’s Alpha. This alpha number can range from 0 to 1 with higher numbers meaning that the teachers’ responses are more consistent in measuring the same content (SPSS FAQ, para. 5). The reliability on the 13 variables was 0.896 using SPSS. See Appendix F for the statistics.

Validity

Validity in research studies can be categorized in a variety of ways. William M. K. Trochim, professor in the Department of Policy Analysis and Management at Cornell University, has described two types of “translation validity” and four types of “criterion-related validity” (Trochim, 2006, para. 4). The translation validities “focus on whether
the operationalization is a good reflect of the construct” (Trochim, 2006, para. 4). The translation validities are:

- **Face validity** – “subjective judgment” (para. 6) based on the researcher’s opinion
- **Content validity** – “checklist” based on relevant “criteria” (para. 7)

The four criterion-related validities will “usually make a prediction about how the operationalization will *perform* based on . . . . the criteria they use as the standard for judgment” (Trochim, 2006, para. 8). The criterion-related validities are:

- **Predictive validity** – researcher predicts outcome based on interactions of variables
- **Concurrent validity** – researcher is able to “distinguish between groups” (para. 10) based on measure instrument
- **Convergent validity** – researcher bases outcome on how well an instrument correlates with outcome from a similar study
- **Discriminant validity** - researcher bases outcome on how well an instrument correlates with outcome from contrasting study

This research study shows evidence of convergent validity. The study compares how similar the overall teachers’ means are to the three levels of mathematics courses taught (1, 2, or 3), and how similar the overall teachers’ means are to the two AYP school determination (making or not making).

**Variables Analyzed**

Time constraints required that the data be limited in scope for analysis. Analysis was done by combining the separate subparts of each question into a single average.
From the 32-question survey, 11 questions were analyzed. Since one question’s subparts dealt with three issues, the responses were split into separate parts. This gave a total of 13 independent variables. The dependent variable was the combined average of the teacher’s responses.

The other questions related to demographics and information about the targeted class are not reported in this dissertation. The variables are listed next to the question number on the questionnaire. A short descriptive name about the question is also provided.

All Teachers

The descriptive statistics for all the teachers’ responses and three levels of mathematics courses are given in Table 4.1. The number respondents, the mean, and standard deviation for all are also included in Table 4.1.

Table 4.1

<table>
<thead>
<tr>
<th>Question Num</th>
<th>Question Name</th>
<th>Total Sample</th>
<th>For Level 1</th>
<th>For Level 2</th>
<th>For Level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Use Standards</td>
<td>163</td>
<td>3.54</td>
<td>.94</td>
<td>29</td>
</tr>
<tr>
<td>2</td>
<td>PAWS Results</td>
<td>163</td>
<td>2.34</td>
<td>1.07</td>
<td>29</td>
</tr>
<tr>
<td>3</td>
<td>Time Prep Test</td>
<td>163</td>
<td>2.99</td>
<td>.79</td>
<td>29</td>
</tr>
<tr>
<td>4</td>
<td>Tchr Collab</td>
<td>164</td>
<td>2.93</td>
<td>.93</td>
<td>29</td>
</tr>
<tr>
<td>5</td>
<td>Tchr Readiness</td>
<td>164</td>
<td>3.31</td>
<td>.48</td>
<td>29</td>
</tr>
<tr>
<td>6</td>
<td>Tch NCTM Stds</td>
<td>164</td>
<td>3.32</td>
<td>.54</td>
<td>29</td>
</tr>
<tr>
<td>7</td>
<td>Profess Develop</td>
<td>164</td>
<td>2.34</td>
<td>.38</td>
<td>29</td>
</tr>
<tr>
<td>21</td>
<td>Textbk Driven</td>
<td>161</td>
<td>3.51</td>
<td>.40</td>
<td>27</td>
</tr>
<tr>
<td>22</td>
<td>Instr Strategies</td>
<td>164</td>
<td>3.52</td>
<td>.36</td>
<td>29</td>
</tr>
<tr>
<td>22</td>
<td>Std Ctrd Learn</td>
<td>164</td>
<td>3.62</td>
<td>.54</td>
<td>29</td>
</tr>
<tr>
<td>22</td>
<td>Tch Mangmt</td>
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<td>.46</td>
<td>29</td>
</tr>
<tr>
<td>23</td>
<td>Instr Time</td>
<td>164</td>
<td>2.19</td>
<td>.56</td>
<td>29</td>
</tr>
</tbody>
</table>
For all the questions, the range of values of the means spanned 3.62 to 2.19. The value of 3.62 meant the teacher chose “Sometimes” (scale of 3) to “Often” (scale of 4). The value of 2.19 meant the teacher chose “16-30%” (scale of 2) to “31-45%” (scale of 3). The range of the standard deviations for the 13 questions spanned 1.07 to 0.36. The majority of standard deviations are smaller than the ‘standard normal’ distribution indicating that there is little variation in responses among the teachers. The top five means in numerical order are:

- 22 - student centered learning (3.62);
- 1 - using standards (3.54);
- 22 - instructional strategies (3.52);
- 21 - textbook driven (3.51); and
- 22 - teacher management (3.47).

These topics reflected that the top issues that concerned teachers were instructional and curriculum issues. See Figure 4.1 for the ordered bar graph with all the topics.

![Scaled Means for All Questions by All Teachers February 2007](image)

*Figure 4.1.* This is an ordered bar graph of the mean of 13 questions for all teachers on the scaled averages for each question from the Wyoming High School Mathematics
Teacher Questionnaire given in February 2007. n = 164 (9 questions); n = 163 (3 questions); n = 161 (1 question).

Course Level 1

For the course level 1 questions, the range of values of the means spanned 3.57 to 2.16. The range of the standard deviations for level 1 was from 1.24 to 0.35. The value of 3.57 for question 22 - instructional strategies meant the teacher chose “Sometimes” (scale of 3) to “Often” (scale of 4). The value of 2.16 for question 23 - instructional time meant the teacher chose “16-30%” (scale of 2) to “31-45%” (scale of 3). The top five means for level 1 were:

- question 22 - instructional strategies (3.57);
- question 1 - using standards (3.54);
- question 22 - student centered learning (3.51);
- question 21 - textbook driven (3.47); and
- question 22 - teacher management (3.44).

These topics reflected that the top issues of concern to teachers were instructional and curriculum issues. See Figure 4.2 for the ordered bar graph with all the questions.

Figure 4.2. This is an ordered bar graph of the mean of 13 questions for the teachers
teaching a level 1 course on the scaled averages for each question from the Wyoming High School Mathematics Teacher Questionnaire given in February 2007.  \( n = 29 \) (12 questions); \( n = 27 \) (1 question).

**Course Level 2**

For the course level 2 questions, the range of values of the means spanned 3.61 to 2.18. The range of the standard deviations for level 2 was from 1.04 to 0.34. The top five means for level 2 were:

- question 22 - student centered learning (3.61);
- question 21 - textbook driven (3.51);
- question 1 - using standards (3.50);
- question 22 - instructional strategies (3.46); and
- question 22 - teacher management (3.44).

The value of 3.61 for question 22 - student centered learning meant the teacher chose “Sometimes” (scale of 3) to “Often” (scale of 4). The value of 2.18 for question 23 - instructional time meant the teacher chose “16-30%” (scale of 2) to “31-45%” (scale of 3). See Figure 4.3 for the ordered bar graph with all the questions.

![Scaled Means for All Questions by Level 2 Teachers](image)

**Figure 4.3.** This is an ordered bar graph of the mean of 13 questions for the teachers teaching a level 2 course on the scaled averages for each question from the Wyoming
High School Mathematics Teacher Questionnaire given in February 2007. n = 109 (11 questions); n = 108 (2 questions).

**Course Level 3**

For the course level 3 questions, the range of values of the means spanned 3.78 to 2.21. The range of the standard deviations for level 3 were 1.04 to 0.33. The top five means for level 3 were:

- question 22 - student centered learning (3.78);
- question 1 - using standards (3.69);
- question 22 - instructional strategies (3.69);
- question 22 - teacher management (3.64); and
- question 21 - textbook driven (3.56).

The value of 3.78 for question 22 - student centered learning meant the teacher chose “Sometimes” (scale of 3) to “Often” (scale of 4). The value of 2.21 for question 2 - using PAWS results meant the teacher chose “Decreased” (scale of 2) to “Remaining the Same” (scale of 3). See Figure 4.4 for the ordered bar graph with all the questions.
Figure 4.4. This is an ordered bar graph of the mean of 13 questions for the teachers teaching a level 3 course on the scaled averages for each question from the Wyoming High School Mathematics Teacher Questionnaire given in February 2007. \( n = 26 \) (11 questions); \( n = 25 \) (2 questions).

The means for all the questions and levels for the target level course followed a somewhat consistent pattern as shown in Figure 4.5. There appeared some variation in questions 3, 4, 5, and all parts of 22.

**Scaled Means for All Questions by Teacher and Course Level**

*February 2007*

![Scaled Means for All Questions by Teacher and Course Level](image)

Figure 4.5. The means of the 13 questions for all teachers’ responses and the means of the questions for the three levels of target classes from the Wyoming High School Mathematics Teacher Questionnaire given in February 2007.
**AYP Groups**

The complete list of descriptive statistics for the schools making AYP designation are in Table 4.2.

Table 4.2

*Descriptive Statistics for Scaled Responses for AYP Schools*

<table>
<thead>
<tr>
<th>Number</th>
<th>Question Name</th>
<th>Total Sample</th>
<th>For Made AYP</th>
<th>For Not AYP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>n  M  SD</td>
<td>n  M  SD</td>
<td>n  M  SD</td>
</tr>
<tr>
<td>1</td>
<td>Using Standards</td>
<td>163 3.54 .94</td>
<td>127 3.59 .95</td>
<td>36 3.35 .90</td>
</tr>
<tr>
<td>2</td>
<td>Using PAWS Results</td>
<td>163 2.34 1.07</td>
<td>128 2.35 1.09</td>
<td>35 2.28 1.01</td>
</tr>
<tr>
<td>3</td>
<td>Time Prep for Testing</td>
<td>163 2.99 .79</td>
<td>128 2.95 .84</td>
<td>35 3.14 .55</td>
</tr>
<tr>
<td>4</td>
<td>Teacher Collaboration</td>
<td>164 2.93 .93</td>
<td>128 2.88 .91</td>
<td>36 3.08 .97</td>
</tr>
<tr>
<td>5</td>
<td>Teacher Readiness</td>
<td>164 3.31 .48</td>
<td>128 3.36 .46</td>
<td>36 3.13 .49</td>
</tr>
<tr>
<td>6</td>
<td>Teach NCTM Standards</td>
<td>164 3.32 .54</td>
<td>128 3.38 .50</td>
<td>36 3.07 .64</td>
</tr>
<tr>
<td>7</td>
<td>Professional Development</td>
<td>164 2.34 .38</td>
<td>128 2.35 .38</td>
<td>36 2.29 .38</td>
</tr>
<tr>
<td>21</td>
<td>Textbook Driven</td>
<td>161 3.51 .40</td>
<td>127 3.55 .35</td>
<td>34 3.37 .53</td>
</tr>
<tr>
<td>22</td>
<td>Instructional Strategies</td>
<td>164 3.52 .36</td>
<td>128 3.50 .36</td>
<td>36 3.57 .37</td>
</tr>
<tr>
<td>22</td>
<td>Student Centered Learning</td>
<td>164 3.62 .54</td>
<td>128 3.63 .54</td>
<td>36 3.56 .52</td>
</tr>
<tr>
<td>22</td>
<td>Teacher Management</td>
<td>164 3.47 .46</td>
<td>128 3.49 .47</td>
<td>36 3.40 .45</td>
</tr>
<tr>
<td>23</td>
<td>Instructional Time</td>
<td>164 2.19 .56</td>
<td>128 2.19 .57</td>
<td>36 2.19 .53</td>
</tr>
<tr>
<td>24</td>
<td>Assessment Used</td>
<td>164 2.43 .52</td>
<td>128 2.45 .52</td>
<td>36 2.35 .49</td>
</tr>
</tbody>
</table>
The means for the questions with the schools making AYP and not making AYP also followed a somewhat consistent pattern. See Figure 4.6. There appeared a small variation in questions 5, 6, and 21.

**Figure 4.6.** The means of the 13 questions for all teachers’ responses and the means of the questions for the two groups of school’s AYP designation from the Wyoming High School Mathematics Teacher Questionnaire given in February 2007.

**Schools Making AYP**

For schools making AYP questions, the range of values of the means spanned 3.63 to 2.19. The range of the standard deviations for the making AYP group were 1.09 to 0.35. The top five means for schools making AYP were:

- question 22 - student centered learning (3.63);
- question 1 - using standards (3.59);
- question 21 - textbook driven (3.55);
- question 22 - instructional strategies (3.50); and
• question 22 - teacher management (3.49).

See Figure 4.7 for the ordered bar graph with all the questions. The value of 3.63 for question 22 - student centered learning meant the teacher chose “Sometimes” (scale of 3) to “Often” (scale of 4). The value of 2.19 for question 23 - instructional time meant the teacher chose “16-30%” (scale of 2) to “31-45%” (scale of 3).

**Figure 4.7.** This is an ordered bar graph of the mean of 13 questions for the teachers teaching in a school which made AYP on the scaled averages for each question from the Wyoming High School Mathematics Teacher Questionnaire given in February 2007. n = 128 (11 questions); n = 127 (2 questions).

**Schools Not Making AYP**

For the schools not making AYP questions, the range of values of the means spanned 3.57 to 2.19. The range of the standard deviations for the not making AYP group were 1.01 to 0.37. The top five means for the schools not making AYP were:

• question 22 - instructional strategies (3.57);
• question 22 - student centered learning (3.56);
• question 22 - teacher management (3.40);
• question 21 - textbook driven (3.37); and
• question 1 - using standards (3.35).

See Figure 4.8 for the ordered bar graph with all the questions. The value of 3.57 for question 22 - instructional strategies meant the teacher chose “Sometimes” (scale of 3) to “Often” (scale of 4). The value of 2.19 for question 23 - instructional time meant the teacher chose “16-30%” (scale of 2) to “31-45%” (scale of 3).

**Figure 4.8.** This is an ordered bar graph of the mean of 13 questions for the teachers teaching in a school which did not make AYP on the scaled averages for each question from the Wyoming High School Mathematics Teacher Questionnaire given in February 2007. n = 36 (10 questions); n = 35 (2 questions); n = 34 (1 question).

**Effect Size**

Effect size is the value when the means of two groups are compared “independent” of their sample sizes. In significance tests, sample sizes are required in those calculations. If sample sizes are large enough, significances test can give significant results when there really are no significant differences between the groups. Thus, the use of effect sizes has become a more common measure when comparing groups. Cohen “hesitantly defined effect sizes as “small, d = .2,” “median, d = .5,” and
“large, \( d = .8 \)" (Becker, 1998, Lecture, para. 13). Using the values in table 1 and the website calculator, the values for effect sizes were calculated for the levels of target courses (Becker, 1998, Calculator). See Table 4.3.

Table 4.3

**Effect Size for Levels Courses**

<table>
<thead>
<tr>
<th>Question Name</th>
<th>ES for 1 &amp; 2 Cohen’s D</th>
<th>ES for 1 &amp; 3 Cohen’s D</th>
<th>ES for 2 &amp; 3 Cohen’s D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Using Standards</td>
<td>.04(^a)</td>
<td>-.17</td>
<td>-.21</td>
</tr>
<tr>
<td>2 Using PAWS Results</td>
<td>.01</td>
<td>.14</td>
<td>.14</td>
</tr>
<tr>
<td>3 Time Prep for Testing</td>
<td>-.43(^b)</td>
<td>-.83(^c)</td>
<td>-.47(^b)</td>
</tr>
<tr>
<td>4 Teacher Collaboration</td>
<td>-.10</td>
<td>-.48(^b)</td>
<td>-.36</td>
</tr>
<tr>
<td>5 Teacher Readiness</td>
<td>-.49(^b)</td>
<td>-.82(^c)</td>
<td>-.35</td>
</tr>
<tr>
<td>6 Teach NCTM Standards</td>
<td>.17</td>
<td>-.34</td>
<td>-.49(^b)</td>
</tr>
<tr>
<td>7 Professional Development</td>
<td>-.18</td>
<td>-.35</td>
<td>-.17</td>
</tr>
<tr>
<td>21 Textbook Driven</td>
<td>-.10</td>
<td>-.25</td>
<td>-.13</td>
</tr>
<tr>
<td>22 Instructional Strategies</td>
<td>.32</td>
<td>-.31</td>
<td>-.59(^b)</td>
</tr>
<tr>
<td>22 Student Centered Learning</td>
<td>-.19</td>
<td>-.51(^b)</td>
<td>-.32</td>
</tr>
<tr>
<td>22 Teacher Management</td>
<td>0</td>
<td>-.43(^b)</td>
<td>-.40</td>
</tr>
<tr>
<td>23 Instructional Time</td>
<td>-.04</td>
<td>-.18</td>
<td>-.14</td>
</tr>
<tr>
<td>24 Assessment Used</td>
<td>.15</td>
<td>.20</td>
<td>.06</td>
</tr>
</tbody>
</table>

Note. \(^a\) positive value means the effect between groups is in the direction favoring the lower coded math level; \(^b\) means there is a moderate effect between groups; \(^c\) means there is a strong effect between groups.

Out of the 39 possible comparisons between the three levels of mathematics courses, only 10 had a moderate or strong effect between the teacher levels. The majority, 29, of the effects was negative. There were only two questions which had a large effect size according to Cohen’s descriptions. The large effect came from teachers in the same levels. They were from teachers in level 1 and level 3.
The questions were:

- question 3 - time preparation for testing (-0.83) and
- question 5 - teacher readiness (-0.82).

Since both values are negative, however, the teachers teaching a lower level courses (teachers teaching a class with content below Algebra 1) appeared do more test preparation time with students than those teachers teaching an honors level class. Also, the teachers teaching a lower level classes felt more prepared to teach a wider variety of mathematical topics than those teachers teaching honors level classes.

There were seven variables between the groups with a moderate negative effect size, which had values close to -0.5. The questions were:

- question 3 - time preparation for testing with level 1 and 2 (-0.43) and
- question 3 – time preparation for testing with level 2 and 3 (-0.47);
- question 4 - teacher collaboration with level 1 and 3 (-0.48);
- question 5 - teacher readiness with level 1 and 2 (-0.49);
- question 6 - teaching NCTM Standards with level 2 and 3 (-0.49);
- question 22 - instructional strategies with level 2 and 3 (-0.59);
- question 22 - student centered learning with level 1 and 3 (-0.51); and
- question 22 - teacher management with level 1 and 3 (-0.43).

All three levels had moderate to strong effect on question 3 - time preparation for testing. This indicates that teachers instructing lower level classes do more test preparation work with students than teachers teaching regular level and honors level.
Even teachers instructing regular level do more test preparation work with students than the teachers instructing the honors level class.

There were three questions with moderate effect size between the schools that made AYP and the schools which did not make AYP. See Table 4.4. All three had a positive effect size. The questions were:

- question 5 - teacher readiness;
- question 6 - teaching NCTM Standards; and
- question 21 - textbook driven.

The teachers in schools, which made AYP, appeared to feel more prepared to teach a variety of mathematics concepts, teach more NCTM Standard, and follow the topics in the textbook than those teachers in school which did not make AYP.

Table 4.4

*Effect Size for Schools*

<table>
<thead>
<tr>
<th>Question Number</th>
<th>Question Name</th>
<th>ES for Making &amp; Not Making AYP</th>
<th>Cohen’s D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Using Standards</td>
<td>.26a</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Using PAWS Results</td>
<td>.04</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Time Prep for Testing</td>
<td>-.27</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Teacher Collaboration</td>
<td>-.21</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Teacher Readiness</td>
<td>.48b</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Teach NCTM Standards</td>
<td>.54b</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Professional Development</td>
<td>.16</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Textbook Driven</td>
<td>.40b</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Instructional Strategies</td>
<td>-.19</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Student Centered Learning</td>
<td>.13</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Teacher Management</td>
<td>.20</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Instructional Time</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>
Note. *positive value means the effect between schools making AYP scoring higher than schools not making AYP, b means there is a moderate effect between groups.

To tell if there was any relationship between the curriculum, instruction, or assessment questions, an ANOVA test was calculated. The significance level was 0.05, so any p-value that is less than 0.05 was significant. For the three levels of target courses the ANOVA test have significant results in the areas of instruction and assessment. See Appendix F for the statistical tables. The results were:

- for curriculum $F(2, 160) = 1.03, p = 0.359$;
- for instruction $F(2, 160) = 5.64, p = 0.004$; and
- for assessment $F(2, 160) = 4.19, p = 0.017$.

Since there were significances found for instruction and assessment questions, SPSS calculated a Tukey HSD Post Hoc Test. This Post Hoc test results were on level 1 teachers’ and level 3 teachers’ instruction questions. Level 2 teachers and level 3 teachers had a significant difference in their means. On the assessment questions only level 1 teachers and level 3 teachers had a significant difference in their means.

$t$-Test

When there are only two groups of teachers’ responses to compare like those in schools making AYP and those in schools not making AYP, the $t$-test of significance is calculated instead of ANOVA. None of the $t$-test values were significant at the 0.05 level. See Appendix F for the statistical results. There was no significant difference between the teachers’ responses in schools making AYP and the teachers’ responses in schools not making AYP in the areas of curriculum, instruction, or assessment.
CHAPTER FIVE: DISCUSSION

This chapter will summarize the results from the teacher’s questionnaire for the Wyoming high school mathematics teachers and school districts. Suggestions will be given for future studies. A caution, however, is “educational research . . . provides general direction that must be interpreted by individual districts, schools, and teachers in terms of their unique circumstances” (Marzona, 2007, p. 5).

Questionnaire Limitations

The questionnaire is “a cost-effective and efficient technique for collecting large amounts of data from many respondents, but its limitations are well known” (Robitaille & Travers, 1992, p. 708). The limitation of biased responses brings cautions when “the data were collected by self-report, and . . . were responding to a brief, written questionnaire” (Hawkins, Stancavage, & Dossey, 1998, p. 5; see also Chval, Grouws, Smith, Weiss, & Ziebarth, 2006, p. 47). Even though this instrument had high reliability (0.896), and many questions had been tested with teachers, “respondents [are] working in different contexts or . . . may have interpreted some of the questions differently” (Hawkins, Stancavage, & Dossey, 1998, p. 5). When you have simple Likert scale words, there is an intrinsic variation with the respondents. The interpretation of the response “Often” by one person is different from the interpretation of the next person. This is true even when the survey participants are from the same school or in the same town. There will be variation of data. Data are not always as clear and as clean as expected. Personality and experiences also influences choices on the instrument. Using a different method of gathering data rather than a self-reporting questionnaire may show additional variation
between the levels of courses or between the schools that did not shown any significance with this research method and data.

The timing of the survey and offer of an incentive promoted a very good response rate (55.87%). A suggestion for improvement would be to get more of the teachers who were non-responses to complete the questionnaire by additional follow-up.

Results

Background

It is important to know the critical factors that must be present in order for students to be proficient as defined in NCLB. These factors are embedded within the Wyoming State statues Title 21, called the Wyoming Education Code of 1969, (Title 21, 2006). Teachers must be aware of what the Wyoming high school students’ mathematics already know and what skills they need to learn in order to be proficient on the PAWS, Performance Assessment of Wyoming Students. School districts provide the teachers with assessment scores from students in their classroom. The results for each school’s latest scores regarding the AYP status and the district’s results in regard to NCLB are also shared with teachers. Another suggestion for improvement would be an onsite visit. During onsite visits, observers should ask teachers how they specifically use the supplied data to make changes in their classroom instruction and assessments.

The questionnaire was created to answer the questions, “Are mathematics teachers’ practices in curriculum, instruction, and assessment related to their schools making adequate yearly progress, AYP?” and “Does the mathematics course level affect the practices in curriculum, instruction, and assessment?”
Curriculum

There were no significant differences found in the curriculum questions for any level of teacher’s courses or any school’s AYP designation. The ANOVA results for the three levels of courses showed no significant differences. The t-test for the schools that made AYP and schools that did not make AYP showed no significant differences. The data from this questionnaire adds more evidence to support the conclusion that the “schools make little difference” in test scores, but “an individual teacher can have a powerful effect” on student’s achievement (Marzona, Pickering, & Pollack, 2001, p. 2).

Because some of the curriculum questions had higher mean scaled scored than instructional or assessment questions, curriculum issues clearly did have an influence on the teachers’ responses on the questionnaire. When planning lessons, it appears that teachers do stay focused on the curriculum topics of the using standards (question 1) or the curriculum presented in the textbook (question 21).

The curriculum questions for all teachers’ responses were:

- question 1 – using standards (3.54),
- question 2 – using PAWS results (2.34),
- question 4 – teacher collaboration (2.93), and
- question 21 – textbook driven (3.51).

Two of these four questions were in the top five means for all teachers.

The curriculum questions for the level 1 teachers’ responses were:

- question 1 – using standards (3.54) and
- question 21 – textbook driven (3.47).
These two questions were in the top five means for level 1 teachers.

The curriculum questions for the level 2 teachers’ responses were:

- question 1 using standards (3.50) and
- question 21 – textbook driven (3.51).

These two questions were in the top three means for level 2 teachers.

The curriculum questions for the level 3 teachers’ responses were:

- question 1 – using standards (3.69) and
- question 21 – textbook driven (3.56).

These were in the top five means for level 3 teachers.

The curriculum questions for the schools making AYP were:

- question 1 – using standards (3.59) and
- question 21 – textbook driven (3.55).

These were in the top three means for the schools making AYP.

The curriculum questions for the schools not making AYP were:

- question 1 – using standards (3.35) and
- question 21 – textbook driven (3.37).

These were in the top five means for the schools not making AYP.

Because national and state tests like NAEP and PAWS follow the curriculum content of the NCTM Standards, districts have aligned the curriculum to these standards (NAEP, 2007, para. 4). It is expected that the teachers to teach toward these standards (Hawkins, Stancavage, & Dossey, 1998, p. 47). The curriculum should be designed for 100% of the students to reach the proficient level by 2014.
There were significant differences in the means of the instruction questions for two out of the three levels of courses. The ANOVA results showing significance was followed by a Tukey HSD comparison test. There was differences in the means (0.004) between teachers teaching the level 1 and 3 courses and differences in means (0.015) between teachers teaching the level 2 and 3 courses. This implies a difference in the instruction responses between teachers teaching courses which contain content below Algebra 1 topics (level 1) and the teachers teaching course which teach an honors or accelerated course (level 3). There were differences in the instruction responses between teachers teaching courses which contain regular course content (level 2) and the teachers teaching course which teach an honors or accelerated course (level 3).

Do the frequencies and types of activities that the teacher reports on the survey really reflect what is happening in the classroom (Robitaille & Travers, 1992, p. 708; Chval, Grouws, Smith, Weiss, & Ziebarth, 2006, p. 47)? While the majority of teachers report that they are aware of and are using reform instructional methods, when the teachers were observed, the observations showed “that many secondary students are not being given the opportunity to learn through reform-based practices” (Wainwright, Morrell, Flick, & Schepige, 2004, p. 322; see also Stigler & Hiebert, 1999, p. 12). Not observing the frequency and type of instruction students receive over the course is a definite limitation of this research project.

The t-test for the mean differences in the schools that made AYP and schools that did not make AYP showed no significant differences between the schools.
Instruction questions analyzed on the questionnaire were:

- question 2 – PAWS results (2.34),
- question 4 – teacher collaboration (2.93),
- question 5 – teacher readiness (3.31),
- question 6 – teaching NCTM Standards (3.32),
- question 7 – professional development (2.34),
- question 22 – student centered learning (3.62),
- question 22 – instructional strategies (3.52),
- question 22 – teacher management (3.47), and
- question 23 – instructional time (2.19).

The three parts of question 22 were in top five means for all the teachers.

In instruction, question 22 – student centered learning had the highest means for:

- all the teachers (3.62),
- level 2 (3.61), and
- level 3 (3.78).

- level 1 (3.51) had the second highest mean.

Researchers found that “an emphasis on student-centered instruction actually increased the differences in science achievement between boys and girls” (Marzano, Pickering, & Pollack, 2001, p. 9). Instruction issues were the other large influence on the teachers’ responses on the questionnaire. This implies that Wyoming high school mathematics teachers care about the delivery of instruction they give and have instruction focused on the students. Teachers care about aligning instruction to the standards (Hawkins, Stancavage, & Dossey, 1998, p. 47).
Teachers do care whether the instruction is providing the opportunity for every student to learn the curriculum topic in an optimal manner.

For the level 1 teachers, the top instruction means were:

- question 22 – instructional strategies (3.57),
- question 22 – student centered learning (3.51), and
- question 22 – teacher management (3.44).

The three parts of question 22 finished in the top five means for level 1 teachers.

For the level 2 teachers, the top instruction means were:

- question 22 – instructional strategies (3.46),
- question 22 – student centered learning (3.61), and
- question 22 – teacher management (3.44).

The three parts of question 22 finished in the top five means for level 2 teachers.

For level 3 teachers, the top instruction means were:

- question 22 – instructional strategies (3.69),
- question 22 – student centered learning (3.78), and
- question 22 – teacher management (3.64).

The three parts of question 22 finished in the top four means for level 3 teachers.

For the schools making AYP, the top instruction means were:

- question 22 – instructional strategies (3.50),
- question 22 – student centered learning (3.63), and
- question 22 – teacher management (3.49).

The three parts of question 22 finished in top five means for schools making AYP.

For the schools not making AYP, the top instruction means were:
• question 22 - instructional strategies (3.57),
• question 22 – student centered learning (3.56),
• question 22 – teacher management (3.40).

The three parts of question 22 finished in the top three means for schools not making AYP. The individual teacher still chooses what to teach and when to teach. Even if teachers are in the same school and are “using the same textbook, they still make independent decisions about what to teach . . . . and depth of instruction” (Paek, 2008, p. 9).

Assessment

The ANOVA results indicated one significant difference in the means (0.015) of the assessment questions between the level 1 and level 3 courses. The t-test for the schools that made AYP and schools that did not make AYP showed no significant differences in the means between the schools. “Because of the complexity of the context in which learning takes place, examining a single variable at a time and its sole relationship to student achievement may not necessarily reveal the true underlying relationships between background factors and students’ cognitive performance” (Hawkins, Stancavage, & Dossey, 1998, p. 5). “In addition, the reader should remember that statistically significant differences may be differences that are not considered educationally significant” (Hawkins, E.F., Stancavage, F.B., Dossey, J.A., 1998, p. 5).

None of the assessment questions had means in the top five for any of the levels of course or school AYP designation.

The assessment questions results for all teachers were:

• question 3 – time preparation for testing (2.99),
• question 4 – teacher collaborating (2.93), and
• question 24 – assessment used (2.45).

For the level 1 the means were:
• question 3 – time preparation for testing (2.64),
• question 4 – teacher collaborating (2.80), and
• question 24 – assessment used (2.50).

For the level 2 the means were:
• question 3 – time preparation for testing (3.00),
• question 4 – teacher collaborating (2.89), and
• question 24 – assessment used (2.42).

For level 3 the means were:
• question 3 – time preparation for testing (3.35),
• question 4 – teacher collaborating (3.22), and
• question 24 – assessment used (2.39).

For the schools making AYP the means were:
• question 3 – time preparation for testing (2.95),
• question 4 – teacher collaborating (2.88), and
• question 24 – assessment used (2.45).

For the schools not making AYP the means were:
• question 3 – time preparation for testing (3.14),
• question 4 – teacher collaborating (3.08), and
• question 24 – assessment used (2.35).
Effect Size

What accounts for the effect size in the differences of the means between level 1 and level 3 on question 3 - time preparation for testing (-0.83) and question 5 – teacher readiness (-0.82)? “Effective teachers appear to be effective with students of all achievement levels,” so the if the teacher is effective, the level of class taught should not make a difference (Marzona, Pickering, & Pollack, 2001, p. 3). The data reveals that there is a difference in the means. Question 3 – time preparation for testing had a mean, which was:

- largest (-0.83) between the lower level (1) and honors (3) teachers;
- moderate (-0.47) between the regular level (2) and the honors (3) teachers; and
- moderate (-0.43) between the lower level (1) and the regular level (2) teachers.

Question 5 - teacher readiness had a mean, which was:

- large (-0.82) between the lower level (1) and the honors level (3) teachers; and
- moderate (-0.49) between the lower level (1) and regular level (2) teachers.

The remaining moderate effect sizes were:

- question 22 - instructional strategies (-0.59) between level 2 and 3 teachers;
- question 22 - student centered learning (-0.51) between level 1 and 3 teachers;
- question 6 - teaching NCTM Standards (-0.49) between level 2 and 3 teachers;
- question 4 - teacher collaboration (-0.48) between level 1 and 3 teachers;
- question 22 - teacher management (-0.43) between level 1 and 3 teachers.

There were only moderate effect size for schools making AYP and those schools, which did not make AYP, were positive. The effect sizes were:
• question 6 – teaching NCTM standards (0.54);
• question 5 – teacher readiness (0.48); and
• question 21 – textbook driven (0.40).

Suggestions for Further Research

The results showed differences between some topics and some levels of courses. The differences cannot be answered by the statistical analysis done. Some questions a researcher should consider to uncover the reasons are:

• Do honors level teachers incorporate test preparation within the normal lessons throughout the school year and not count this time as test preparation time?
• How do the teachers teaching different level courses prepare and present a lesson?
• Do the teachers change the lessons, activities, quizzes, and tests from year to year for a particular level of course?
• How do the teachers pace the curriculum material throughout the entire course?
• Why do the teachers in schools which make AYP feel more prepared to teach the broad five NCTM Standards than the teachers in schools which did not make AYP?
• Do the level 3 teachers only want to focus on a limited amount of mathematics content in order to “become experts” at that content level?
• This study included 29 lower level teachers and 26 honors level teachers. Is a larger sample size needed?

If classroom and school visits did occur, the researcher needs to:

• Talk to the teachers by asking probing questions.
• Listen to how they prepare and present a lesson or plan a unit.

• Note any insights about the similarities that teachers do whether they teach level 1, level 2, or level 3 classes.

• View the pacing of the lessons, activities, and assessments.

• Determine the teachers’ personal demographics – age, gender, degrees held.

• Determine the professional demographics for the teacher’s teaching level 1, level 2 and level 3 courses.

• Determine the personal and professional demographics for the teachers in schools that have made AYP and schools that have not made AYP.

Under the NCLB Act, schools have yearly increasing AYP targets that all student subgroups in a school must achieve. By 2014, all students in all subgroups must be 100% proficient (NCLB Annual Report, 2005, p. 1). With this goal fast approaching, teachers do not have much time to insure all the key factors of curriculum, instruction, and assessment are in place to insure success for all the students in Wyoming. Further study is needed to observe and document specific instructional strategies and assessment that occur. Researchers need to observe what effective teachers at whichever level of course or in whatever AYP designated school do to help students be successful at achieving proficiency in mathematics.
REFERENCES


http://web.uccs.edu/lbecker/Psy590/escalc3.htm


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http://www.pdkintl.org/kappan/kbla9810.htm


http://pareonline.net/getvn.asp?v=8&n=9


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National Council of Teachers of Mathematics.

standards for school mathematics*. Reston, VA: National Council of Teachers of
Mathematics.


teaching mathematics*. Reston, VA: National Council of Teachers of
Mathematics.


Press.


www.ed.gov/nclb/overview/intro/execsumm.html


http://www.k12.wy.us/SAA/standards/math.pdf


http://www.k12.wy.us/A/2005_pr/NAEP.pdf
APPENDIX A

INSTITUTIONAL BOARD REVIEW APPROVALS
Dear Mary:

This letter is to officially notify you of the approval of your project by the Institutional Review Board (IRB) for the Protection of Human Subjects. It is the Board’s opinion that you have provided adequate safeguards for the rights and welfare of the participants in this study. Your proposal

The Relationship between Curriculum, Instruction, and Assessment Provided By Wyoming High School Mathematics Teachers and the Performance of Wyoming 11th Grade Students on the Adequate Yearly Progress of Wyoming Schools

was reviewed in compliance with this institution’s Federalwide Assurance 0000255 and the DHHS Regulations for the Protection of Human Subjects (45 CFR 46).

Date of IRB Review: 11/29/06.

You are authorized to implement this study as of the Date of Final Approval, 12/4/06. This approval is Valid Until: 12/4/07.

1. Enclosed is the IRB-approved Consent form for this project. Please use this form when making copies to distribute to your participants. If it is necessary to create a new informed consent form, please send us your original so that we may approve and stamp it before it is distributed to participants.

2. Please send us back signed copies of the letter the superintendent’s signed. We will send you an e-mail, acknowledging receipt of the superintendent’s letter. You must submit these and wait for a response from the IRB before you recruit participants. You may submit the superintendent’s letters individually for approval.

We wish to remind you that the principal investigator is responsible for reporting to this Board any of the following events within 48 hours of the event:

- Any serious event (including on-site and off-site adverse events, injuries, side effects, deaths, or other problems) which is in the opinion of the local investigator was unanticipated, involved risk to subjects or others, and was possibly related to the research procedures.
- Any serious adverse or unintentional change to the IRB-approved protocol that involves risk or has the potential to recur.
- Any publication in the literature, safety monitoring report, interim report or other finding that indicates an unanticipated change to the risk/benefit ratio of the research.
- Any breach in confidentiality or compromise in data privacy related to the subject or others; or
- Any complaint of a subject that indicates an unanticipated risk or that cannot be resolved by the research staff.

For projects which continue beyond one year from the starting date, the IRB will request continuing review and update of the research project.

Your study will be due for continuing review as indicated above. The investigator must also advise the Board when this study is limited or discontinued by completing the enclosed Protocol Final Report form and returning it to the Institutional Review Board.

If you have any questions, please contact Shirley Horstman, IRB Administrator, at 472-9417 or email shorstman1@unl.edu.

Sincerely,

Shirley Horstman
IRB Administrator

cc: Faculty Advisor
From: pswanson2@unlnotes.unl.edu
Subject: NUgrant Message - IRB Project Approved
Date: Mon, 3 Dec 2007 12:00:02 -0600
To: mcxoler@tribesp.com

Your project has been approved by the IRB.

Approvers Comments:

Ms. Holer and Dr. Fowler-

Project - The Relationship between the curriculum, instruction, and assessment provided by Wyoming High School Mathematics Teachers and the performance of Wyoming 11th grade students on the adequate yearly progress of Wyoming schools

Your request for Continuing Review has been received, reviewed and approved.

A copy of the approval letter will be uploaded onto NUgrant as well as any informed Consent Forms/ Surveys/ Handouts you may have associated with your project.

If you have any questions please don't hesitate to call me. I am here to help you with your project in any way I can.

Thank you and good luck with your project!

Patty Swanson
472-6907

==================================================================================

This message has been sent to you through NUgrant. To view project/form you can click the link below.

Link: https://nugrant.unl.edu/irb/projectDetails.php?ReferenceMessageID=2441

If you have any NUgrant questions you can contact nugrant@unl.edu for help.
APPENDIX B

SUPERINTENDENT REQUESTS
December 11, 2006

Dear [Superintendent's Name],

I am a mathematics teacher at Kelly Walsh High School and a doctoral student in Teaching, Learning, and Teacher Education at the University of Nebraska-Lincoln. I would appreciate your assistance in providing permission for the high school (grades 9–12) mathematics teachers in your district to participate in this dissertation research study.

As you know, mathematics teachers are dealing with many new mandates due to the standards movement and the No Child Left Behind Act of 2001. The purpose of this research is to determine whether the teachers' practices in curriculum, instruction, and assessment are related to their schools' making adequate yearly progress, AYP. AYP is based on the 11th grade students' performance scores and participation rate on the mathematics section of the Performance Assessment of Wyoming Students, PAWS. The analysis of the survey will provide information for Wyoming school districts and teachers to consider when improving the teaching of mathematics and student learning at the high school level.

Eighty-three high schools in Wyoming were selected to participate in this study, and one or more schools from your district have been identified. Participation in this survey is completely voluntary, and teachers can withdraw at any time without harming the relationship with the researchers or the University of Nebraska Lincoln. The proposed research is expected to involve no risk to the participants. Completion of the survey should take only about 20–30 minutes. No information identifying specific teachers, schools, or districts will be released or published.

If you have any questions or comments about this study, please contact me. The telephone number at Kelly Walsh High School is 233-2000, or 234-6354 is my home number. You may e-mail me at Mary_Moler@acsd.k12.wy.us or mmoler@srbcsp.com. Also, if you have questions or concerns about research participants' rights, you may call the University of Nebraska-Lincoln Institutional Review Board at (402) 472-6665.

Please sign and return the enclosed letter in the pre-addressed, stamped envelope (or may fax the enclosed letter) if you grant permission for me to conduct this research study with the high school mathematics teachers in your school district. I would appreciate if the permission letter is returned by January 8, 2007. Thank you very much for your consideration of this request.

Have a great day!

Sincerely,

Mary Moler
Mathematics Teacher
Kelly Walsh High School
307-233-2000
Mary_Moler@acsd.k12.wy.us
1625 Holly Street
Casper, WY 82604-3217
307-234-6354
mmoler@srbcsp.com
Dear Miss Mary Moler,

As superintendent of ___________________________ County School District # ____________, I give permission for
the high school teachers in my district to participate in the research study previously described.

Superintendent's Signature

Date

Please return this sheet to:

Mary Moler
1625 Holly Street
Casper, WY 82604-3227

or Fax to:

Attention: Mary Moler
Kelly Walsh High School
307-232-2066
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<th>City</th>
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<td>Brad LaCroix</td>
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<tr>
<td>Troy Claycomb</td>
<td>Weston County School District #7</td>
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APPENDIX C

PRINCIPAL REQUESTS
January 11, 2007

Dear Principal,

I am a mathematics teacher at Kelly Walsh High School and a doctoral student in Teaching, Learning, and Teacher Education at the University of Nebraska-Lincoln. I would appreciate your assistance in supporting this research study. I have received permission from the superintendent of your school district to survey high school mathematics teachers in the school district.

Mathematics teachers, as you know, are dealing with many new mandates due to the standards’ movement and the No Child Left Behind Act of 2001. The purpose of this research is to determine whether the teachers’ practices in curriculum, instruction, and assessment are related to their schools’ making adequate yearly progress, AYP. AYP is based on the 11th grade students’ performance scores and participation rate on the mathematics section of the Performance Assessment of Wyoming Students, PAWS. The analysis of the survey will provide information for Wyoming school districts and teachers to consider when improving the teaching of mathematics and student learning at the high school level.

Eighty-three high schools throughout Wyoming were selected to participate in this study, and your school from your district has been identified. All of the high school mathematics teachers in the school are going to be asked to complete a survey. Participation in this survey is completely voluntary, and teachers can withdraw at any time without harming the relationship with the researchers or the University of Nebraska-Lincoln. The proposed research is expected to involve no risk to the participants. Completion of the survey should take only about 20–30 minutes. No information identifying specific teachers, schools, or districts will be released or published. The coding in the corner of the survey is for tracking purposes only.

In order that I do not miss any teachers in your school, I need the names and school email addresses of all the grade 9-12 mathematics teachers in your school. The email addresses will be used only to remind the teachers of the survey deadline. The surveys should arrive by US mail at the school’s address about February 5, 2007. I will send you a copy of the survey as a courtesy at the same time. The teachers will need to have the survey returned prior to March 5, 2007, in order to facilitate the research and in order for the teachers to be entered into an incentive drawing.

If you have any questions or comments about this study, please contact me. The telephone number at Kelly Walsh High School is 233-2000, or 234-6354 is my home number. You may e-mail me at Mary.Moler@ncsd.k12.wy.us or mmcoler@tribesp.com. Also, if you have questions or concerns about research participants’ rights, you may call the University of Nebraska-Lincoln Institutional Review Board at (402) 472-6965.

Before January 19, 2007, please complete the enclosed form and return it in the pre-addressed, stamped envelope; send the information electronically to mmcoler@tribesp.com; or fax it to me at 307-233-2066. If you would like to receive an executive summary of the results, please note this on the enclosed address form. Thank you very much for your consideration of this request.

Have a great day!

Sincerely,

Mary Moler
Mathematics Teacher
Kelly Walsh High School
307-233-2000
Mary.Moler@ncsd.k12.wy.us
1025 Holly Street
Casper, WY 82604-3227
307-234-6354
mmcoler@tribesp.com

Dear Miss Mary Moler,

As principal of Jackson Hole High School, I am providing a list of the grade 9-12 mathematics teachers and their email addresses for the research study you are conducting.

Would you like an executive summary of the results of the research survey? (Circle one circle.)

- [ ] Yes
- [ ] No

Principal's Signature               Date

The school's enrollment in grades 9-12 is ___________ students.

<table>
<thead>
<tr>
<th>Teacher's Name (e.g. Jane Doe)</th>
<th>School email address (e.g. <a href="mailto:Jane.Doe@k12wy.us">Jane.Doe@k12wy.us</a>)</th>
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Please return this sheet to:

Mary Moler
1622 Kelly Street
Casper, WY 82601-3227

or Fax to:

Attention: Mary Moler
Kelly Welsh High School
207 223-2066

or email to:

mcander@stary.com

118 Henze Hall / P.O. Box 880355 / Lincoln, NE 68588-0355 / (402) 472-2331 / FAX (402) 472-2037
APPENDIX D

TEACHER REQUESTS
Dear Mathematics Teacher,

Hello! Mathematics teachers, as you know, are dealing with many new mandates due to the standards movement and the No Child Left Behind Act of 2001. I have been teaching mathematics for 28 years in the Natrona County School District, presently at Kelly Walsh High School in Casper, Wyoming. I am about to attend a seminar on Teaching, Learning, and Teacher Education at the University of Nebraska-Lincoln. I would appreciate your assistance in providing information for a research study.

The purpose of this research is to determine whether the teachers' practices in curriculum, instruction, and assessment are related to their students' meeting state and national standards. The study will be conducted during the fall of 2007. The results of the study will be used to inform the development of professional development opportunities for mathematics teachers.

You have been selected to participate in this study as a Wyoming high school mathematics teacher. Participation in this survey is voluntary; there is no known risk, and you can withdraw at any time without harming the relationship with the researchers, the University of Nebraska-Lincoln, or your school.

The survey should take only about 20-30 minutes of your time. By returning this completed survey, you are consenting to participate in the study. Please complete the enclosed survey and return it in the enclosed self-addressed envelope. If you return the survey prior to the deadline, you will be entered into a drawing for one of five $25 VISA gift cards. The drawing will be held on March 2, 2007.

Your answers will be confidential. No information identifying specific teachers, schools, or districts will be released or published. The coding in the corner of your survey is for tracking purposes only.

If you have any questions about this study, I would be happy to talk with you. The telephone number at Kelly Walsh High School is 307-224-3200, or 324-6384 at my home; you may e-mail me at Mary.Moler@nood.k12.wy.us or mcmaddle@khsl.com, or you may contact my advisor, Dr. David Powers at 307-224-3310. All other questions about this study should be directed to the University of Nebraska-Lincoln Institutional Review Board at 307-224-3131.

Thank you very much for your assistance. Have a great day!

Sincerely,

Mary Moler
Mathematics Teacher
Kelly Walsh High School
307-224-3200
mcm Flavor@nood.k12.wy.us
118 Winter West / P.O. Box 880355 / Lincoln, NE 68588-0355 / (402) 472-1321 / Fax (402) 472-2037
How to Complete the Questionnaire

Most of the questions instruct you to “circle one” or “darken one.” For a few questions, you are asked to write in your answer on the line provided. Please use a #2 pencil or black or blue pen to complete this questionnaire. Be sure to erase or white out completely any stray marks.

Target Class

Part of the questionnaire asks you to provide information about a particular “target” class. Please consider your second period or block mathematics class as the target class. If this is your planning time, please use your first mathematics class as the target class. If your schedule varies by day, use today’s schedule or the most recent school day. If you are not teaching math at this time, please think back to a class you taught last semester or last year.

If You Have Questions

If you have questions about the study or any items in this questionnaire, please contact me at Kelly Walsh High School – 307-233-2000 or 307-234-6354 (home) or email at Mary_Moler@ncsd.k12.wy.us or mcmoler@tribesp.com (home).

Drawing Deadline

If you return your completed questionnaire before Monday, March 5, 2007, your name and phone number will be separated from the questionnaire and entered into a drawing for one of three VISA Gift cards. The first name drawn will receive a $100 VISA Gift card. A $75 VISA Gift card will be awarded to the second name drawn. A $50 VISA Gift card will be awarded to the third name drawn. The VISA Gift cards should be accepted anywhere VISA is accepted and can be used for a tank of gas, a dinner at your favorite restaurant, or a special gift for you – your choice. (You may wish to date and copy your completed questionnaire, if there is a question about returning it prior to March 5th.)

Thank you very much. Your participation is greatly appreciated. Please return the completed questionnaire in the postage-paid envelope.

Mary Moler
Teacher Survey
1625 Holly Street
Casper, WY 82604-3227
Wyoming High School Mathematics Teacher Questionnaire

UNL IRB Project # 2006-11-119 EP

Note: Survey items are modified and reprinted with permission from the Center for the Study of Mathematics Curriculum, the National Science Foundation, the RAND Corporation, and Horizon Research, Inc.

National Mathematics Standards have been written and revised since 1989. The state of Wyoming requires the district's curriculum to be aligned to the Wyoming Mathematics Content and Performance Standards since July 2003.

Shade circles like this: ✡
Not like this: ☐ ☐

1. About how often do you use or consider the Wyoming Mathematics Content and Performance standards when doing the following activities?
   a. Planning the content of my lessons.
   b. Planning the instructions to be used.
   c. Planning the assessments to be used.

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<th>Rarely</th>
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   a. |       |       |          |       |        |
   b. |       |       |          |       |        |
   c. |       |       |          |       |        |

Performance Assessment of Wyoming Students, PAWS, is the assessment given annually either in January or March to high school juniors in accordance with the No Child Left Behind Act of 2001.

2. About how often this year are you using the school's PAWS results in your classroom?
   a. I use the school's PAWS results when planning the curriculum.
   b. I use the school's PAWS results when planning lessons.
   c. I use the school's PAWS results when assessing students.

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<th>Sometimes</th>
<th>Often</th>
<th>Always</th>
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</table>
   a. |               |       |        |           |       |        |
   b. |               |       |        |           |       |        |
   c. |               |       |        |           |       |        |

3. How has your instructional time changed for the following test preparation over the past 3 years?
   a. For district required math test(s).
   b. For state-wide tests (e.g., PAWS).
   c. For national tests (e.g., PSAT, SAT, ACT).

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   a. |               |           |           |                   |
   b. |               |           |           |                   |
   c. |               |           |           |                   |

4. About how often do you and your colleagues do the following?
   a. Collaborate on math curriculum.
   b. Collaborate on math instruction.
   c. Collaborate on creating math assessments.
   d. Collaborate on scoring student assessments.

<table>
<thead>
<tr>
<th></th>
<th>Does Not Apply</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Always</th>
</tr>
</thead>
</table>
   a. |               |       |        |           |       |        |
   b. |               |       |        |           |       |        |
   c. |               |       |        |           |       |        |
   d. |               |       |        |           |       |        |
Within mathematics, many teachers feel better prepared to teach some topics than others.

5. How well prepared do you feel to teach each of the following topics, whether or not it is currently included in your curriculum?

<table>
<thead>
<tr>
<th>Topic</th>
<th>Not Adequately Prepared</th>
<th>Somewhat Prepared</th>
<th>Fairly Well Prepared</th>
<th>Very Well Prepared</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Estimation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Measurement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Pre-Algebra</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Algebra</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Patterns and relationships</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Geometry and spatial sense</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. Functions (including trigonometric) and pre-calculus concepts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. Data collection and analysis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Probability</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>j. Statistics (e.g., hypothesis tests, regression)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>k. Calculus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>l. Topics from discrete mathematics (including combinatorics, graph theory, recursion)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>m. Technology (calculators, computers) in support of mathematics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When teaching mathematics, many teachers feel better prepared to guide and help develop student learning in some domains than in others.

6. How well prepared do you feel to teach each of the following GRADE(S) LEVEL YOU TEACH, whether or not it is currently included in the curriculum?

<table>
<thead>
<tr>
<th>Topic</th>
<th>Not Adequately Prepared</th>
<th>Somewhat Prepared</th>
<th>Fairly Well Prepared</th>
<th>Very Well Prepared</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Problem Solving</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Reasoning &amp; proof</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Communication (written and oral)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Connections within mathematics and from mathematics to other disciplines</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Multiple representations (e.g., concrete models, and numeric, graphical, symbolic, and geometric representations)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Professional development can be effective if it is well-designed, implemented, and supported.

7. How interested are you in each of the following types of professional development opportunities?

<table>
<thead>
<tr>
<th>a. Deepening my own mathematics content knowledge.</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ Not interested ○ Somewhat Interested ○ Very Interested ○ Does Not Apply</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>b. Focusing on understanding student thinking in mathematics.</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ Not interested ○ Somewhat Interested ○ Very Interested ○ Does Not Apply</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>c. Focusing on teaching strategies to enhance student engagement &amp; learning in math.</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ Not interested ○ Somewhat Interested ○ Very Interested ○ Does Not Apply</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>d. Focusing on questioning strategies to enhance student engagement &amp; learning in math.</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ Not interested ○ Somewhat Interested ○ Very Interested ○ Does Not Apply</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>e. Focusing on the use of mathematics curriculum materials.</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ Not interested ○ Somewhat Interested ○ Very Interested ○ Does Not Apply</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>f. Focusing on the use of technology to support mathematics teaching &amp; learning.</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ Not interested ○ Somewhat Interested ○ Very Interested ○ Does Not Apply</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>g. Focusing on learning how to assess student learning in mathematics.</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ Not interested ○ Somewhat Interested ○ Very Interested ○ Does Not Apply</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>h. Observing other teachers teaching mathematics and discuss with them their decisions and teaching strategies.</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ Not interested ○ Somewhat Interested ○ Very Interested ○ Does Not Apply</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>i. Meeting regularly with a local group of teachers to study/discuss mathematics teaching issues.</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ Not interested ○ Somewhat Interested ○ Very Interested ○ Does Not Apply</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>j. Collaborating on mathematics teaching issues with a group of teachers at a distance using telecommunications.</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ Not interested ○ Somewhat Interested ○ Very Interested ○ Does Not Apply</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>k. Attending national or regional mathematics conference/meeting.</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ Not interested ○ Somewhat Interested ○ Very Interested ○ Does Not Apply</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>l. Attending the state mathematics conference/meeting.</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ Not interested ○ Somewhat Interested ○ Very Interested ○ Does Not Apply</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>m. Applying for National Board for Professional Teaching Standards Certification.</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ Not interested ○ Somewhat Interested ○ Very Interested ○ Does Not Apply</td>
</tr>
</tbody>
</table>

8. How many mathematics classes are you teaching? ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 or more
Please answer the following questions 89-242 for your SECOND PERIOD OR BLOCK MATHEMATICS CLASS OF THE DAY. (If this is your planning time, please use your first mathematics class of the day.) This will be referred to as the target class.

9. What is the title of this target class? ________________________________

10. Is this target class considered and accelerated (i.e., ahead of normal) class? ○ Yes ○ No

11. What is the calendar duration of this target mathematics class? ○ Year ○ Semester ○ Quarter ○ Other (Please list.)

12. Approximately how many students are in this target class? ○ 10 or fewer ○ 11-15 ○ 16 - 20 ○ 21 - 25 ○ 26 - 30 ○ more than 30

13. Approximately what percentage of students in this class is officially classified as requiring special education services? ○ less than 25% ○ 25 - 49% ○ 50 - 74% ○ 75% or more

14. Approximately how many minutes are usually spent presenting and developing new mathematical concepts in this target class? ___________________________ (minutes)

15. Who is the publisher and what is the title for the textbook/program used with this target class? Publisher ___________________________ Title ___________________________

16. Please indicate the ISBN number of the mathematics textbook/program (or any module in the series) used most often for this target class. Note that the ISBN number is typically found on the page with the copyright and publication information. (If you use no textbook, write the resource you use most often.)

17. Which best describes the level at which the decision to use the mathematics textbook/program was made? ○ District level ○ School level ○ Individual teacher level

18. Over the course of the school year, approximately what percentage of the mathematics instructional time for this target class will use the above listed mathematics textbook/program? ○ less than 25% ○ 25 - 49% ○ 50 - 74% ○ 75 - 90% ○ more than 90%

19. Estimate the percentage of the above listed mathematics textbook/program you will cover during the school year with this target class? ○ less than 25% ○ 25 - 49% ○ 50 - 74% ○ 75 - 90% ○ more than 90%

20. How would you rate the overall quality of the above listed mathematics textbook/program for this target class? ○ Very Poor ○ Poor ○ Fair ○ Good ○ Very Good ○ Excellent

21. For each of the following, please indicate how often you use that mathematics textbook/program in this target class?

   a. The textbook guides the structure (content emphasis) of this class. ○ Never ○ Rarely ○ Sometimes ○ Often ○ Always

   b. I follow the textbook page by page. ○ Never ○ Rarely ○ Sometimes ○ Often ○ Always

   c. I pick what I consider important from the textbook and skip the rest. ○ Never ○ Rarely ○ Sometimes ○ Often ○ Always

   d. I follow my district's curriculum recommendations, regardless of what is in the textbook. ○ Never ○ Rarely ○ Sometimes ○ Often ○ Always

   e. I incorporate activities from other sources to supplement the textbook. ○ Never ○ Rarely ○ Sometimes ○ Often ○ Always

   f. I read and review suggestions in the textbook's teacher guide to plan lessons for this target class. ○ Never ○ Rarely ○ Sometimes ○ Often ○ Always

   g. I assign homework from the textbook. ○ Never ○ Rarely ○ Sometimes ○ Often ○ Always

   h. Students use their textbook during the mathematics lesson. ○ Never ○ Rarely ○ Sometimes ○ Often ○ Always
22. About how often do you do each of the following when you teach mathematics to this target class?

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Introduce content through formal presentations.</td>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
</tr>
<tr>
<td>b.</td>
<td>Pose close-ended questions.</td>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
</tr>
<tr>
<td>c.</td>
<td>Require students to use calculators/computers for learning or practicing skills.</td>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
</tr>
<tr>
<td>d.</td>
<td>Pose open-ended questions.</td>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
</tr>
<tr>
<td>e.</td>
<td>Ask students to look for alternative methods for solving a problem.</td>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
</tr>
<tr>
<td>f.</td>
<td>Engage the whole class in discussions.</td>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
</tr>
<tr>
<td>g.</td>
<td>Ask students to explain concepts to one another.</td>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
</tr>
<tr>
<td>h.</td>
<td>Encourage students to communicate</td>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
</tr>
<tr>
<td>i.</td>
<td>Require students to explain their reasoning when giving an answer.</td>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
</tr>
<tr>
<td>j.</td>
<td>Record, represent, or analyze data.</td>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
</tr>
<tr>
<td>k.</td>
<td>Have students write reflections about their learning.</td>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
</tr>
<tr>
<td>l.</td>
<td>Read and comment on student reflections.</td>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
</tr>
<tr>
<td>m.</td>
<td>Encourage students to use multiple representations (e.g., numeric, graphic, geometric, etc.).</td>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
</tr>
<tr>
<td>n.</td>
<td>Encourage students to collaborate with other students in solving a problem.</td>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
</tr>
<tr>
<td>o.</td>
<td>Engage the class in working on real world problems.</td>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
</tr>
<tr>
<td>p.</td>
<td>Help students see connections between mathematics and other disciplines.</td>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
</tr>
<tr>
<td>q.</td>
<td>Engage the class in hands-on lab activities.</td>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
</tr>
<tr>
<td>r.</td>
<td>Require students to do work which requires mastery of essential skills.</td>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
</tr>
<tr>
<td>s.</td>
<td>Assign mathematics homework.</td>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
</tr>
</tbody>
</table>
23. On average, what percentage of instructional time allotted to mathematics is spent on the following in this target class?

<table>
<thead>
<tr>
<th>Percentage</th>
<th>0 - 15%</th>
<th>16 - 30%</th>
<th>31 - 45%</th>
<th>46 - 60%</th>
<th>61 - 75%</th>
<th>76 - 100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Daily routines, interruptions and other non-instructional activities.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>b. Whole class lecture or discussions.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>c. Answering textbook or worksheet questions.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>d. Individual student reading text completing worksheets, etc.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>e. Small group work.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>f. Assess student progress by observing students.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>g. Assess student progress by using a checklist.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Assessment of student mathematical knowledge has become more critical in determining proficiency. Assessment activities include designing, developing, selecting, administering, scoring, recording, reporting, evaluating, and revising.

24. In general, about how often do the students in the target mathematics class take part in the following activities?

<table>
<thead>
<tr>
<th>Activity</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Work on extended math investigations or projects (a week or more in duration).</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>b. Make a formal presentation about a project to the entire class.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>c. Take a pre-assessment to determine what students already know.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>d. Take an embedded assessment in class activities to see if students are &quot;getting it&quot;.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>e. Take a multiple-choice, matching, true-false, or fill-in-the-blank test (for the majority of questions).</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>f. Take a constructed or open-ended response test or quiz.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>g. Collect their best mathematics work in a portfolio.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>h. Reflect on their learning in a journal.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>i. Be required to keep a notebook that is periodically reviewed by the teacher.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
Please provide me with some information about yourself. This will help me to understand what different groups are doing in a high school mathematics classroom. Your answers will be kept completely confidential.

25. Please write the name of the school district where you are presently teaching.

26. Please write the name of the school where you are presently teaching.

27. What is the grade configuration of your school?
   ○ K - 12   ○ 7 - 12   ○ 9 - 12   ○ 10 - 12   ○ Other ______________________ (Please list.)

28. Including this year, how many years have you:
   a. Taught at the K-12 level?
      ○ 1 - 4   ○ 5 - 10   ○ 11 - 15   ○ 16 - 20   ○ 21 - 25   ○ 26 or more
   b. Taught at this school?
      ○ 1 - 4   ○ 5 - 10   ○ 11 - 15   ○ 16 - 20   ○ 21 - 25   ○ 26 or more
   c. Taught in this school district?
      ○ 1 - 4   ○ 5 - 10   ○ 11 - 15   ○ 16 - 20   ○ 21 - 25   ○ 26 or more
   d. Taught math in this district or elsewhere?
      ○ 1 - 4   ○ 5 - 10   ○ 11 - 15   ○ 16 - 20   ○ 21 - 25   ○ 26 or more

29. What is your gender?  ○ Male  ○ Female

30. What is the highest level of education you hold?
   ○ Bachelor’s  ○ Master’s  ○ Educational Specialist  ○ Educational Doctorate  ○ Doctorate of Philosophy

31. In the box below, include any additional comments or ideas about the curriculum, instruction, or assessment in the mathematics classroom.

32. Please complete to enter in the drawing before Monday, March 5, 2007. This portion will be separately entered in the drawing.

   Your Name _____________________________ Phone _____________________________

   Thank you very much for taking time to participate in this survey!

   Return the survey in the pre-addressed envelope provided to:
   Mary Moler, Teacher Survey, 1625 Holly Street, Casper, WY 82604-3227
APPENDIX E

FOLLOW-UP REQUEST
To: teacher’s email address
From: mcmoler@tribcsp.com
Date: February 24, 2007

Dear Mathematics Teacher,

Several weeks ago, you were sent a teacher survey in the US mail. The survey asked questions about standards, PAWS results, your mathematical and pedagogical background, professional development, a target mathematics class, and the textbook/program, the instruction used, and the assessments given to the target class. To the best of my knowledge, your survey has not been returned. (If you have just sent it, please ignore this reminder.) Remember your answers will be completely confidential. No information identifying specific teachers, schools, or districts will be released or published.

The data from the teachers who have already responded is useful, but it does not give a complete picture without your unique perspective of what you do in your math classroom.

Remember, I need to have the survey completed and returned prior to March 5, 2007, in order for you to be entered into the drawing. Your opportunity to be entered to win a $100, $75, or $50 VISA Gift card is fast approaching.

I hope that you will complete and return the survey. If you have any questions or comments about this study, I would be happy to talk with you. The telephone number at Kelly Walsh High School is 233-2000 or 234-6354 at my home. You may e-mail me at Mary_Moler@ncsd.k12.wy.us or mcmoler@tribcsp.com. Also, if you have questions or concerns about research participants’ rights, you may call the University of Nebraska-Lincoln Institution Review Board at (402) 472-6965.

Thank you for assisting with this important survey. Have a great day!

Sincerely,

Mary Moler
Mathematics Teacher
Kelly Walsh High School
307-233-2000
Mary_Moler@ncsd.k12.wy.us
1625 Holly Street
Casper, WY 82604-3227
307-234-6354
mcmoler@tribcsp.com
APPENDIX F

SPSS RESULTS
Reliability

Warnings

The space saver method is used. That is, the covariance matrix is not calculated or used in the analysis.

Case Processing Summary

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valid</td>
<td>132</td>
<td>80.5</td>
</tr>
<tr>
<td>Excluded(a)</td>
<td>32</td>
<td>19.5</td>
</tr>
<tr>
<td>Total</td>
<td>164</td>
<td>100.0</td>
</tr>
</tbody>
</table>

a Listwise deletion based on all variables in the procedure.

Reliability Statistics

<table>
<thead>
<tr>
<th>Cronbach's Alpha</th>
<th>N of Items</th>
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## Descriptives

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|       | 1  | 29   | 3.0068         | .27449     | .05097           | 2.9023  | 3.1112  | 2.37   | 3.42   |
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|       | 3  | 25   | 3.2526         | .28311     | .05662           | 3.1357  | 3.3694  | 2.65   | 3.72   |
|       | Total| 163 | 3.0919         | .28692     | .02247           | 3.0475  | 3.1362  | 2.37   | 3.75   |

|       | 1  | 29   | 2.4473         | .41073     | .07627           | 2.2911  | 2.6036  | 1.71   | 3.50   |
|       | 2  | 109  | 2.5623         | .44333     | .04246           | 2.4781  | 2.6464  | 1.64   | 3.86   |
|       | 3  | 25   | 2.7943         | .51521     | .10304           | 2.5816  | 3.0070  | 1.79   | 3.79   |
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## ANOVA

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## Post Hoc Tests

### Multiple Comparisons

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*: The mean difference is significant at the 0.05 level.
T-Test

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