2017

Relationship Between Teachers' Use of Academic Progress Data and Students' Test Scores

Amanda Egan Egan
Walden University

Walden University

COLLEGE OF EDUCATION

This is to certify that the doctoral study by

Amanda Egan

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. Amy White, Committee Chairperson, Education Faculty
Dr. Keren Meister-Emerich, Committee Member, Education Faculty
Dr. Beate Baltes, University Reviewer, Education Faculty

Chief Academic Officer

Eric Riedel, Ph.D.

Walden University
2017

Abstract

Relationship Between Teachers' Use of Academic Progress Data and Students' Test Scores

by

Amanda Egan

MA, Salem State University, 2008

BS, Worcester Polytechnic Institute, 2001

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

Walden University

February 2017

Abstract

A small private secondary school in Mexico implemented periodic progress testing with the intention of individualizing education of its students. The relationship between teachers' use of Measures of Academic Progress (MAP) data and students' mathematics and reading gain scores was not known. The purpose of this study was to determine whether the frequency of teachers' use of MAP data or student profiles was related to students' MAP mathematics and reading test gain scores between 2 years of test administrations. The theoretical framework for the study was Dewey's, Kolb's, and Vygotsky's ideas on pragmatism and constructivism, which support students' opportunities for growth in learning through realization of their strengths and talents. The mathematics and reading MAP gain scores of 76 students were examined, along with 8 teachers' responses from a questionnaire on teachers' frequency of use of MAP data or student profiles. Data were analyzed using analyses of variance. Results indicated significant differences in students' MAP gain scores in reading when their teachers reported using MAP data at least once per week ($F = 4.086$, $p = 0.001$) or online student profiles at least once per month ($F = 3.638$, $p = 0.013$). Targeted training videos and materials were created to support teachers' use of MAP results to inform instruction at the study site. Implications for social change include encouraging teachers and administrators to meet the individual needs of students, which may result in increased student reading and mathematics scores, graduation rates, and latitude in vocation selection.

Relationship Between Teachers' Use of Academic Progress Data and Students' Test Scores

by

Amanda Egan

MA, Salem State University, 2008

BS, Worcester Polytechnic Institute, 2001

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

Walden University

February 2017

Dedication

This doctoral study is dedicated to Philip J. Egan (1943-2015). Philip was not only a dedicated husband and father, but was also a dedicated educator in the Manchester, New Hampshire public school district for 45 years. He served as a classroom teacher, assistant principal, principal, and president of the principals' union. He was an authentic and diplomatic leader in education, and will never be forgotten.

Acknowledgments

To be able to acknowledge all who have had a hand in helping me reach this point in my academic career would be impossible. However, there are a few who need to be mentioned. First, I need to thank my administrators who supported this undertaking to further my goals as a leader in the field of education. Second, I want to thank those who work in the establishments I attended to complete my work, especially the baristas at the Starbucks in Mexico. Third, I want to thank special coworkers and friends who encouraged me to work by setting an example and being dedicated to their own work, and assisting me with recording, editing, and organizing. Last, I want to thank my family. During this doctoral study, we went through a lot of major changes, including moving to a different country, losing those who were very important to us, and the birth of my daughter. My family supported me and my work through it all. I hope my work makes you proud, and that you know that I appreciate you all.

Table of Contents

List of Tables

Section 1: The Problem

A small, private, secondary school in Mexico implemented periodic progress testing with the intention of individualizing education for its students. To determine whether and how teachers' use of the information provided from the tests was related to students' progress in English and mathematics, I conducted a project study. In this section, I describe the problem at the local level and in supporting professional literature, the significance of the problem, related theoretical frameworks, and implications of the study.

Local Problem

Schools in the United States consistently collect data about student achievement through periodic standardized assessments. However, Mexican schools lack data because they are not required to assess learning. The few standardized tests offered to Mexican students are used to offer scholarships for postsecondary educational opportunities, but not to assess progress and growth of individual students. A private, bilingual American middle and high school in a suburban city in Mexico is attempting to collect and analyze data to improve student achievement, as well as to assist teachers in creating individualized educational plans for students. The school recently implemented periodic Measures of Academic Progress (MAP) testing as a way to achieve these goals.

The problem at a dual diploma school in Mexico was a lack of research on the effect of teachers' MAP data and student profile use on students' mathematics and reading scores. Class means show that students at this school are performing at or above the norms of all international schools that conduct MAP testing in both mathematics and

reading, according to the means presented in the seasonal norms report from Northwest Evaluation Association (NWEA, 2013f). However, class averages are misleading because 26% of students in Grade 8 are below the international norm in reading, and 54% are below in mathematics. In addition, 44% of Grade 9 students are below the international norms in both mathematics and reading. These are high percentages for a college preparatory school, and do not meet the internal goals of the school (school director, personal communication, January 14, 2013). The new MAP testing program was implemented, individual student profiles were created, and comprehensive professional development on differentiation, creative lesson planning, and the importance of assessment as a result of the first round of MAP testing was provided for staff. However, whether these actions were effective in helping make gains in student mathematics and reading achievement on MAP tests has not been investigated (school director, personal communication, January 14, 2013). Moreover, MAP testing requires time away from regular classroom instruction, which is an inconvenience for both teachers and students (NWEA Representative, personal communication, June 28, 2013). This is problematic because neither classroom teachers nor students see the value of their perceived inconvenience if there are no corresponding increases in student achievement, as measured by test scores. Stakeholders need data that support or refute the notion that regular, online, formative assessments help with instruction and engagement in the learning process. Therefore, a study to measure the relationship between teachers' use of MAP data or student profiles and score improvement on MAP tests was needed.

Rationale

Evidence of the Problem at the Local Level

The school study site is part of the Southern Association of Colleges and Schools (SACS)/AdvancED accreditation program, which guarantees that students who graduate will earn a diploma from the United States as well as one from Mexico. Implementing periodic standardized testing and using the results to shape curricula was a suggestion from the accreditation team during the school's most recent reaccreditation process in October of 2011. Low stakes standardized tests would provide the school with additional documentation about the individual needs of each student, which regular teacher-created classroom assessments cannot provide. The school needed to undergo these changes to enhance the SACS criteria of Teaching and Assessing for Learning, which allowed the school to maintain accreditation with the bureau and to continue to offer the dual diploma program.

The accreditation team also suggested monthly grade-level meetings to increase collaboration among teachers, which were implemented in 2011. In the grade-level meetings, teachers discuss individual student cases and gaps in achievement. However, analysis of the grade-level meeting minutes revealed that students were not meeting or exceeding teachers' expectations in the MAP tested subjects of mathematics and reading (school psychologist, personal communication, January 28, 2012). Administrators suggested that more dynamic lesson plans based on individual needs might be used to improve scores and performance. Teachers agreed, but felt that more information about individual students was needed. Student profiles were created and shared with all

teachers at the school. The profiles contain each student's strength and area for improvement based on MAP benchmarks, as well as his or her learning style as assessed by the school psychologist. In addition, staff training in the use of the profiles was provided during staff meetings on three separate occasions. The training provided to students based on their individual needs had to be evaluated to determine whether it was effective in creating gains in future mathematics and reading MAP tests, or if other strategies needed to be explored.

The purpose of this quantitative study was to determine whether the use of MAP data or student profiles was related to students' MAP test scores. I also examined to what degree teachers were using the training and student profiles they were provided to shape their approach to teaching the nearly 100% English-speaking population. The independent variables were the frequency of use of MAP data and student profiles by the teaching staff. The dependent variable in each analysis was the change in MAP test scores in either mathematics or reading.

Evidence of the Problem From the Professional Literature

Northwest Evaluation Association (NWEA; 2013e), the author of MAP tests, published testimonials that demonstrate the many benefits to using its online testing program. NWEA (2013e) has reported an increase in student achievement, empowerment of teachers and students, and a return on investment for participating schools. National educational studies conducted by NWEA have also shown that MAP tests' adaptive settings can close achievement gaps, help with growth of individual students, and assist in the success of schools (NWEA, 2013b). The computer-based assessment also provides

online professional development for teachers and staff. Teachers can log in to the NWEA site, watch online videos about administering MAP tests, and read and analyze the results. However, Cordray, Pion, Brandt, Molefe, and Toby (2012) conducted a study for the U.S. Department of Education that showed that although schools in Illinois were implementing MAP testing and corresponding professional development in their schools, the teachers were not more likely to differentiate instruction, and students' reading scores did not significantly increase because of the implementation of MAP. Conflicting findings from the professional literature demonstrated the need for a local study that would address the site school's demographics. This school has not evaluated the implementation of individualized strategies as a result of MAP testing to increase student achievement on future MAP tests; therefore, there was a gap in practice justifying the need for the study. The purpose of this study was to determine whether the levels of teachers' use of MAP data or student profiles were related to students' MAP test scores.

Definition of Terms

AdvancED: The bureau used by the Southern Association of Colleges and Schools (SACS) and other organizations to determine accreditation of its schools. AdvancED creates teams of experts to travel to schools all over the world to grant accreditation, which includes a complete inspection of "the whole institution – the programs, the cultural context, the community of stakeholders – to see how well the parts work together to meet the needs of students" (Lefkowits, 2016). The research-based standards for quality that AdvancED examines during the accreditation process include purpose and

direction, governance and leadership, teaching and assessing for learning, resources and support systems, and using results for continuous improvement (AdvancED, 2011).

Measures of Academic Progress: Online formative assessment tools aligned to a school's curriculum. The assessments are unique in that they are adaptive, which means that each question adapts to the student taking the test (NWEA, 2013c). When students answer correctly, the questions become more challenging. When students answer incorrectly, the system reverts to a question in a previous learning level. Results of the assessments display individual student scores in specific subtopics of each subject as related to the chosen standards of the school.

Differentiated instruction: An approach to teaching developed to allow each student to learn at the highest capacity (Salar & Turgut, 2015). Because students learn in different ways, differentiated instruction allows students to be engaged in the learning process by using their strengths to succeed. Some differentiated instruction techniques include grouping students based on their strengths or interests, and varying delivery or assessment methods based on their learning styles.

Student profiles: Online Google Docs created to communicate students' strengths and weaknesses according to MAP test results in mathematics and reading to teachers at the project site. The student profiles are separated by grade and included all tested students from Grades 7 to 11. Teachers may choose to access these profiles when planning lessons in an attempt to individualize students' educational experiences (Siegle, Moore, Mann, & Wilson, 2010).

Significance of the Study

Because the site school needed to implement MAP testing to maintain accreditation, the problem was important to local stakeholders. Teachers, administrators, students, and parents needed evidence to support or refute the assertion that formative online assessments, when used properly, can increase student achievement. If this assertion proved to be true, students receiving a more individualized education would be more successful in school and more engaged in the learning process.

Administrators, school leaders, and teachers were interested in the results of this study. The findings would show whether teachers' understanding and use of MAP data or student profiles had a relationship to students' MAP test scores. This may have had an effect not only on the MAP test scores, but also on the differentiation of students' day-to-day work. Students and parents were interested in the results of the research as well. The study may have shown students and parents whether the time spent on MAP testing was worthwhile, would increase individualized education, and would lead to a higher level of student engagement.

Research Questions and Hypotheses

Previous research has shown that American teachers have a general positive attitude about using data from formative assessments for tailoring classroom practices; however, there was little evidence showing that teachers use data from formative assessments with the specific intention of increasing student achievement (Clark, 2012b; Passmore, Brookshaw, & Butler, 2011; Schaffhauser, 2011). The site school needed to know whether teachers were using the provided individual student data to modify lesson

plans or classroom strategies, and whether this use of data improved mathematics and reading MAP test scores. To determine whether the use of MAP data or student profiles was related to students' MAP test gain scores, I calculated the difference between two test administrations to answer the following research questions (RQs):

RQ1: What are the differences in students' MAP test scores (gain scores) in mathematics among the varying frequencies of teachers' use of MAP data?

$H_0$1: There are no differences in students' MAP scores (gain scores) in mathematics among the varying frequencies of teachers' use of MAP data.

H_A1: There are differences in students' MAP scores (gain scores) in mathematics among the varying frequencies of teachers' use of MAP data.

RQ2: What are the differences in students' MAP test scores (gain scores) in reading among the varying frequencies of teachers' use of MAP data?

$H_0$2: There are no differences in students' MAP scores (gain scores) in reading among the varying frequencies of teachers' use of MAP data.

H_A2: There are differences in students' MAP scores (gain scores) in reading among the varying frequencies of teachers' use of MAP data.

RQ3: What are the differences in students' MAP test scores (gain scores) in mathematics among the varying frequencies of teachers' use of student profiles?

$H_0$3: There are no differences in students' MAP scores (gain scores) in mathematics among the varying frequencies of teachers' use of student profiles.

H_A3: There are differences in students' MAP scores (gain scores) in mathematics among the varying frequencies of teachers' use of student profiles.

RQ4: What are the differences in students' MAP test scores (gain scores) in reading among the varying frequencies of teachers' use of student profiles?

$H_0$4: There are no differences in students' MAP scores (gain scores) in reading among the varying frequencies of teachers' use of student profiles.

H_A4: There are differences in students' MAP scores (gain scores) in reading among the varying frequencies of teachers' use of student profiles.

The answers to these research questions would show whether data from regular online assessments, if used by teachers, would affect student achievement on MAP tests in both reading and mathematics.

Review of the Literature

To reach a saturation of literature reviewed, I used specific search terms including *individualized education*, *formative assessments*, *online assessments*, and *student profiles*. I searched various education databases including Education Resources Information Center (ERIC), Education Research Complete, and Education from SAGE, Psych Info. I examined peer-reviewed sources by searching by topic and to determine whether the source was germane to the literature review, which was followed by a review of the study's participants, setting, results, implications, and limitations.

Theoretical Frameworks

The idea of improving student achievement through the use of individualized educational plans is related to Dewey's pragmatic and construction theories (Jenkins, 2006; Petersen, 2006). According to pragmatism, there is no absolute truth; instead, truth is constructed (Hickman & Neubert, 2009). Therefore, the needs of learners depend on

each learner's construction of truth. This is a direct rejection of the one-size-fits-all paradigm upon which current standardized tests rely. Dewey's constructivist theory promoted the development of education from within the individual (Garrison, 2008). Dewey believed in a democratic approach to education (Boisvert, 1997). Reich (2008) wrote that this allowed for diversity in classrooms to be celebrated and for individuals to learn through the realization of their talents and skills.

Kolb expanded Dewey's pragmatic and constructivist theories with his learning cycle, which consists of concrete experience, reflective observation, abstract conceptualization, and active experimentation (Illeris, 2007; Lingham, 2008). Kolb believed that learning is an internal process and relies solely on the individual. Illeris wrote that this model is a systematic approach to learning by experience.

Vygotsky's social constructivist theory posits that teachers act as facilitators of learning, and recognizes that students learn by way of social interaction and meaningful experiences (McClare & Winsler, 2005; Pritchard & Woollard, 2010). Social constructivist theory suggests that teachers plan interventions in the classroom to engage students in the learning process. Pritchard and Woollard suggested scaffolding, which requires the classroom teacher to explain, cue, sequence, modify, and model desired learning outcomes as a means of intervention.

These theoretical suggestions link to the problem and potential solutions for this project study. Individualized educational plans built from student profiles would include developing grouping techniques, activities, and assessments based on students' strengths and weaknesses. This could be as simple as combining students into groups based on

academic strengths or as complex as creating individual assessments based on developing students' opportunities for growth. This allows the teacher to be the facilitator of student engagement and learning as suggested by social constructivist theory. It also allows students to use individual experiences to find meaning in lessons by doing activities that are relevant to them as suggested by pragmatism and constructivism.

Current Research

Individualized education. Differentiated instruction is a method used to individualize the learning experience for today's students. Students are not the same and do not learn the same; therefore, it is the responsibility of the teacher to modify instruction to ensure that each student gains the most from his or her schooling (Christensen, Horn, & Johnson, 2011; Kappler-Hewitt & Weckstein, 2012; Reis, McCoach, Little, Muller, & Kaniskan, 2011). Researchers have suggested that the best education takes place when there is a balanced, student-centered environment based on individual student profiles (Christensen et al., 2011; Doherty & Hilberg, 2007; Kilfoil, 2008). However, Norris (2010) wrote that "education becomes learning in the most narrow sense: an individual issue and an individual responsibility for individual benefit" (p. 118). Regardless of the discord among researchers about the singular benefit of individualization, it leads to equality in the integrated classroom (van der Westhuizen, 2012).

Differentiation techniques such as scaffolding, grouping, and providing individualized texts and assignments allow for a more individualized approach to learning (Connor et al., 2010; Konstantinou-Katzi, Tsolaki, Meletiou-Mavrotheris, &

Koutselini, 2013; Rao, 2009). Connor et al. (2010) used leveled science texts and flexible grouping to teach literacy skills embedded into the science curriculum for 87 second grade students, and found these techniques offered additional challenge for more independent students and allowed the teacher to provide more support for less independent learners. The implementation of techniques of this nature was effective in increasing students' reading comprehension levels as well as content area knowledge (Connor et al., 2010). Although Connor et al. did not compare these techniques of teaching and learning to other methods, the pre- and posttest design did demonstrate an improvement of students' literacy skills. Rao (2009) explained that individualizing education is democratic, teaches critical thinking, gives self-direction, nurtures creativity, and develops a student's self-concept. Rao added that the teacher is the key to accomplishing appropriate individualization in the classroom. If a classroom teacher values diversity, it will be demonstrated through instructional practices.

Differentiating instruction as a means of individualization is especially important for students whose first language is not English because it allows students to make connections to previously acquired knowledge and experiences, and research demonstrating this is overwhelming (Echevarria & Vogt, 2010; Menken, Hudson, & Leung, 2014). In addition to basic differentiation techniques such as flexible grouping and scaffolding, teachers are encouraged to use sheltered content instruction practices including adapting oral discourse, using culturally relevant texts, and modifying written assignments for students whose first language is not English (Baecher, Artigliere, Patterson, & Spatzer, 2012; Ebe, 2010; Echevarria, Short, & Powers, 2008; Echevarria &

Vogt, 2010; Mays, 2008; Short, Echevarria, & Richards-Tutor, 2011). Short et al. (2011) conducted experimental studies over a 2-year period with two matched school districts and found that middle and high school students taught by teachers trained in the use of sheltered instruction scored significantly higher on standardized assessments than students who were not. Differentiation can be accomplished with content, process, product, or any combination of the three. This provides access to the same learning outcomes for all students regardless of their starting points (Baecher et al., 2012).

Lee-Tarver (2006) surveyed teachers regarding their perceptions of individualized educational plans. Findings indicated that, although teachers found information in students' plans to be helpful for planning curriculum, more training was needed for teachers to fully understand how individualized plans are created and successfully implemented. This need for training was echoed by Kappler-Hewitt and Wekstein (2012). Dexter (1998) wrote that teachers found grouping within a classroom to be an effective way to reach all students if each group has a differentiated assignment, and Valiandes (2015) found that students in differentiated classrooms benefited more than students whose teachers did not use grouping for differentiation. Vogel (2012) wrote that this allows students to move freely between and among groups. This technique for differentiation is successful only if the teacher is reflective and open to feedback (Dexter, 1998).

MAP testing promotes differentiated instruction. Because student score reports are completely individual, teachers can use the feedback from test reports to plan instruction that is catered to a specific student's needs. The tests focus on the student,

allowing teachers and administrators to plan accordingly (NWEA, 2012). Teachers and administrators can use MAP tests result to select relevant text books, group students by strengths or weaknesses, or create specific assignments to meet the needs of individual students. This practice of using feedback to deliberately place students in groups for differentiation has been shown to increase student learning (Valiandes, 2015).

Formative and online assessments. One of the purposes of formative assessments is to provide feedback to students about the quality of their work (Black, Harrison, Lee, Marshall, & Wiliam, 2003; Clark, 2011; Dunlosky, Rawson, Marsh, Natan, & Willingham, 2013; Graham, Hebert, & Harris, 2015; Roskos & Neuman, 2012; James, 2015). This formative feedback needs to allow students to be engaged in the learning process and to "understand the relationship between their prior performance, their current understanding, and clearly defined success criteria" (Clark, 2011, p. 162). Formative assessment of this nature has shown benefit to students' progress in reading, and is an important part of the assessment cycle (Li, 2016). Formative classrooms rely heavily on culturally responsive interactions between student and teacher, which include question and answer techniques that lead to critical thinking and autonomous learning (Black et al., 2003; Brookfield, 2010; Clark, 2011; Clark, 2012a; Roskos & Neuman, 2012).

Kesianye (2015) narrowed down the purposes of formative assessment into three perspectives – assessing to ensure all curricula is covered, assessing to check the quality of teaching, and assessing to give feedback to students about their performance. It is the final perspective that allows both teacher and student to take ownership in closing the

achievement gap in a timely fashion (Graham, Hebert, & Harris, 2015; Kesianye, 2015; Wilkie, 2016). Box, Skoog, and Dabbs (2015) asserted that formative assessment can be as simple as asking convergent and divergent questions instead of polar or direct questions. Star et al. (2015) provided specific examples of preestablished formative assessments that asked students to explain mathematical procedures, which demonstrated students' depth of knowledge and encouraged precise communication. The information gained for a thought-provoking question-and-answer session is telling about students' levels of understanding of material. Because formative assessment is still part of the learning, it is low stakes. It allows for students and teachers to make improvements before a final grade is given for a particular subject.

However, American teachers of different grade levels have reported that problems with formative assessments exist because of the difficulty obtaining and using data from the assessments and transforming teaching practices based on that data (Clark, 2012b; James, 2015; Lees & Anderson, 2015; Popham, 2006). This is concerning considering that "the whole point of collecting evidence of learning is to then use it diagnostically to ascertain students' existing knowledge and then plan next steps for individual learning progressions" (Clark, 2012b, p. 34). Although educators questioned the relevance of professional development regarding formative assessments, teachers who receive continuous professional development in data analysis, giving feedback, and adapting lesson plans based on information from formative assessments should be able to make major changes in their classrooms (Black et al., 2003; Clark, 2012b; Popham, 2006). Therefore, professional development aligned with a school's formative assessments is

critical to successful classroom practice (Black et al., 2003; Falk, 2012; Levine, 2007; NWEA, 2012; Volante & Beckett, 2011; Wylie & Lyon, 2014). Hollingworth (2012) added that formative assessment initiatives can only be successful with appropriate relationships between teachers and administrators. Administrators need to provide practical support for teachers, such as mentors and collaborative time with peers, to ensure that formative assessment is in the foreground of their routines (Hollingworth, 2012).

MAP testing and similar formative online assessments address concerns disclosed by parents and teachers to measure, monitor, and adjust teaching for individual students (NWEA, 2012). These types of assessments can open dialogue between teachers and students that may not have previously been open (Huang, 2012; NWEA, 2012). Huang (2012) wrote that nonthreatening formative assessments, graded by an impartial and objective third party, reveal students' capacities for learning and allow a platform from which to build understanding between teacher and student. Teachers can use information from formative assessments to adapt their teaching style to the individual needs of their students (National Research Council [NRC], 2000; Rátiva Velandia, Pedreros, & Núñez Alí, 2012). Huang said that this is the major distinction between summative assessments of learning and formative assessments for learning.

Computer-based assessments, the newest method with which students are being evaluated, promise advantages for both teachers and students (Christensen et al., 2011). These formative and summative assessments offer "a more interactive, personalized, and independent learning experience" for students (Inan, Flores, & Grant, 2010, p. 148).

Online assessments appeal to students because this is the digital format with which they are familiar and that allows for a more student-centered experience (Kim et al., 2011; Schaffhauser, 2011; Wilson, Wright, Inman, & Matherson, 2011). Online assessments also offer the delivery of immediate feedback to the student, which requires less marking and grading on the part of instructors, while maintaining accurate student data (Passmore et al., 2011; Schaffhauser, 2011). Online tests have proven quite useful as formative assessments. "Teachers can gauge progress and address inadequacies in learning," especially when the assessment is related directly to the standards of the curriculum (Schaffhauser, 2011, p. 28). In fact, Angus and Watson (2009) demonstrated that regular online assessments better prepare students for summative assessments. Students who used formative online assessments produced higher scores on the online summative assessments than those who did not (Angus & Watson, 2009). Lastly, formative and online assessments provide data to school administrators for the purpose of class placement. Faulkner, Crossland, and Stiff (2013) wrote that performance on formative assessments was a much more accurate predictor of student performance in class than other indicators including teachers' perception of the student's ability and track placement.

Czerniak, Lumpe, Haney, and Beck (1999) wrote that teachers' plans and classroom actions are based on their perceptions. Therefore, knowledge of teachers' perceptions of educational technology is critical. Teachers do believe that technology enhances student learning (Czerniak et al., 1999; Yurtseven Avci, Eren, & Seckin Kapucu, 2016). However, one of the biggest barriers to utilizing technology in a way to

enhance learning for students is time allotted for professional development. Gorder (2008) conducted a survey of approximately 300 K-12 teachers to investigate how they utilize technology in their classrooms, how their practices differ from each other, and if these practices were related to demographics such as age, years of experience, or content area. Results of the study showed that ongoing training for teachers was of utter importance, and that there was little difference in perceptions based on personal or demographic characteristics. The study showed that gender, age, and years of teaching did not demonstrate a significant difference in perceptions about educational technology. Gorder also recommended more research to be done in different geographical locations for a broader scope. NWEA (2012) wrote that 67% of teachers and 93% of administrators find information from formative online assessments such as MAP to be valuable for determining content knowledge obtained by students and demonstrating student growth in subject areas.

Because MAP online tests are adaptive, each student receives their own challenging, but not frustrating testing experience. When students answer questions correctly, the next question is slightly more difficult. When students answer incorrectly, the next question is less difficult or asks the question again in another way. Non-computerized adaptive testing would require a great deal of time to administer, grade, and analyze. The adaptive nature of MAP tests should be used to inform classroom instruction based on specific strengths, weaknesses, and progress of each individual student (Kingsbury & Hauser, 2004; NWEA, 2013d).

Student profiles. The use of individual student profiles, also called student snapshots or learning profiles, is not a new concept. Files on students have been stored in filing cabinets in offices for centuries. In recent years, information about students' demographics, grades, and assessments have been computerized, making accessing student information fast and efficient for teachers and faculty. Data from MAP tests are perfect for building student profiles because MAP student score reports provide a ranking of specific benchmarks in each tested subject area in which students need improvement. Getting this information to teachers to inform instruction and make curriculum decisions is vital. Teachers can access online databases to make decisions about class lesson plans, project grouping, or specific student assignments. Wayman, Cho, Jimerson, and Spikes (2012) conducted a mixed methods research design of numerous teachers in different content areas to find out how they currently use data to make classroom decisions. Surveys and interviews revealed that teachers were able to use data from formative assessments to help struggling students by utilizing flexible grouping, reteaching concepts when necessary, and collaborating with support staff. They also revealed a general positive attitude about data and its use in the classroom.

Databases for individual student information available to teachers also assist in tracking student progress and making individualized educational decisions (Birnie, 2015), which, in turn, make for smoother parent teacher meetings (Bird, 2006). Parents are able to see objective documentation about their child. This not only helps them to close gaps in learning through a more individualized approach, but it also assists in selecting students for gifted and talented or honors programs (Albano & Ascione, 2008; Reyes,

2011; Siegle et al., 2010; Van der Westhuizen, 2012). Siegle et al. wrote that student profiles should also include students' interests for a more complete analysis of each student. In addition, teachers require training on how to utilize student profiles to their benefit, and need to understand that information published on student profiles is a work in progress and may change over time (Siegle et al., 2010).

Individual student information is also helpful to other school faculty (Birnie, 2015). Guidance counselors and school psychologists benefit from knowledge in a student profile. They are better able to suggest future plans for university or career that are aligned with the students' interests and abilities (Hirschi, 2010). These staff members can also use this information to develop students' areas of opportunity and celebrate students' achievements (Scherer, 2006). These student profiles can also act as documentation to be referenced during staff meetings.

Implications

The results of data collection and analysis could lead to many different courses of action for both school and staff. If teachers are not utilizing student profiles and students' MAP test scores do not significantly improve, then more professional development in the area of individualized education might be necessary for the teaching staff. If teachers are utilizing student profiles and students' MAP test scores improve, teachers who emerge as strong users of the student profiles may be partnered with those teachers who struggle with the concept of relating the student profiles to their classroom work. If teachers are not using student profiles, but students' scores increase, or if teachers are using the student profiles, but the students' scores do not increase, professional development with

the staff might still be necessary. Teachers may need guidance on the use of profiles, creating lessons integrating the information from the profiles, or relating lessons to standards, to which MAP tests have already been aligned. These directions could occur in either the mathematics or English departments, or both. Therefore, any professional development activities could be tailored to a specific department or more general for application in all curricula.

Summary

Previous research has indicated that individualized instruction and regular formative assessments are necessary for students to be successful. This is even truer for students who do not speak the primary language of the school. Online formative assessments that provide immediate and accessible results are useful for teachers to adapt their classroom practices for the benefit of all students. Continuous professional development for teachers is necessary to implement these practices successfully. Based on this previous research, data at this location is needed to determine what factors influence improvement on students' MAP test scores. A causal-comparative research design helped demonstrate whether teachers' use of MAP data or student profiles was related to students' MAP test results. Section two describes the research design, setting, sample, and instrumentation in the study in detail. The following will also show data was collected for each variable and analyzed.

Section 2: Methodology

Research Approach and Design

The purpose of this study was to determine whether the levels of teachers' use of MAP data or student profiles were related to students' MAP test scores. To see if there is a relationship, I conducted a causal-comparative study analyzing archival MAP test scores in mathematics and reading in relation to teachers' responses to a questionnaire regarding MAP data and student profile use. This relates directly to the problem at the study site, a lack of research on the effect of teachers' use of MAP data on students' mathematics and reading scores.

Setting and Sample

The local setting was a private, international American school in a major tourist center in Mexico. The school is accredited by SACS/AdvancED, Mexico's Department of Education, and the National Autonomous University of Mexico. The school comprises approximately 300 students in Grades 7-12, 20 full-time staff members, and 10 part-time staff members. About one third of the staff is from the United States, United Kingdom, and Canada, and more than half of classes are given in English. School leadership consists of a principal, vice principal, school psychologist, and, my role, assessment coordinator. Only students who took both the mathematics and reading portions of the MAP test given in 2012 and 2013 were sampled ($N = 76$). All 13 English-speaking teachers were asked to participate. Five of the 13, who conduct classes in Spanish, assisted with the pilot questionnaire, and the remaining teachers, who conduct classes in English, took part in the actual questionnaire.

Purposeful convenience sampling is considered the least desirable; however, it was necessary for this study because of the location of the school and schools with similar demographics (Lodico, Spaulding, & Voegtle, 2010). The teachers who participated were purposefully sampled from the English-speaking faculty. During the 2012-2013 school year, MAP tests were administered to all students in Grades 8-10, 96% of whom were native Spanish speakers. The gain scores of students who were tested during the 2012-2013 year and retested in the 2013-2014 school year were calculated. This included 76 students in Grades 9 and 10.

Instruments and Materials

The first instrument, an adapted questionnaire given to teachers, contained a variety of question types, including Likert scale and multiple choice questions, and allowed space for a free response pertaining to the student profiles document and MAP. The questionnaire was adapted from the National Educational Technology Trends Study conducted for the United States Department of Education (Bakia, Yang, & Mitchell, 2008). The original survey was about teachers' use of technology in their classrooms; therefore, questions only needed MAP inserted into the questions for it to be relevant. In addition to basic demographics, the adapted survey included questions about teachers' frequency of use of MAP data, frequency of use of the student profile document, participation in professional development, and general attitudes about MAP and related documents. Although attitudinal measures do not provide evidence of teachers' specific behaviors (Creswell, 2012), they can provide insight into individuals' perceptions and were also collected on this instrument and used to inform the project developed in

Section 3. The questionnaire also included basic demographic and teaching background questions such as gender, ethnicity, years of experience, and subject area taught. The questionnaire can be found in Appendix B. Although using established instruments is preferable, this questionnaire is site and place specific, and needed to be tailored to gain very specific information from a narrow population of teachers. Because of the unique composition of teachers at the site, a purposeful sampling technique was necessary. The Mexican teachers who speak English but give classes in Spanish were asked to participate in testing the pilot questionnaire only.

The second instrument was the MAP test, which is administered to students annually. Although NWEA first began administering computerized adaptive tests in 1986, these tests were eventually refined and called MAP tests in 1997 (NWEA, 2013c). Over three million students worldwide are taking MAP tests in reading comprehension, mathematics, general science, and language usage to generate immediate and individualized feedback for teachers and students (NWEA, 2013c). The mathematics and reading comprehension MAP tests used in this study contained approximately 50 questions each. Teachers proctor the tests, which are administered on iPads during regular instructional time for the subject being tested. For example, reading tests are conducted during English class. Because they are adaptive, each student has different questions based on his or her ability and knowledge. Students' scores are reported on the Rasch Unit (RIT) scale, which ranges from 100 to 300 depending on the testing season (NWEA, 2013a). The RIT, which measures data with equal increments and an arbitrary zero, is a grade-level independent, equal interval scale and relates directly to the school's

predetermined curriculum standards. NWEA (2013g) conducted multiple test-retest reliability studies to ensure MAP test scores are stable from one test administration to another. The Pearson correlation coefficient ranged from 0.8 to 0.94, which is considered a strong positive relationship (NWEA, 2004). In addition, internal reliability studies were conducted ensuring that test items are consistent (NWEA, 2013g). The marginal reliability coefficients for these tests yielded values that averaged 0.94, which demonstrates the same strong positive relationship (NWEA, 2004). NWEA (2013g) aligned testing questions with schools' standards allowing for appropriate questions with minimal errors. The validity correlations are strong and positive ($r = 0.85$) (NWEA, 2004).

Data Collection and Analysis

To ensure content validity, the online questionnaire was piloted with teachers ($n = 5$) who were knowledgeable about the school's student profiles and spoke English, but who were not part of the sample because they conduct classes in Spanish (Lodico et al., 2010). One-shot self-developed surveys require an examination of the consistency of participants' responses. Internal consistency reliability of the instrument was calculated with a Cronbach coefficient with an alpha value of 0.905, which is considered acceptable (Tavalok & Dennick, 2011).

To prepare the questionnaire for analysis, I grouped questions to develop constructs with overarching concepts. These constructs were MAP data use, student profile use, and descriptive information. To test reliability for the content in the questionnaire given to the teachers in the sample, Cronbach's alpha was run for each

construct. Certain questions were removed from each construct to increase its alpha value as those questions did not strongly align with each concept.

In this one-shot questionnaire design, eight of the 13 English-speaking teachers received a link via e-mail to the online questionnaire to elicit their responses about MAP and student profiles at this one particular point in time (Lodico et al., 2010). The e-mail also included a statement of consent and confidentiality. I compiled results from the teacher questionnaire. To protect confidentiality of the teachers, each respondent was assigned a number. Therefore, names were not necessary. Likert scale questions generate ordinal data about attitudes, while categorical questions use a nominal scale.

De-identified MAP test scores were supplied by the school's data administrator for the years 2012 and 2013. The data administrator in the school first collected students' MAP test scores in an Excel spreadsheet. This administrator ensured students' names were removed, which is recommended to guarantee the confidentiality of participants (Creswell, 2009, 2012), and then shared it with me for analysis. Each student's MAP test scores were matched with the appropriate teacher's responses. Each teacher was first related to either mathematics or reading. Mathematics, science, and foreign language teachers were associated with the mathematics scores. English, history, and social studies were associated with the reading scores. Then each student was matched with the teachers he or she had during the year of that MAP test administration. This was possible because students are assigned to specific classes during specific years. For example, all Grade 9 students are required to take geometry; therefore, that mathematics score was matched with the responses from the teacher who reported teaching Grade 9 mathematics

classes. Because students had multiple teachers during that year, the teacher responses appear in the data set multiple times. The Excel spreadsheet with all information was then exported to the IBM SPSS Statistics Standard Edition software for analysis. All documents were stored on a personal password-protected computer for security, ensuring that only I had access to them. Table 1 summarizes each variable as well as from where it was collected.

Table 1

Independent and Dependent Variable Types and Collection Methods

Variable	*Data Type*	*Data Source*
MAP gain scores	Interval	Archived school data
Mathematics		
Reading		
Frequency of use of MAP data	Ordinal	Questionnaire
Never		
A few times		
Once or twice a month		
Once a week or more		
Frequency of use of student profiles	Ordinal	Questionnaire
Never		
A few times		
Once or twice a month		
Once a week or more		
Descriptive information	Various	Questionnaire
Gender	Nominal	
Race	Nominal	
Language	Nominal	
Grade level taught	Nominal	
Subject area	Nominal	
Secondary teaching assignments	Nominal	
Valid teaching certificate	Nominal	
Full or part time	Nominal	
Years of teaching experience	Ordinal	
How MAP data was used	Nominal	

ANOVA was appropriate for the research questions and the given independent variables. Each ANOVA compared one of the multilevel independent variables (frequency of use of MAP data and frequency of use of online student profiles) with the dependent variable (MAP gain scores, which is the difference between the MAP scores in 2012 and those in 2013) in either mathematics or reading.

Assumptions, Limitations, Scope, and Delimitations

I assumed that teachers' answers were honest and not politically correct. I further assumed that the provided archival data were correct. A limitation of the study was that each teacher response was replicated for each student. In addition, only one school and one set of gain scores were used for analysis. Consequently, the analyses of the behaviors of teachers and achievement of students at this specific school and their results may not be generalized for a larger population.

This study was delimited to English-speaking teachers who teach subjects in English to students in the MAP-tested Grades 9-10. This was to ensure that the surveyed teachers were well versed in MAP testing and its purposes. I also used the gains students made in MAP scores between two administrations, which may encompass any preexisting differences in students' abilities.

The scope of this study included causal relationships between students' MAP gain scores in mathematics and reading and teachers' use of MAP data or student profiles. Although this school is in a Spanish-speaking country and the school offers classes in mathematics and reading in Spanish, this study focused on teachers conducting classes in English.

Protection of Participants' Rights

To protect the rights of all participants, no names were used. The data entry administrator removed all names of students prior to data analysis. Before teachers could access the questionnaires through the link, they received an informal email explaining the details of the study, including the fact that their participation would be confidential, as well as informed consent information on the first page of the questionnaire. If they chose to participate, they clicked the link in the e-mail to electronically sign the consent form and answer the questionnaire.

Results of the Analysis

Teachers' responses addressing the variables in the research questions (frequency of MAP data use and frequency of student profile use) were analyzed using descriptive frequencies. Additional teacher information was used to make inferences about teacher perceptions and behaviors, which were used to inform the content and direction of the project described in Section 3.

Descriptive Information

The questionnaire was used to gather general information about the teaching staff at the project site. Table 2 summarizes this information.

Table 2

Descriptive Variable Numbers and Percentages

Variable		*N*	*Percentage*
Gender	Male	2	25%
	Female	6	75%
Race	White	7	88%
	Hispanic/Latino	1	13%
English is first language	Yes	8	100%
	No	0	0%
Grade level taught	7	3	38%
	8	3	38%
	9	5	63%
	10	5	63%
	11	5	63%
	12	6	75%
Subject area	Mathematics	2	25%
	English/Language Arts	2	25%
	Science	2	25%
	Social Studies	1	13%
	World Language	1	13%
Years of teaching experience	0-2 years	1	13%
	3-5 years	3	38%
	6-8 years	2	25%
	9+ years	2	25%
Hold teacher certification	Yes	5	63%
	No	3	38%
Full or part time	Full Time	7	88%
	Part Time	1	13%
Have a secondary teaching assignment	Yes	7	88%
	No	1	13%
Agree that MAP data can be used to improve instructional practices	Yes	8	100%
	No	0	0%

Only half of the respondents ($n = 4$) replied that their primary teaching assignment was in mathematics or English/language arts, the tested MAP subjects. 88% of teachers who completed the questionnaire stated that they did have a secondary teaching assignment, indicating they teach in multiple departments. More than a third of the teachers (38%) did not hold a valid teaching certificate. Furthermore, half of the teachers who participated had 5 years or less of teaching experience.

Frequency of MAP Data Use

Analyses of variance were used to examine teachers' responses as reported in the questionnaire regarding MAP data use frequency and student profile use frequency (Appendix B). The first variable analyzed was frequency of MAP data use. This variable included four levels: (a) never, (b) a few times, (c) once or twice a month, and (d) once a week or more. The ANOVA results revealed that there was no significant difference in the students' mean gain MAP test scores ($M = 5.09$, $SD = 7.205$) in mathematics ($F = 0.329$, $p = 0.896$) when they were taught by teachers who reported using MAP data with varying frequencies. However, students' MAP test gain score averages in reading ($M = 3.80$, $SD = 8.515$) showed a significant improvement ($F = 4.086$, $p = 0.001$, $\eta^2 = .047$) when they were taught by teachers who reported using MAP data at least once per week. Games-Howell Post Hoc Tests showed that students who had teachers who considered themselves frequent MAP data users scored 5.945 points higher in reading as compared to those who had teachers who reported a less frequent use of MAP data.

Frequency of Student Profile Use

The second variable, frequency of student profile use, also included four levels: (a) never, (b) a few times, (c) once or twice a month, and (d) once a week or more. The ANOVA for this variable produced similar results. There was no significant difference in students' mean MAP test gain scores ($M = 5.09$, $SD = 7.205$) in mathematics ($F = 0.299$, $p = 0.826$). However, students' mean MAP test gain scores ($M = 3.80$, $SD = 8.515$) in reading significantly improved ($F = 3.638$, $p = 0.013$, $\eta^2 = .025$) when they were taught by teachers who reported utilizing the online student profiles at least once per month. Games-Howell Post Hoc Tests showed that students taught by teachers who reported using the online student profiles more frequently scored 4.705 points higher in reading as compared to those who had teachers who reported less frequent use.

While the aforementioned self-reported descriptive variables may not have been involved in the statistical analyses, they do speak to the level of ownership teachers may hold over MAP testing and results. Because teachers have multiple teaching assignments and little experience, they could be overwhelmed with the addition of data-based decision making within their classrooms. Some teachers may not even be trained in the field of education, making it difficult to see the relevance of MAP testing and its results**.** Additionally, questionnaire statistics indicated that the school provided teachers with an average of four hours of professional development related to differentiated instruction in the form of a traditional workshop. Other forms of professional development, such as activities resulting from partnerships with other schools or mentors, were either not made available to staff or these staff members chose not to participate when they were

available. Therefore, even though individualizing students' educational experiences is a school initiative, many of these teachers may be lacking support and direction to implement this initiative with confidence and fidelity. Lastly, 100% of the teachers agreed that MAP data, including student profiles, can be used to improve instructional practice and that formal professional development could improve teachers' use of MAP. This information factors into the need for a project focused on professional development to fully implement the use of MAP data and student profiles that will lead to data-based decision making of the teachers.

Conclusion

This quantitative research design relied on ANOVA to analyze the relationships between teacher-reported questionnaire items and student MAP test results. The ANOVA showed that, while the averages of the students' MAP test scores have not significantly changed from one year to the next in mathematics, they have significantly improved in reading when teachers utilize the tools available to them, MAP data and student profiles, for instructional purposes. Analysis of the descriptive information from the questionnaire suggested teacher ownership of MAP testing and their results may be lacking. Additionally, all of the surveyed teachers agreed that MAP and its data can be used to improve instructional practices. Based on the results from the data analysis, a professional development project was created to affect social change for the local stakeholders. A formal, targeted professional development series for teachers and administrators was developed to strengthen teachers' current practices with MAP and related data. It will assist teachers in finding and using MAP data and student profiles to

further individualize students' learning experiences. This project is presented in the following section.

Section 3: The Project

Analysis of the results presented in Section 2 showed that teachers, although not using MAP test results to their fullest, did have positive perceptions of MAP testing and the potential for using MAP test results to better differentiate instruction. This information from the questionnaire helped point to the need for targeted professional development on more efficient and effective ways to access and analyze MAP test data. This section contains the three-part professional development project, including its goals and rationale. The literature review addresses all aspects of the professional development including online training, professional learning teams, and data-based decision making for both administrators and teachers. Resources, supports, and barriers for implementation of the project are also discussed.

Rationale

The results of the analyses indicated that MAP gain scores increased when teachers accessed MAP data or student profiles to assist in lesson planning. To see if MAP testing can make a difference in student learning, teachers need to feel confident accessing MAP administration reports and online student profiles. This will allow school leaders and administrators to determine whether accurate and prolonged use of student profiles based on MAP test results affects student achievement.

Continuous professional development for teachers is necessary to ensure that teachers are informed of school or district initiatives (Tammets, Pata, & Laanpere, 2013). When administrators learn alongside their teaching staff, a culture of collaboration is built and teachers feel more empowered to participate (Pedersen, Yager, & Yager, 2010).

Results of the project study indicated that teachers have a positive effect on student performance on MAP tests. Therefore, continuous professional development in a collaborative setting with regard to differentiation through MAP test data may improve the learning environment.

An examination of the project study data showed that teachers of English and related subjects had a positive effect on MAP reading test scores, up to a 6-point average improvement in some cases, when those teachers used the results from previous test administrations to make changes to their curriculum or classroom environment. Although this point increment is impressive, it can be improved. The mathematics MAP test results did not improve as much as the reading tests, although the students' mathematics scores did slightly improve or stayed the same. This seems to indicate that development of teachers' abilities to regularly use MAP test data to modify their learning environments would improve students' scores on future MAP tests.

Collaborative work with a professional learning team promotes success for teachers (Pedersen et al., 2010; Stewart & Exley, 2014). Teachers may be more likely to begin the process of analyzing student MAP test data once they are shown the most efficient way to find it, read it, and use it. They will also be more likely to complete a task such as question creation when a team is depending on them, when it has been learned alongside an administrator, and if part of their annual review reflects the work they have done related to MAP testing. Learning how to apply this knowledge efficiently is a daunting task for educators because their schedules are already demanding. Online training in the form of webinars and the like makes training for busy educators easier.

Training and professional development can be completed at the convenience of the educator, and time spent with peers can be better used for collaboration and creation of relevant instructional materials and assessments.

Administrators and teachers need to understand the necessity of MAP testing. Once they understand the benefits MAP results can provide for students and the roles teachers play in achieving success using MAP, they can begin to master the most efficient ways to analyze students' MAP test data. With this understanding, MAP testing can become a more utilized formative assessment of student progress from year to year. If teachers begin to more consistently take responsibility for their students' success on assessments, the students may begin to take ownership of their education.

Review of the Literature

There are many types of projects that could have been proposed, such as a white paper or curriculum development. However, those project types were not appropriate for this study. A white paper would suggest a solution to the problem by seeking resources from a third party (Candal & Pioneer Institute for Public Policy Research, 2016). Specific curricula did not need to be developed to address the research questions either. Professional development was the appropriate next step after seeing the connections teachers have to their students' success on MAP tests and realizing all of the tools that are already available. Teachers were able to voice their perceptions regarding MAP testing, and because all agreed on its possible benefits, professional development on how to use the MAP administration website and the data more effectively to assist in making classroom decisions would be beneficial to all stakeholders. There is research to support

that teachers respond to school or district-wide initiatives when school leaders learn with them, especially when it is blended with electronic resources (Alsofyani, Aris, Eynon, & Majid, 2012; Clary, Styslinger, & Oglan, 2012; Pedersen et al., 2010). If the professional development series is delivered by a respected school leader or a knowledgeable MAP representative, teachers will be able to learn and improve their techniques with regard to data-based decision-making (Alsofyani et al., 2012; Clary, Styslinger, & Oglan, 2012; Pedersen et al., 2010). There is also research to support that teachers will embrace school or district-wide initiatives when there is an added benefit or compensation (Lavy, 2007).

Professional Development

The professional development series in this project was designed to provide teachers and administrators with efficient expert-led sessions that demonstrate the accessibility of MAP test results and related student profiles. In the sessions, teachers will be allotted time to practice with related technologies, collaborate with peers, and ask probing questions. Although teachers will be led in the sessions by a site MAP representative or school leader, teachers will also be led in the online training videos. This blend of educational pedagogies is ideal for the adult learner. Alsofyani et al. (2012) stated that adult learners prefer a "blend of pedagogies such as the presentation, demonstration, practice and feedback if they are structured and instructor-led with an efficient training length" (p. 20). Because many of the portions of this professional development series are electronic, teachers and administrators will also improve their technological practices in the sessions as well, making it relevant and effective in all aspects (Callahan & Sadeghi, 2015).

Teachers participate in continuous professional development to improve their teaching practices. “Teachers take part in continuous professional development because they believe it will make them better teachers and this will ultimately enhance student outcomes” (Holmes, 2013, p. 97). Holmes also stated that when teachers see the positive effect they have on their students, they feel motivated and are more apt to change instructional practices. Therefore, continuous professional development not only plays a role in student success, but also in the empowerment of teachers and their propensity for change (Petrie & McGee, 2012; Stewart & Exley, 2014). Training that affects teacher practice and empowers teachers is considered true professional development (Giraldo, 2014; Lin, Cheng, & Wu, 2015).

The goal of changing educational practices from examining MAP data is to differentiate instruction to accommodate students’ different learning styles. Dixon, Yssel, McConnell, and Hardin (2014) found that the more professional development educators receive regarding differentiated instruction, the more they differentiate and have a positive attitude toward differentiation. Similar results were found when professional development opportunities were optional. Stewart and Houchens (2014) found that participants and nonparticipants began to practice the use of formative assessments with the intention of differentiating instruction more when there were workshops on those topics available. Even educators who do not directly participate in professional development begin to examine their practices when a school initiative has been implemented.

Online Training

Professional development offered online supports "the development of teachers' cognition" (Holmes, 2013, p. 100). Jones and Dexter (2014) reported that teachers' greatest support system is the Internet. Benefits are twofold. When teachers improve their abilities regarding technology, they also strengthen their knowledge base about differentiated instruction (Holmes, 2013; Koellner, Jacobs, & Borko, 2011).

Webinars are becoming increasingly popular ways of delivering professional development to teachers. Kohl (2012) wrote that webinars not only utilize available technologies, but also allow teachers to receive information at any time or place, making it more favorable to them. Web-based seminars are also more cost effective for districts and schools because they do not require travel or lodging expenses for the expert delivering the professional development (Kohl, 2012; Yates, 2014).

The purpose of videos for teacher education is to highlight pedagogical strategies with teacher commentary (Brunvand, 2010). A benefit to using videos as part of online training is that teachers can refer to them even after the professional development session is over. For instance, teachers may not see the relevance of a certain professional development session until they are asked to put what they learned into practice. When the time comes to perform tasks presented in their online training sessions, the videos are still accessible to them for continued support (Brunvand, 2010; Owen, 2012). This allows for educator reflection and discussion in professional learning teams, and can lead to improvements in student performance (Jensen & Moller, 2013; Lotter, Rushton, & Singer, 2013; Shaha, Glassett, & Copas, 2015). Marquez et al. (2016) conducted a review

of an online professional development series, and teachers reported the efficiency of short videos and having a visual as an aid. Although teachers value this type of independent learning through videos and webinars, they also have "communicated the desire for training in how to better utilize web resources for independent research as well as for time to be built into their schedule for this type of research" (Jones & Dexter, 2014, p. 378). Online training can be efficient and effective only if used properly and when aimed at the appropriate audience.

There are some challenges that educators should consider with online training. Olsen, Donaldson, and Hudson (2010) cited specific necessities for proper online learning. These included "access to a personal computer with Internet capabilities, course quality, accessibility of the instructor, and networking opportunities" (Olsen et al., 2010, p. 14). Lacking any of these essentials would be detrimental to an online training program.

Professional Learning Teams

Once school staff have completed the professional development series, they will be allotted time to reflect and collaborate. This time with peers is important to the success of professional development. Professional learning teams, also called communities or groups, are an important component to successful professional development. Holmes (2013) reported that professional learning communities create "a sense of trust, reciprocity, shared values, and beliefs amongst the participants" (p. 104). Participants support each other and offer constructive criticism. Groups also are the perfect environment for the collaboration that is necessary for reflection and action. Dufour and

Dufour (2012) explained that professional learning teams foster collective efficacy especially in education.

Professional development is necessary to ensure all teachers remain current with educational reform, as well as to demonstrate possibilities for teaching and instruction in an ever-changing diverse classroom (Lawless & Pellegrino, 2007). Jones and Dexter (2014) reported that professional learning communities provide an opportunity for this type of professional development. Teachers can discuss current reforms and instructional possibilities with each other. They can brainstorm, share ideas, and provide support to one another, especially with regard to data (Dufour & Dufour, 2012; Jones & Dexter, 2014; Pella, 2012; White & Anderson, 2012).

The development of professional learning communities in international schools is particularly important. Lalor and Abawi (2014) found that teachers in international school settings wholeheartedly appreciate being members of a professional learning team because not only were they able to focus on student achievement, but they also felt valued as professionals in such groups. Teachers are able to bring their previous experiences and fresh ideas to the table when placed in learning communities. Administrators should be careful when developing professional learning teams, however. Sims and Penny (2015) studied professional learning groups that consisted of high school teachers whose focus was data. Teams were unsuccessful because they were not allotted enough time to delve into issues, there was little support from administration, and their focus was narrow and had no direction (Sims & Penny, 2015).

Successful professional learning communities require team members who trust and respect each other and are open to reflective conversation with a focus on student learning, appropriate time and space to collaborate, and engagement from administrators (Nellis, 2012; Sims & Penny, 2015). Stewart and Houchens (2014) explained that true professional learning communities are groups of teachers and administrators who collaborate to focus on curriculum, instruction, and assessment with student success in mind.

Data-Based Decision-Making for Administrators

School leaders will have an important role with this data-based professional development series. School leaders may be the school's director, assistant, school psychologist, head of a particular department, or a grade-level representative. These leaders need to be part of a team that that will influence the rest of the teachers at the research site. This democratic type of distributed leadership helps to mobilize organizations in their initiatives (Grady & O'Dwyer, 2014; Liang & Sandmann, 2015).

Many school leaders are successfully making data-based decisions every day. Using data does not mean only drawing conclusions based on looking at number patterns in testing data, but it also means considering the data continuously and interpreting its meaning in daily practice (Gerzon, Guckenburg, Regional Educational Laboratory Northeast & Islands, & National Center for Education Evaluation and Regional Assistance, & Education Development Center, 2015; Murray, 2014; Powers & Mandal, 2011; Spillane, 2012). School leaders influence whether or not their academic teams accept sources of data as legitimate measures. Once this occurs, the team can collaborate

and collectively make a decision on the data they are examining together. Spillane (2012) suggested that these types of collaborative data examination sessions are "anchored in organizational routines" (p. 135). This means that school leaders need to coordinate staff interactions with structure around studying testing data together. If individualized learning and differentiating instruction is a necessary school-wide initiative, then school leaders at this site will need to design a formal structure that will allow teachers to collaborate about MAP test results and student profiles specifically, and then how to differentiate instruction based on those results. Researchers agree that continuous data collection, specifically through online assessments, leads to improved academic performance (Angus & Watson, 2009; Powers & Mandal, 2011). This needs to be reiterated by school leaders to teachers and supporting staff so that the examination of data is seen as a necessity for student success. One way for administrators and school leaders to support the differentiation initiative is to include it is a benchmark on teachers' classroom evaluations and annual reviews (Hewitt & Weckstein, 2012).

Student achievement is rarely used to differentiate between teachers (Measures of Effective Teaching Project, 2010); however, everyone agrees that this is an important measure in the effectiveness of a teacher. Because of this, Shakman et al. (2012) conducted a study of the five states in the United States that had statewide multiple ratings performance-based teacher evaluation systems in place during the 2010-2011 academic year. All states' systems included observations, self-assessments, and a teaching standards scoring rubric. Evidence of student learning was embedded into teachers' evaluations in three states at the time of the study. Teachers in North Carolina

provide pass-fail rates for their classes, Tennessee provide pre- and post-assessment data to their administrators for review, and Texas uses "an aggregate of performance data for all students in the school" (Shakman et al., 2012, p. 9). Although this evaluation process may be a daunting one, it is a much more revealing look at a teacher's performance throughout the year and would be an effective addition to the data currently collected on teacher performance.

Performance-based pay is being used in schools both internationally and in the United States to compensate teachers whose classes can demonstrate positive output. Lavy (2007) reviewed the many different types of performance-based compensation for teachers. Compensation has come in the form of individual monetary bonuses, team monetary bonuses, and extra personal days, but is not always just related to student performance on tests. It may also include attendance, retention, and/or graduation rates (Lavy, 2007). Loyalka, Sylvia, Liu, Chu, Rozelle, & Society for Research on Educational Effectiveness (2015) reviewed different performance-based pay systems in China. The review found that "only 'pay-for-percentile' incentives had a positive, statistically significant effect on average student achievement," and that "teacher incentives based on 'levels' or 'gains' were ineffective" (Loyalka et al., 2015, p. 4). Because performance-based pay rewards teachers based on their productivity, schools can attract and retain highly qualified and engaged teachers; consequently, public support for education increases (Lavy, 2007). However, this type of system may also cause otherwise satisfactory teachers to narrow their focus to only include data measures for which they are paid. This can cause feelings of negativity amongst colleagues and may even motivate

school leaders to “play” with their numbers or concentrate on low performing students only (Lavy, 2007; Loyalka et al., 2015).

Data-Based Decision-Making for Teachers

Hagen and Nordmeyer (2013) wrote, “Looking at student learning data as part of an ongoing improvement process is one of the defining factors of the most successful schools worldwide” (p. 28). There are levels of data-based decision making at the classroom level. Teachers can use very basic formative assessments, like entrance and exit tickets or journal entries, to make decisions about lessons, timing, and student understanding and readiness (Cornelius, 2014). These types of formative assessments do not produce hard data the way a standardized test would though. Standardized, technology supported formative assessments create statistical analyses of student results as well as keep a record of them (Feldman & Capobianco, 2008). Teachers can use MAP test results, among others, to determine whether or not more support is needed for a particular skill or subject area, or if students have skills that can be enriched (NWEA, 2013d). Support and enrichment can be built into instruction, assessments, and project work (Supovitz, Foley, & Mishook, 2012; von Frank, 2014). When they are, especially in an international setting, schools are considered thriving, and “a thriving international school uses data, rather than intuition or tradition, to guide decisions about instruction, curriculum, scheduling, and professional learning” (Hagen & Nordmeyer, 2013, p. 37).

Jimenez, Mims, and Browder (2012) reported that, although research has shown that teachers can use instructional data to make decisions in their classrooms, little was ever shown about how to recognize patterns in data and how to apply information learned

from the data to their classrooms. A procedure, known as a data-based decision system of guidelines, can assist teachers in finding general data patterns and in creating a plan for analyzing and interpreting data (Jimenez et al., 2012). It is important to recognize that procedures like this exist so that schools can either use it or develop their own guidelines with which to make decisions based on data.

Project Description

Based on the results of the study, professional development sessions for both teachers and administrators of schools utilizing MAP testing are necessary. This project, composed of two webinars for teachers and one for administrators, will directly address the needs of stakeholders as described in the study's problem statement. Since data collected in the project study phase indicated teachers do not necessarily use MAP data to improve educational outcomes, more professional development will address this need. Comprehensive training regarding all facets of MAP testing is needed for both teachers and administrators.

The first of the teacher professional development webinars will center on ensuring teachers are able to access and utilize data and reports provided by MAP testing. The second will focus on ideas for creating activities and assessments that support practicing MAP-type questions for students at all levels and that will assist students in increasing their low score subject area and/or enrich their high score subject area. The goal of these webinars is to equip teachers to be well versed in a common language about the purpose, results, data, and individualized learning as related to MAP testing and that they will feel confident with differentiating lessons as part of the MAP teaching and testing process.

The webinar for school administrators who utilize MAP testing will allow upper level management the opportunity to investigate how MAP test results can be used for student information, including class placement or suggested accommodations for more individualized learning, and for team and teacher information. This would include establishing professional learning teams to develop questions for students, determining appropriateness of teacher placement in a course, and utilizing MAP test results as a teacher evaluation tool. The goal of this webinar is to ensure that administrators have a more hands-on top-down approach to information provided by MAP testing and that they will be able to encourage departments or grade levels to work together for practice question creation and relate teachers' periodic evaluations directly to differentiation and the MAP testing process.

Implementation

Implementation of this professional development series will require support from those at the project site. Teleconferencing and sharing of electronic materials may be necessary to deliver all that is included in the professional development sessions. Administrators at the site have a very important role in the implementation of this project. The school's director will need to gather the heads of each department, as well as any administrative assistants that are responsible for data entry, for review of all shared materials. Once this leadership team fully understands all portions of the project, they will be the ones to deliver the materials and message to the teaching staff.

Potential Resources and Existing Supports

Office staff, teachers, and administrators still working at the research site will have important roles in the implementation of the professional development series. Face to face delivery of the project may not be possible because the site is located in another country and travel to the site could be costly. Although face to face delivery of this project would be best, because it is electronic, delivery to administration would be possible via teleconferencing. Once the project is shared electronically, school officials will deliver the timeline for the professional development to the staff.

The author of the MAP test, NWEA, also provides support for all MAP users. NWEA's website offers general information about MAP testing and articles about schools currently using the tests. The project site has a NWEA representative assigned to it, and the school is also part of a MAP Users Group (MUG) that spans Mexico and other parts of Latin America. These supports are always in place for additional brainstorming and clarification.

Potential Barriers

A potential barrier for successful implementation of the professional development series is unreliable internet service. Although internet service in the region has improved over the past decade, there are still issues with it. Internet is a necessary component for the project because it requires teachers to access current MAP test results from the test administration website. While the creation of a CD for training materials might be an option, this also increases the cost to the school, minimally, and decreases just-in-time access to teachers as they leave and are hired new to the school.

Another barrier for implementation of the project would be scheduling. Although there is time allotted in the school year for professional development, other initiatives may take precedence over MAP test results. Lastly, I no longer work at the site, and professional development from a former employee may be strange for some of the existing administrators. Therefore, arrangements will be made to have a school leader or NWEA representative lead this initiative. The professional development videos can still be shared with teachers for use if an MAP testing expert is unavailable though.

Proposal for Implementation and Timetable

A responsible person who is still working at the site has been contacted to review each piece of the professional development series. The site's assessment coordinator will schedule the series to be given in three parts during the school's professional development week, which is the third week of June, when teachers are still in service, but students have completed the year. A detailed timetable can be found in the project in Appendix A. The first part will be the session for administrators. This will allow administrative staff, including department heads, to buy into the idea of MAP testing, the analysis of its results, team building for practice question creation, and teacher evaluations that will include their MAP related work. This will also ensure that administrators can be a positive influence on the teachers when the second and third professional development sessions are delivered. After the session has been completed, it is important that school leaders collaborate to establish school guidelines and policies for MAP test result analysis and MAP practice procedures.

The second and third sessions for teachers can be delivered in one day; however, their online nature allows teachers to watch and re-watch the sessions multiple times if necessary during a training window established by school leadership. The first session will teach staff how to access their students' MAP test results together. The second session will be a more in-depth look at the student profiles and how to use those to make data-based decisions in their classrooms. Undoubtedly, this will generate a brainstorming session in which teachers can give ideas about how they are already using the information from the MAP data as well as the student profiles. Lastly, the MAP professional development training window should conclude with teachers getting into teams, either in departments, or grade levels, or both, to develop a schedule for giving students practice with MAP-style questions, as well as to develop a first round of practice questions to be given to students.

Roles and Responsibilities of Students and Others

Because I travel to the location of the project site at least once per year, I am willing to deliver the professional development session to my former coworkers. It may be more likely that a current staff member deliver the professional development series to administrators and staff. I would need to prepare the school's current MAP administrator by sharing each presentation and related materials. Because all are electronic I would most likely share everything via Google Docs.

The current MAP or testing administrator would receive all shared materials and meet with the rest of the leadership at the school. This would include the school's director, administrative assistants who may be responsible for data entry into student

profiles, and department heads. Once the MAP or testing administrator has delivered the professional development to the school's administrative staff, he or she can give the teacher sessions. Key administrators, such as the director and department heads, should be present in the teacher sessions as well. This way all staff receives the same information about accessing and utilizing MAP data and student profiles, and clear expectations regarding their use can be delivered from the top down.

Project Evaluation Plan

Evaluation of the usefulness of this professional development series will be twofold. First, teachers will begin to access technology more than they previously reported to gather student information from MAP test results. This includes reports from the MAP administration website and the student profiles Google Doc. The onsite coordinator can examine the amount of time spent viewing and working with MAP profiles and document and increase if one occurs. An increase in knowledge about student strengths and weaknesses will guide teachers in making changes to their instructional planning and classroom environments. Therefore, a follow-up survey or questionnaire to the teachers inquiring about frequency of use of MAP-related technology and instructional changes they have made due to the professional development series would evaluate the usefulness for teachers. The follow-up questionnaire for teachers can be found in Appendix A.

Secondly, students' MAP test scores will continue to be affected by teachers' behaviors. Therefore, continuous comparison of students' MAP test scores from year to

year in mathematics and reading will be necessary. Students' scores should improve based on the results of the investigation.

Project Implications

The professional development series has implications that will affect all stakeholders. Assuming the training is effective; teachers should gain a deeper understanding of their effect on students' MAP test scores, as well as other formative and summative assessments. Teachers will have a deeper understanding of their students' strengths and weaknesses, and how this knowledge can be translated into differentiated instruction and changes to their classroom environments. Teachers will also see that administrative staff has a complete understanding of MAP testing and its implications for the learning environment.

Administrators will be able to hold teachers and support staff more accountable. Not only will differentiation continue to be evaluated on teachers' annual reviews, but the effect of that differentiation, students' MAP test scores, can be examined. Additionally, administrators could create some healthy competition among staff by incorporating some sort of compensation for teachers whose students perform well on their MAP tests. This will increase morale and foster teacher ownership of MAP results.

Students should continue to improve or at least maintain their MAP test results if the training is effective. They will also have potential for a higher level of engagement in their own learning because their teachers have differentiated based on their strengths and weaknesses. This will demonstrate to parents that teachers at this particular site motivate students to be engaged in their learning through differentiated instruction.

The project is a good choice for stakeholders in this community. It has a blend of technology and collaborative teamwork to allow teachers and administrators to make decisions based on actual student data. The professional development series is flexible in its delivery as well. It can be given by a MAP expert on-site, or administered remotely with its embedded videos. The following section will discuss the project's strengths and weaknesses in more detail, and also implications, applications, and directions for future related research.

Section 4: Reflections and Conclusions

Project Strengths and Limitations

Accessibility is this project's strength. The professional development series can be completed as a group or with specific individuals. It can be done anywhere that is convenient for the receivers. Videos can be watched and rewatched to ensure receivers completely understand each component. The project promotes top-down leadership as well as collaborative input from teaching staff in all curriculum areas. The project addresses issues that may arise for teachers and administrators who are interested in using MAP-testing data to make changes to classroom, school, or district starting with the most influential person: the teacher.

There are limitations to the project, however. The professional development series is exclusively electronic; therefore, unless the professional development is simultaneously led by a MAP expert in person, questions may arise during collaborative discussions that will not be answered immediately. Questions may be emailed to the appropriate person, department, or company, but the professional development receivers will have to wait for a response.

Administrator-level professional development does not include exact instructions for execution of evaluating teachers, but merely offers suggestions. This is the same with teacher professional development with regard to practice MAP question development. The professional development series only offers recommendations for the organization of professional learning teams and possible question creation techniques.

Recommendations for Alternative Approaches

Another option for approaching this project would have been to design and deliver face-to-face professional development sessions. Although the benefit of live training is tangible, with limited time and working off site, this approach was not feasible for the current project. Additionally, administrators might wish to design mentoring relationships where more experienced teachers mentor novice teachers on the uses of MAP testing and individualizing education. In future studies, data should be collected regarding the amount of time teachers spend using MAP data and its effect on their daily instructional practices.

Scholarship, Project Development and Evaluation, and Leadership and Change

This project study allowed me to reflect on all aspects of the process, including the methods I used to complete the study and the process I followed when developing the project. Also, the project study allowed me to reflect on my learning. I believe this process will make me a more caring educator, a more authentic leader, and a more reflective practitioner.

Research Processes

As a teacher, lifelong learner, and general lover of mathematics, I have always considered numbers and statistics to be the key to understanding and problem-solving. A sign in my own classroom reads “Numbers never lie,” an important truth I want to instill in my students. However, although I wholeheartedly support the previous statement, the research process has taught me that numbers may not tell the entire story.

When I began my study, I was only interested in doing quantitative research. I thought the numbers would tell me what I needed to know. Although I was able to answer my research questions and develop a project based on the results, I was left with more ideas about researching similar topics, but in a qualitative manner. I want to know more about teachers' beliefs and perceptions of differentiated instruction, data-based decision-making, and formative assessments. I want to interview teachers in different settings to observe their body language while they answer questions about webinars and professional learning communities. I want to observe teachers using formative assessments to plan lessons. These types of research practices can only be done through a qualitative approach, and may be even more revealing than their quantitative counterparts.

Project Development

Developing an idea for this project was easy. I knew immediately that professional development would be the way to teach educators at all levels how to access MAP data and use it to make decisions throughout the school. The creation of the project was difficult, however. The webinars required a script to be read while accessing MAP test websites while being recorded through screen-casting software. The process required numerous attempts with different hardware and multiple takes to ensure it sounded professional. However, this is a necessary duty of any educational leader. Successful leaders in education must find the appropriate tools with which to work, which could be hardware, software, or people. The process may involve making the wrong choices in the beginning, only to eventually find the right choice for a successful school environment.

Personal Learning

When I began my graduate studies, I had the intention of completing this project study in three to four years. Life changes made this difficult, but the major personal lesson was perseverance. When I moved from Mexico back to the United States, I needed to refigure my entire routine. It required flexibility. When my father passed away, it was a major setback. It required pushing through personal sadness. When my first child was born, family time became more essential than ever. It required short-term sacrifice for long-term gain. These are all requirements for successful leaders in the field of education. Regardless of location, personal struggle, or family obligations, leaders must persevere to create the best possible environment for educators to teach and for students to learn. These personal struggles have also taught me to be a more understanding school leader. I want to support my peers and staff when they have their own personal struggles and are expected to maintain the highest level of professionalism.

Reflection on Importance of the Work

Throughout this project study, I questioned the relevance of the work. However, I was asked recently by my current supervisor whether I thought we should renew our school's subscription to MAP testing. I was shocked at the question, but I reminded myself that not everyone is as invested in the usefulness of MAP testing and the value of its results. I promptly responded that Web-based, adaptive, low stakes formative assessments like MAP that show student progress and can guide teachers in planning effective lessons differentiated according to students' strengths and opportunities for growth are essential to student success. It was at that moment I realized the importance of

my work. It is not to support NWEA, but to support educators in their quests to help students achieve their highest potential. I want to be part of the process in which teachers learn to analyze relevant data and make decisions in their classrooms. I want to assist my peers in making dramatic changes to their classrooms to accommodate students' needs. Whether it is through MAP testing or some other formative assessment tool, I believe this project study can help educators answer some of their questions about creating change in education at any level.

Implications, Applications, and Directions for Future Research

This study will not only have an effect on the project site, but similar sites struggling with formative assessments, data collection and analysis, and/or data-based decision-making. The professional development webinars, although created specifically for the project site, can be used at any school using MAP testing. That means that this project has the potential to have international influence. Schools in many different countries are using MAP testing to check on student progress, and this professional development series can guide them with what to do with the data and, more importantly, how to change educational practices to accommodate different learners.

Questions may arise from the professional development series once it has been implemented. Development of an online discussion board or blog may be necessary to field questions and share answers with multiple users worldwide. This way teachers and administrators can get immediate assistance and clarification for issues that may arise during training.

Once a site has started to examine MAP data more deeply and create MAP-like questions for students to use for practicing online test-taking techniques, more research is necessary. Students' MAP test scores in reading and mathematics should be collected and compared again to see if suggested procedures have a significant positive effect on student MAP test achievement. Additionally, a deeper look into teachers' perceptions of differentiated instruction at this project site may be necessary. Because of its location abroad and international teaching staff, qualitative research on beliefs about differentiation and formative assessment may lead to the development of educational norms at this particular site.

Conclusion

This project study presented answers to the following research questions:

RQ1: What are the differences in students' MAP test scores (gain scores) in mathematics among the varying frequencies of teachers' use of MAP data?

RQ2: What are the differences in students' MAP test scores (gain scores) in reading among the varying frequencies of teachers' use of MAP data?

RQ3: What are the differences in students' MAP test scores (gain scores) in mathematics among the varying frequencies of teachers' use of student profiles?

RQ4: What are the differences in students' MAP test scores (gain scores) in reading among the varying frequencies of teachers' use of student profiles?

The teacher questionnaire addressed possibilities of teachers' influence on students' MAP test scores. Results of the ANOVA on responses from the teacher questionnaire indicated no significant improvement in students' MAP test scores in

mathematics. However, analysis of the teachers' self-reported frequency of use of MAP test data and student profiles revealed a significant improvement in students' reading MAP tests. Students of teachers who reported using MAP data at least once per week or using the online student profiles Google Doc at least once per month scored approximately two to six points higher from one year to the next in reading. These results indicated a need for professional development regarding MAP testing at all levels. A series of professional development video presentations were created to assist teachers and administrators with navigating the MAP test administration site, understanding MAP test results and the student profile Google Doc, and analyzing each. These video presentations will help teachers and administrators stay focused on the results that MAP tests provide by showing that school leaders have ownership over those results. Administrators can place more emphasis on MAP testing by including test results in teachers' annual reviews. Teachers can do the same by using the results of the formative assessments to plan differentiated lessons. The professional development video series will be helpful at all sites that use MAP testing. Therefore, the influence that this project study has will not only affects the research site, but any school interested in diving deeper into the results that MAP testing provides.

References

AdvancED. (2011). *Standards for quality*. Retrieved from http://www.advanc-ed.org/sites/default/files/documents/SchoolStndsNolevels.pdf

Albano, G. G., & Ascione, R. R. (2008). E-learning and affective student's profile in mathematics. *International Journal of Emerging Technologies in Learning*, *3*(S3), 6-13. doi:10.3991/ijet.v3i1.755

Alsofyani, M. M., Aris, B. B., Eynon, R., & Majid, N. A. (2012). A preliminary evaluation of short blended online training workshop for TPACK development using technology acceptance model. *Turkish Online Journal of Educational Technology - TOJET*, *11*(3), 20-32. Retrieved from http://www.tojet.net/articles/v11i3/1133.pdf

Angus, S. D., & Watson, J. (2009). Does regular online testing enhance student learning in the numerical sciences? Robust evidence from a large data set. *British Journal of Educational Technology, 40*(2), 255-272. doi:10.1111/j.1467-8535.2008.00916.x

Baecher, L., Artigliere, M., Patterson, D. K., & Spatzer, A. (2012). Differentiated instruction for English language learners as "Variations on a Theme." *Middle School Journal, 43*(3), 14-21. doi:10.1080/00940771.2012.11461807

Bakia, M., Yang, E., & Mitchell, K. (2008). National educational technology trends study: Local-level data summary. Retrieved from http://files.eric.ed.gov/fulltext/ED504192.pdf

Bird, K. (2006). Student information systems: How do you spell parental involvement? S-I-S. *T.H.E. Journal, 33*(7), 38-42. Retrieved from https://thejournal.com/Articles/2006/02/01/Student-Information-Systems--How-Do-You-Spell-Parental-Involvement-SIS.aspx

Birnie, B. F. (2015). Making the case for differentiation. *Clearing House*, *88*(2), 62-65. doi:10.1080/00098655.2014.998601

Black, P., Harrison, C., Lee, C., Marshall, B., & Wiliam, D. (2003). *Assessment for learning: Putting it into practice.* Buckingham, England: Open University Press.

Boisvert, R. D. (1997). *John Dewey*. Albany, NY: State University of New York Press.

Box, C., Skoog, G., & Dabbs, J. M. (2015). A case study of teacher personal practice assessment theories and complexities of implementing formative assessment. *American Educational Research Journal*, *52*(5), 956-983. Retrieved from http://journals.sagepub.com/doi/full/10.3102/0002831215587754

Brookfield, S. D. (2010). *Developing critical thinkers*. San Francisco, CA: Jossey-Bass Publishers.

Brunvand, S. (2010). Best practices for producing video content for teacher education. *Contemporary Issues in Technology and Teacher Education, 10*(2), 247-256. Retrieved from https://pdfs.semanticscholar.org/0887/384bae6e0c02c9ffae4c067cae3486bda097.pdf

Callahan, K., & Sadeghi, L. (2015). Teacher perceptions of the value of teacher evaluations: New Jersey's ACHIEVE NJ. *International Journal of Educational*

Leadership Preparation, 10(1), 46-59. Retrieved from http://files.eric.ed.gov/fulltext/EJ1060978.pdf

Candal, C. S., & Pioneer Institute for Public Policy Research, C. R. (2016). *Massachusetts charter public schools: Best practices using data to improve student achievement in Holyoke* (White Paper No. 143). Location: Pioneer Institute for Public Policy Research.

Christensen, C. M., Horn, M. B., & Johnson, C. W. (2011). *Disrupting class: How disruptive innovation will change the way the world learns*. New York, NY: McGraw-Hill.

Clark, I. (2011). Formative assessment: Policy, perspectives and practice. *Florida Journal of Educational Administration & Policy*, *4*(2), 158-180. Retrieved from http://files.eric.ed.gov/fulltext/EJ931151.pdf

Clark, I. (2012a). Formative assessment: Assessment is for self-regulated learning. *Educational Psychology Review*, *24*(2), 205-249. doi:10.1007/s10648-011-9191-6

Clark, I. (2012b). Formative assessment: A systematic and artistic process of instruction for supporting school and lifelong learning. *Canadian Journal of Education*, *35*(2), 24-40. Retrieved from http://files.eric.ed.gov/fulltext/EJ975274.pdf

Clary, D. M., Styslinger, M. E., & Oglan, V. A. (2012). Literacy learning communities in partnership. *School-University Partnerships, 5*(1), 28-39. Retrieved from http://files.eric.ed.gov/fulltext/EJ974367.pdf

Cohen, J. (1969). *Statistical power for the behavioral sciences.* New York, NY: Academic Press.

Connor, C., Kaya, S., Luck, M., Toste, J. R., Canto, A., Rice, D., & Underwood, P. S. (2010). Content area literacy: Individualizing student instruction in second-grade science. *Reading Teacher, 63*(6), 474-485. doi:10.1598/RT.63.6.4

Cordray, D., Pion, G., Brandt, C., Molefe, A., & Toby, M. (2012). *The impact of the Measures of Academic Progress (MAP) program on student reading achievement.* (NCEE 2013-4000). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. Retrieved from http://files.eric.ed.gov/fulltext/ED537982.pdf

Cornelius, K. E. (2014). Formative assessment made easy: Templates for collecting daily data in inclusive classrooms. *Teaching Exceptional Children*, *47*(2), 112-118. doi:10.1177/0040059914553204

Creswell, J. W. (2012). *Educational research*. Boston, MA: Pearson Education, Inc.

Creswell, J. W. (2009). *Research design*. Thousand Oaks, CA: Sage Publications.

Czerniak, C. M., Lumpe, A. T., Haney, J. J., & Beck, J. (1999). Teachers' beliefs about using educational technology in the science classroom. *International Journal of Educational Technology*, *1*(2), 1-18. Retrieved from http://files.eric.ed.gov/fulltext/EJ768874.pdf

Dexter, D. (1998). Cluster grouping: A strategy for effective teaching. *Gifted Child Today Magazine*, *21*(3), 14-18. Retrieved from http://journals.sagepub.com/doi/pdf/10.1177/107621759802100305

Dixon, F. A., Yssel, N., McConnell, J. M., & Hardin, T. (2014). Differentiated instruction, professional development, and teacher efficacy. *Journal for the Education of the Gifted*, *37*(2), 111-127. doi:10.1177/0162353214529042

Doherty, R., & Hilberg, R. (2007). Standards for effective pedagogy, classroom organization, English proficiency, and student achievement. *Journal of Educational Research, 101*(1), 24-35. Retrieved from http://www.jstor.org/stable/27548212?seq=1#page_scan_tab_contents

Dufour, R., & Dufour, R. (2012). *The school leader's guide to professional learning communities at work.* Bloomington, IN: Solution Tree Press.

Dunlosky, J., Rawson, K.A., Marsh, E.J., Natan, M.J., & Willingham, D.T. (2013). Improving students' learning with effective learning techniques: Promising directions from cognitive and educational psychology. *Psychological Science in the Public Interest, 14*(1), 4–58. doi:10.1177/1529100612453266

Ebe, A. E. (2010). Culturally relevant texts and reading assessment for English language learners. *Reading Horizons, 50*(3), 193-210. Retrieved from http://scholarworks.wmich.edu/cgi/viewcontent.cgi?article=1016&context=reading_horizons

Echevarria, J., Short, D., & Powers, K. (2008). Making content comprehensible for non-native speakers of English: The SIOP model. *International Journal of Learning, 14*(11), 41-49. Retrieved from http://ijlar.cgpublisher.com/

Echevarria, J., & Vogt, M. (2010). Using the SIOP model to improve literacy for English learners. *New England Reading Association Journal, 46*(1), 8-15. Retrieved from

http://msmiddletonsclassroom.weebly.com/uploads/5/4/3/6/54366123/siop_model_for_ells.pdf

Falk, A. (2012). Teachers learning from professional development in elementary science: Reciprocal relations between formative assessment and pedagogical content knowledge. *Science Education*, *96*(2), 265-290. doi:10.1002/sce.20473

Faulkner, V. N., Crossland, C. L., & Stiff, L. V. (2013). Predicting eighth-grade algebra placement for students with individualized education programs. *Exceptional Children*, *79*(3), 329-345. Retrieved from https://www.researchgate.net/publication/285983120_Predicting_Eighth-Grade_Algebra_Placement_for_Students_With_Individualized_Education_Programs

Feldman, A., & Capobianco, B. M. (2008). Teacher learning of technology enhanced formative assessment. *Journal of Science Education & Technology*, *17*(1), 82-99. doi:10.1007/s10956-007-9084-0

Fink, A. (2009). *How to conduct surveys*. Thousand Oaks, CA: Sage Publications.

Garrison, J. (2008). Introduction: Reconstructing democracy and recontextualizing Deweyan pragmatism. In J. Garrison (Ed.), *Reconstructing democracy, recontextualizing Dewey: Pragmatism and interactive constructivism in the twenty-first century.* Ithaca, NY: State University of New York Press.

Gerzon, N., Guckenburg, S., Regional Educational Laboratory Northeast & Islands, & National Center for Education Evaluation and Regional Assistance & Education Development Center. (2015). Toolkit for a workshop on building a culture of data

use. REL 2015-063. *Regional Educational Laboratory Northeast & Islands.* Retrieved from http://files.eric.ed.gov/fulltext/ED555739.pdf

Giraldo, F. (2014). The impact of a professional development program on English language teachers' classroom performance. *PROFILE: Issues in Teachers' Professional Development, 16*(1), 63-76. Retrieved from http://www.scielo.org.co/pdf/prf/v16n1/v16n1a05.pdf

Gorder, L. M. (2008). A study of teacher perceptions of instructional technology integration in the classroom. *Delta Pi Epsilon Journal*, *50*(2), 63-76. Retrieved from http://mollymckee.wiki.westga.edu/file/view/A+Study+of+Teacher+Perceptions+of+Instructional+Technology+Integration+in+the+Classroom.pdf

Grady, M. W., O'Dwyer, L. M., Regional Educational Laboratory Northeast & Islands, & National Center for Education Evaluation and Regional Assistance. (2014). The English language learner program survey for principals. REL 2014-027. *Regional Educational Laboratory Northeast & Islands.* Retrieved from https://ies.ed.gov/ncee/edlabs/regions/northeast/pdf/REL_2014027.pdf

Graham, S., Hebert, M., & Harris, K. R. (2015). Formative assessment and writing: A meta-analysis. *Elementary School Journal, 115*(4), 523-547. doi:10.1086/681947

Hagen, E., & Nordmeyer, J. (2013). No data left behind. *International Schools Journal*, *33*(1), 26-40. Retrieved from http://www.johncattbookshop.com/books/international-schools-journal

Hewitt, K. K., & Weckstein, D. (2012). Programs in practice: Differentiated instruction--Begin with teachers! *Kappa Delta Pi Record, 48*(1), 35-46. Retrieved from http://dx.doi.org/10.1080/00228958.2012.654719

Hickman, L. A., & Neubert, S. (2009). John Dewey between pragmatism and constructivism. Bronx, NY: Fordham University Press.

Hirschi, A. (2010). Individual predictors of adolescents' vocational interest stabilities. *International Journal for Educational and Vocational Guidance*, *10*(1), 5-19. doi:10.1007/s10775-009-9171-2

Hollingworth, L. (2012). Why leadership matters: Empowering teachers to implement formative assessment. *Journal of Educational Administration*, *50*(3), 365-379. Retrieved from http://dx.doi.org/10.1108/09578231211223356

Holmes, B. (2013). School teachers' continuous professional development in an online learning community: Lessons from a case study of an eTwinning learning event. *European Journal of Education, 48*(1), 97-112. doi:10.1111/ejed.12015

Huang, S. (2012). Like a bell responding to a striker: Instruction contingent on assessment. *English Teaching: Practice and Critique*, *11*(4), 99-119. Retrieved from https://edlinked.soe.waikato.ac.nz/research/files/etpc/files/2012v11n4art7.pdf

Illeris, K. (2007). *How we learn: Learning and non-learning in school and beyond.* Florence, KY: Routledge.

Inan, F. A., Flores, R., & Grant, M. M. (2010). Perspectives on the design and evaluation of adaptive web based learning environments. *Contemporary Educational*

Technology, 1(2), 148-159. Retrieved from https://pdfs.semanticscholar.org/ce6c/d02398942bdaffeb0fda2909b294529424b6.pdf

James, R. (2015). The three most important things in teaching? Assessment, assessment, assessment! *Mathematics Teaching*, (249), 5-8. Retrieved from https://www.atm.org.uk/write/MediaUploads/Journals/MT249/MT249-15-01.pdf

Jenkins, J. (2006). Constructivism. In F. English (Ed.), *Encyclopedia of educational leadership and administration.* (pp. 196-200). Thousand Oaks, CA: SAGE Publications. doi:10.4135/9781412939584.n121

Jensen, R., & Moller, J. (2013). School data as mediators in professional development. *Journal of Educational Change, 14*(1), 95-112. doi:10.1007/s10833-012-9197-y

Jimenez, B. A., Mims, P. J., & Browder, D. M. (2012). Data-based decisions guidelines for teachers of students with severe intellectual and developmental disabilities. *Education and Training in Autism and Developmental Disabilities*, *47*(4), 407-413. Retrieved from http://www.daddcec.org/portals/0/cec/autism_disabilities/research/publications/education_training_development_disabilities/2011v47_journals/etadd_47_4_407-413.pdf

Jones, W. M., & Dexter, S. (2014). How teachers learn: The roles of formal, informal, and independent learning. *Educational Technology Research and Development*, *62*(3), 367-384. Retrieved from http://www.daddcec.org/portals/0/cec/autism_disabilities/research/publications/ed

ucation_training_development_disabilities/2011v47_journals/etadd_47_4_407-413.pdf

Kappler Hewitt, K., & Weckstein, D. K. (2012). Differentiated Instruction: Begin with Teachers! *Kappa Delta Pi Record, 48*(1), 35-40. doi:10.1080/00228958.2012.654719

Kesianye, S. K. (2015). The three perspectives of integrating assessment and instruction in the learning of school mathematics. *Journal of Education and Practice, 6*(19), 212-214. Retrieved from http://files.eric.ed.gov/fulltext/EJ1079550.pdf

Kilfoil, W. R. (2008). A model for learning development. *South African Journal of Higher Education, 22*(5), 1019-1028. doi:10.4314/sajhe.v22i5.42921

Kim, P., Hagashi, T., Carillo, L., Gonzales, I., Makany, T., Lee, B., & Gàrate, A. (2011). Socioeconomic strata, mobile technology, and education: A comparative analysis. *Educational Technology Research & Development, 59*(4), 465-486. doi:10.1007/s11423-010-9172-3

Kingsbury, G. G., & Hauser, C. (2004). Computerized adaptive testing and No Child Left Behind. *Northwest Evaluation Association*. Retrieved from http://www.nwea.org/sites/www.nwea.org/files/Computerized_Adaptive_Testing_and_NCLB_0.pdf

Koellner, K., Jacobs, J., & Borko, H. (2011). Mathematics professional development: Critical features for developing leadership skills and building teachers' capacity. *Mathematics Teacher Education and Development, 13*(1), 115-136. Retrieved from http://files.eric.ed.gov/fulltext/EJ960952.pdf

Kohl, M. J. (2012). AAFCS webinars: Statewide opportunities for FCS educators. *Journal of Family and Consumer Sciences*, *104*(2), 48-49. Retrieved from http://www.aafcs.org/Resources/Journal.asp

Konstantinou-Katzi, P., Tsolaki, E., Meletiou-Mavrotheris, M., & Koutselini, M. (2013). Differentiation of teaching and learning mathematics: An action research study in tertiary education. *International Journal of Mathematical Education in Science & Technology, 44*(3), 332-349. doi:10.1080/0020739X.2012.714491

Lalor, B., & Abawi, L. (2014). Professional learning communities enhancing teacher experiences in international schools. *International Journal of Pedagogies & Learning*, *9*(1), 76-86. doi:10.5172/ijpl.2014.9.1.76

Lavy, V. (2007). Using performance-based pay to improve the quality of teachers. *Future of Children*, *17*(1), 87-109. doi:10.1353/foc.2007.0007

Lawless, K. A., & Pellegrino, J. W. (2007). Professional development in integrating technology into teaching and learning: Knowns, unknowns, and ways to pursue better questions and answers. *Review of Educational Research, 77*(4), 575-614. doi:10.3102/0034654307309921

Lee-Tarver, A. (2006). Are individualized education plans a good thing? A survey of teachers' perceptions of the utility of IEPs in regular education settings. *Journal of Instructional Psychology*, *33*(4), 263-272. Retrieved from http://www.projectinnovation.biz/journal_of_instructional_psychology

Lees, R., & Anderson, D. (2015). Reflections on academics' assessment literacy. *London Review of Education*, *13*(3), 42-48. Retrieved from

http://docserver.ingentaconnect.com/deliver/connect/ioep/14748460/v13n3/s6.pdf?expires=1487268766&id=89938942&titleid=10430&accname=Guest+User&checksum=C21B69071FFC5F3A3A39FDEC87A9B31C

Lefkowits, L. (2016). *Accreditation, accountability, and continuous improvement.* Retrieved from http://www.advanc-ed.org/source/accreditation-accountability-and-continuous-improvement

Levine, M. (2007). Teaching all students. *The Jossey-Bass reader on educational leadership* (2nd ed., Rev. ed., pp. 289-298). San Francisco, CA: Jossey-Bass.

Li, H. (2016). How is formative assessment related to students' reading achievement? Findings from PISA 2009. *Assessment in Education: Principles, Policy & Practice, 23*(4), 473-494. doi:10.1080/0969594X.2016.1139543

Liang, J. G., & Sandmann, L. R. (2015). Leadership for community engagement--A distributed leadership perspective. *Journal of Higher Education Outreach and Engagement*, *19*(1), 35-63. Retrieved from http://files.eric.ed.gov/fulltext/EJ1061871.pdf

Lin, S., Cheng, W., & Wu, M. (2015). Uncovering a connection between the teachers' professional development program and students' learning. *Journal of Education and Practice, 6*(23), 66-74. Retrieved from http://files.eric.ed.gov/fulltext/EJ1079018.pdf

Lingham, T. (2008). Experiential learning. In S. Clegg, & J. Bailey (Eds.), *International encyclopedia of organization studies.* (pp. 488-493). Thousand Oaks, CA: SAGE Publications, Inc. doi:10.4135/9781412956246.n171

Lodico, M., Spaulding, D. & Voegtle, K. (2010). *Methods in educational research.* San Francisco: Jossey-Bass.

Lotter, C., Rushton, G. T., & Singer, J. (2013). Teacher enactment patterns: How can we help move all teachers to reform-based inquiry practice through professional development? *Journal of Science Teacher Education, 24*(8), 1263-1291. doi:10.1007/s10972-013-9361-0

Loyalka, P., Sylvia, S., Liu, C., Chu, J., Rozelle, S., & Society for Research on Educational Effectiveness. (2015). Teaching to the tails: Teacher performance pay and the distribution of student achievement. *Society for Research on Educational Effectiveness*. Retrieved from http://files.eric.ed.gov/fulltext/ED562536.pdf

Marquez, B., Vincent, C., Marquez, J., Pennefather, J., Smolkowski, K., & Sprague, J. (2016). Opportunities and challenges in training elementary school teachers in classroom management: Initial results from classroom management in action, an online professional development program. *Journal of Technology & Teacher Education*, *24*(1), 87-109. Retrieved from http://files.eric.ed.gov/fulltext/EJ1092428.pdf

Mays, L. (2008). The cultural divide of discourse: Understanding how English-language learners' primary discourse influences acquisition of literacy. *Reading Teacher, 61*(5), 415-418. Retrieved from http://www.jstor.org/stable/20204605

McClare, E., & Winsler, A. (2005). Vygotsky, Lev (1896–1934). In N. Salkind (Ed.), *Encyclopedia of human development.* (pp. 1315-1318). Thousand Oaks, CA: SAGE Publications, Inc. doi:10.4135/9781412952484.n634

Measures of Effective Teaching Project (2010). *Learning about teaching: Initial findings from the measures of effective teaching project.* Seattle, WA: Bill & Melinda Gates Foundation. Retrieved from http://s3.documentcloud.org/documents/18327/met-research-paper.pdf

Menken, K., Hudson, T., & Leung, C. (2014). Symposium: Language assessment in standards-based education reform. *TESOL Quarterly: A Journal for Teachers of English to Speakers of Other Languages and of Standard English as a Second Dialect, 48*(3), 586-614. doi:10.1002/tesq.180

Murray, J. (2014). Critical issues facing school leaders concerning data--Informed decision-making. *Professional Educator, 38*(1). Retrieved from http://files.eric.ed.gov/fulltext/EJ1038162.pdf

National Research Council. (2000). *How people learn: Brain, mind, experience, and school*. Washington, DC: National Academy Press.

Nellis, L. M. (2012). Maximizing the effectiveness of building teams in response to intervention implementation. *Psychology in the Schools, 49*(3), 245-256. doi:10.1002/pits.21594

Northwest Evaluation Association. (2012). *For every child, multiple measures: What parents and educators want from K-12 assessments*. Retrieved from http://www.nwea.org/sites/www.nwea.org/files/NWEA-GRUNWALD_Assessment_Perceptions_b.pdf.pdf

Northwest Evaluation Association. (2004). *Reliability and validity estimates*. Retrieved from

http://images.pcmac.org/Uploads/Jacksonville117/Jacksonville117/Sites/DocumentsCategories/Documents/Reliability_and_Validity_Estimates.pdf

Northwest Evaluation Association. (2013a). *MAP scoring*. Retrieved from http://www.nwea.org/products-services/assessments/map%C2%AE

Northwest Evaluation Association. (2013b). *National education research.* Retrieved from http://www.nwea.org/our-research/national-education-research

Northwest Evaluation Association. (2013c). *Our history*. Retrieved from http://www.nwea.org/about-nwea/our-history

Northwest Evaluation Association. (2013d). *Our mission, vision and values*. Retrieved from http://www.nwea.org/why-choose-nwea/our-mission-vision-and-values

Northwest Evaluation Association. (2013e). *Proven results.* Retrieved from http://www.nwea.org/why-choose-nwea/proven-results

Northwest Evaluation Association. (2013f). *Spring 2013 international comparisons*. Portland, OR. Retrieved from https://www.nwea.org/content/uploads/2014/07/Spring-2013-International-Comparisons.pdf

Northwest Evaluation Association. (2013g). *The reliability of NWEA assessments*. Retrieved from http://www.nwea.org/support/article/533

Olsen, H., Donaldson, A. J., & Hudson, S. D. (2010). Online professional development: Choices for early childhood educators. *Dimensions of Early Childhood*, *38*(1), 12-18. Retrieved from http://www.southernearlychildhood.org/

Owen, H. (2012). Reinventing professional learning and development: Ensuring relevance and building resilience. *Journal of Open, Flexible and Distance Learning, 16*(1), 42-55. Retrieved from http://files.eric.ed.gov/fulltext/EJ1079995.pdf

Passmore, T., Brookshaw, L., & Butler, H. (2011). A flexible, extensible online testing system for mathematics. *Australasian Journal of Educational Technology, 27*(6), 896-906. Retrieved from http://dx.doi.org/10.14742/ajet.919

Pedersen, J., Yager, S., & Yager, R. E. (2010). Distributed leadership influence on professional development initiatives: Conversations with eight teachers. *Academic Leadership (15337812)*, *8*(3), 1-9. Retrieved from http://contentcat.fhsu.edu/cdm/ref/collection/p15732coll4/id/595

Pella, S. (2012). What should count as data for data-driven instruction? Toward contextualized data-inquiry models for teacher education and professional development. *Middle Grades Research Journal, 7*(1), 57-75. Retrieved from http://www.psycholosphere.com/What%20should%20count%20as%20data%20for%20data-driven%20instruction%20.%20.%20.%20contextualized%20data-inquiry%20by%20Pella%20-%20Lesson%20Study.pdf

Petersen, N. (2006). Child development theories. In F. English (Ed.), *Encyclopedia of educational leadership and administration.* (pp. 123-128). Thousand Oaks, CA: SAGE Publications, Inc. doi:10.4135/9781412939584.n79

Petrie, K., & McGee, C. (2012). Teacher professional development: Who is the learner? *Australian Journal of Teacher Education, 37*(2), 59-72. Retrieved from http://files.eric.ed.gov/fulltext/EJ969517.pdf

Popham, W. J. (2006). Phony formative assessments: Buyer beware! *Educational Leadership, 64*(3), 86–87. Retrieved from http://www.ascd.org/publications/educational-leadership.aspx

"Power" (n.d.) para 1. http://powerandsamplesize.com/Calculators/Compare-k-Means/1-Way-ANOVA-Pairwise

Powers, K., & Mandal, A. (2011). Tier III assessments, data-based decision making, and interventions. *Contemporary School Psychology*, *15,* 21-33. Retrieved from http://files.eric.ed.gov/fulltext/EJ934703.pdf

Pritchard, A., & Woollard, J. (2010). *Psychology for the classroom: Constructivism and social learning.* Florence, KY: Routledge.

Rao, G. (2009). Individualization of instruction: A teaching strategy for quality improvement in school education. *GYANODAYA: The Journal of Progressive Education, 2*(1), 79-84. Retrieved from http://www.indianjournals.com/ijor.aspx?target=ijor:gjpe&type=home

Rátiva Velandia, M., Pedreros Torres, A. L., & Núñez Alí, M. (2012). Using web-based activities to promote reading: An exploratory study with teenagers. *PROFILE: Issues in Teachers' Professional Development, 14*(2), 11-27. Retrieved from http://www.redalyc.org/pdf/1692/169224635002.pdf

Reich, K. (2008). Democracy and education after Dewey: Pragmatist implications for constructivist implications. In J. Garrison (Ed.), *Reconstructing democracy, recontextualizing Dewey: Pragmatism and interactive constructivism in the twenty-first century.* Ithaca, NY: State University of New York Press.

Reis, S. M., McCoach, D. B., Little, C. A., Muller, L. M., & Kaniskan, R. B. (2011). The effects of differentiated instruction and enrichment pedagogy on reading achievement in five elementary schools. *American Educational Research Journal, 48*(2), 462-501. Retrieved from http://journals.sagepub.com/doi/full/10.3102/0002831210382891

Reyes, M. (2011). Domain specificity of motivation and learning strategies: Filipino science high school students' profiles in science and social studies. *Asia-Pacific Education Researcher*, *20*(2), 308-321. Retrieved from http://ejournals.ph/article.php?id=4121

Roskos, K., & Neuman, S. B. (2012). Formative assessment: Simply, no additives. *Reading Teacher*, *65*(8), 534-538. doi:10.1002/TRTR.01079

Salar, R. R., & Turgut, U. U. (2015). Implementing differentiated instruction on pre-service physics teachers: Agendas. *Bartin University Journal of Faculty of Education, 4*(2), 682-695. doi:10.14686/buefad.v4i2.5000136908

Schaffhauser, D. (2011). High-stakes online testing. *T.H.E. Journal, 38*(6), 28. Retrieved from https://thejournal.com/articles/2011/06/07/high-stakes-online-testing-coming-soon.aspx

Scherer, M. (2006). Celebrate strengths, nurture affinities: A conversation with Mel Levine. *Educational Leadership*, *64*(1), 8-15. Retrieved from http://www.ascd.org/publications/educational-leadership/sept06/vol64/num01/Celebrate-Strengths,-Nurture-Affinities@-A-Conversation-with-Mel-Levine.aspx

Shaha, S. H., Glassett, K. F., & Copas, A. (2015). The impact of teacher observations with coordinated professional development on Student performance: A 27-state program evaluation. *Journal of College Teaching & Learning, 12*(1), 55-64. Retrieved from https://www.cluteinstitute.com/ojs/index.php/TLC/article/view/9070/9056

Shakman, K., Riordan, J., Sanchez, M. T., Cook, K. D., Fournier, R., Brett, J., & Regional Educational Laboratory Northeast & Islands (2012). An examination of performance-based teacher evaluation systems in five states. Issues & answers. REL 2012-No. 129. *Regional Educational Laboratory Northeast & Islands*. Retrieved from http://files.eric.ed.gov/fulltext/ED529800.pdf

Short, D. J., Echevarría, J., & Richards-Tutor, C. (2011). Research on academic literacy development in sheltered instruction classrooms. *Language Teaching Research, 15*(3), 363-380. doi:10.1177/1362168811401155

Siegle, D., Moore, M., Mann, R. L., & Wilson, H. E. (2010). Factors that influence in-service and preservice teachers' nominations of students for gifted and talented programs. *Journal for the Education of the Gifted*, *33*(3), 337-360. Retrieved from http://files.eric.ed.gov/fulltext/EJ881389.pdf

Sims, R. L., & Penny, G. R. (2015). Examination of a failed professional learning community. *Journal of Education and Training Studies*, *3*(1), 39-45. Retrieved from http://files.eric.ed.gov/fulltext/EJ1054892.pdf

Southern Association of Colleges and Schools. (2006). Southern Association of Colleges and Schools. Retrieved from http://sacs.org/

Spillane, J. P. (2012). Data in practice: Conceptualizing the data-based decision-making phenomena. *American Journal of Education*, *118*(2), 113-141. Retrieved from http://www.jstor.org/stable/10.1086/663283

Star, J. R., Foegen, A., Larson, M. R., McCallum, W. G., Porath, J., Zbiek, R. M., Caronongan, P. Furgeson, J., Keating, B., & Lyskawa, J. *Teaching Strategies for Improving Algebra Knowledge in Middle and High School Students. Educator's Practice Guide. What Works Clearinghouse. NCEE 2015-4010*. What Works Clearinghouse. Retrieved from http://ies.ed.gov/ncee/wwc/PracticeGuide.aspx?sid=20

Stewart, W., & Exley, S. (2014). There's no 'isolation' in 'team', survey says. *TES: Times Educational Supplement, 5101*, 6-7. Retrieved from https://www.tes.com/

Stewart, T. S., & Houchens, G. W. (2014). Deep impact: How a job-embedded formative assessment professional development model affected teacher practice. *Qualitative Research in Education*, *3*(1), 51-82. doi:10.4471/qre.2014.36

Supovitz, J., Foley, E., & Mishook, J. (2012). In search of leading indicators in education. *Education Policy Analysis Archives, 20*(19). Retrieved from http://epaa.asu.edu/ojs/article/view/952

Tammets, K., Pata, K., & Laanpere, M. (2013). Promoting teachers' learning and knowledge building in a socio-technical system. *International Review of Research in Open and Distance Learning, 14*(3), 251-272. Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/1478/2532

Tavalok, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education, 2*(1), 53-55. doi:10.5116/ijme.4dfb.8dfd

Triola, M. F. (2012). *Elementary statistics*. Boston, MA: Pearson Education, Inc.

Valiandes, S. (2015). Evaluating the impact of differentiated instruction on literacy and reading in mixed ability classrooms: Quality and equity dimensions of education effectiveness. *Studies in Educational Evaluation, 45*, 17-26. doi:10.1016/j.stueduc.2015.02.005

Van der Linden, W. J. (1993). Measurement scale in the Rasch model. Retrieved from http://www.rasch.org/rmt/rmt72c.htm

Van der Westhuizen, G. J. (2012). Learning equity in a university classroom. *South African Journal of Higher Education*, *26*(3), 623-637. Retrieved from https://www.researchgate.net/publication/261174493_Learning_Equity_in_a_University_Classroom

Vogel, L. R. (2012). A leader's journey: The challenges of implementing standards-based student grouping. *NASSP Bulletin, 96*(4), 323-349. Retrieved from http://journals.sagepub.com/doi/pdf/10.1177/0192636512467675

Volante, L., & Beckett, D. (2011). Formative assessment and the contemporary classroom: Synergies and tensions between research and practice. *Canadian*

Journal of Education, *34*(2), 239-255. Retrieved from http://files.eric.ed.gov/fulltext/EJ936752.pdf

von Frank, V. (2014). Track data. Tweak instruction. Repeat. A constant focus on student progress boosts achievement in Texas district. *Journal of Staff Development, 35*(3), 44-46. Retrieved from https://learningforward.org/publications/jsd

Wayman, J. C., Cho, V., Jimerson, J., & Spikes, D. D. (2012). District-wide effects on data use in the classroom. *Education Policy Analysis Archives*, *20*(25), 1-27. doi:10.14507/epaa.v20n25.2012

White, P., & Anderson, J. (2012). Pressure to perform: Reviewing the use of data through professional learning conversations. *Mathematics Teacher Education and Development, 14*(1), 60-77. Retrieved from http://files.eric.ed.gov/fulltext/EJ991858.pdf

Wilkie, K. J. (2016). Using challenging tasks for formative assessment on quadratic functions with senior secondary students. *Australian Mathematics Teacher*, *72*(1), 30-40. Retrieved from http://www.aamt.edu.au/Webshop/Entire-catalogue/Australian-Mathematics-Teacher

Wilson, E. K., Wright, V. H., Inman, C. T., & Matherson, L. H. (2011). Retooling the social studies classroom for the current generation. *Social Studies, 102*(2), 65-72. doi:10.1080/00377996.2010.484445

Wylie, E. C., & Lyon, C. J. (2015). The fidelity of formative assessment implementation: Issues of breadth and quality. *Assessment in Education: Principles, Policy & Practice,22*(1), 140-160. doi:10.1080/0969594X.2014.990416

Yates, J. (2014). Synchronous online CPD: Empirical support for the value of webinars in career settings. *British Journal of Guidance & Counselling, 42*(3), 245-260. doi:10.1080/03069885.2014.880829

Yurtseven Avci, Z., Eren, E., & Seckin Kapucu, M. (2016). Practical tools for content development: Pre-service teachers' experiences and perceptions. *International Journal of Instruction, 9*(2), 19-34. Retrieved from http://files.eric.ed.gov/fulltext/EJ1106319.pdf

Appendix A: The Project

This is a professional development series for teachers and administrators about Measures of Academic Progress (MAP) testing, related reports, and suggestions for changes to the classroom and/or school environment.

Teacher Professional Development #1

- For all teachers and administrators
- Demonstrates by video how to access, print, and utilize reports in the MAP administration website
- Goals are to help teachers feel more confident in accessing/utilizing reports that are provided by MAP and how to understand MAP reports

Teacher Professional Development #2

- For all teachers and administrators who have completed PD #1
- Demonstrates by video how to access and utilize the Student Profile Google Doc of students' MAP test results and additional planning tools
- Goals are to help teachers feel more confident in accessing/utilizing the Student Profile Google Doc and additional planning tools provided by the school's MAP testing administrator, and to suggest changes teachers can make to improve MAP test results in the future

Administrator Professional Development

- For administrators and school leaders only
- Suggests ways in which administrators and school leaders can use MAP test data to create a collaborative, successful school environment
- Goal is to demonstrate ideas that can make MAP testing more meaningful to the school's stakeholders

Suggested Timetable

Teacher Professional Development #1 (Total Duration: 6 hours 5 minutes)

Topic	Activity	Duration
Welcome	Introductions (if necessary)	15 minutes
Slide 1: Learning Objective #1 – How to access, print, and utilize reports in the MAP administration website	Facilitator leads.	10 minutes
Slide 2 & Video: Logging In	Teachers will watch video together and actually log in to MAP website and change password if necessary.	30 minutes
Slide 3 & Video: Class Report/Slide 4: Suggested Guiding Questions	Teachers will watch video together, run a class report, and discuss first-glance results in grade level teams. Suggested guiding questions: What patterns do you notice in the data? What might be some reasons for these results? What can teachers do to help influence these results?	55 minutes
Break		15 minutes
Slide 5 & Video: Achievement Status & Growth Summary Report/Slide 6: Suggested Guiding Questions	Teachers will watch video together, run a summary report, and discuss first-glance results in grade level teams. Suggested guiding questions: What patterns do you notice in the data? What might be some reasons for these results? What can teachers do to help influence these results?	45 minutes
Lunch		60 minutes
Slide 7 & Video: Student Progress Report/Slide 8: Suggested Guiding Questions	Teachers will watch video together, run relevant student progress reports, and discuss first-glance results in grade level teams. Suggested guiding questions: What patterns do you notice in the data? What might be some reasons for these results? What can teachers do to help influence these results?	60 minutes
Break		15 minutes

Slide 9: Conclusion	Teachers will review what was covered, ask clarifying questions to facilitator, and create action plans about ways to use reports in grade level teams. Suggested guiding question: What specific, measureable action plans can we create to begin utilizing information from these reports?	60 minutes

Teacher Professional Development #2 (Total Duration: 6 hours 25 minutes)

Topic	**Activity**	**Duration**
Welcome	Introductions (if necessary)	15 minutes
Slide 1: Learning Objective #2 – How to use the Student Profile Google Doc to view MAP testing results and get access to other tools	Facilitator leads.	10 minutes
Slide 2 & Video: Student Profile Google Doc/Slide 3: Suggested Guiding Questions	Teachers will watch the video together, log in to Google, access the Student Profiles in their Google Drive, sort a class's information, and collaborate within departments or small groups to discuss potential ways to use the presented information. Suggested guiding questions: What patterns (if any) do you notice in the data? What might be some reasons for these results? What types of assessments can be created using this information? Give some examples. Groups will share aloud.	90 minutes
Break		15 minutes
Slide 4 & Video: NWEA RIT Reference Charts/Slide 5: Activity	Teachers will watch the video together, access the RIT Reference Charts, and collaborate within departments or small groups to discuss potential ways to use the presented information. Teachers will also create actual MAP style practice	90 minutes

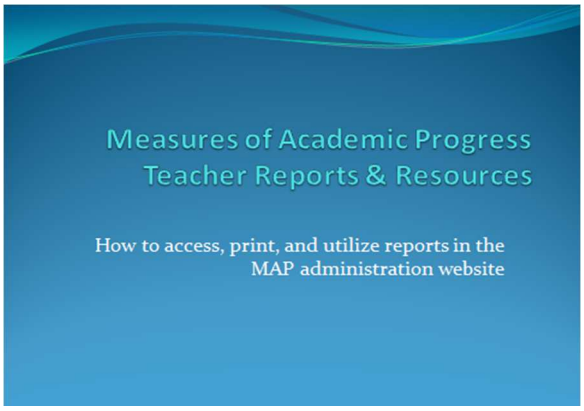
	questions to be used in departments. Groups will share aloud.	
Lunch		60 minutes
Slide 6: Student Goal Setting	Facilitator leads. Then teachers will discuss how to incorporate student goal setting into MAP planning.	30 minutes
Break		15 minutes
Slide 7: How to use MAP test results	Teachers will review what was covered and ask clarifying questions to facilitator. Suggested guiding question: What specific, measureable action plans can we create to begin utilizing information from these reports?	60 minutes

Administrator Professional Development #1 (Total Duration: 6 hours 15 minutes)

Topic	**Activity**	**Duration**
Welcome	Introductions (if necessary)	15 minutes
Slide 1: Learning Objective – How school leaders can use MAP test data to create a collaborative, successful learning environment	Facilitator leads.	10 minutes
Slide 2: How school leaders can use MAP test data	Facilitator leads.	20 minutes
Slide 3: Demonstrate School Quality/Slide 4: Suggested Guiding Questions	School leaders should discuss any additional ways to use MAP data to demonstrate school quality. Suggested guiding questions: How can MAP test results be used to demonstrate school quality to stakeholders? Is the school currently sharing the results? How can the results be shared, and by whom?	60 minutes
Break		15 minutes
Slide 5: Include in Teachers' Reviews/Slide 6: Suggested Guiding Questions	School leaders should discuss and plan specific ways to implement. Suggested guiding questions: How are differentiated instruction and test results currently evaluated with relationship to teachers?	60 minutes

	How can differentiated instruction and test results be included in teachers' evaluations?	
Lunch		60 minutes
Slide 7: Create Professional Learning Teams/Slide 8: Suggested Guiding Questions	School leaders should discuss and plan specific ways to implement. Suggested guiding questions: How will staff be assigned to professional learning teams? By department? By grade level? Something else? What will the responsibilities of the professional learning team be? When and where will they be able to meet?	60 minutes
Break		15 minutes
Slide 9: Learn with your staff/Slide 10: Conclusion	School leaders should create a plan to implement some or all of the suggested items from presentation. Suggested guiding question: What specific, measureable action plans can we create to implement change regarding MAP testing at the school?	60 minutes

Teacher Professional Development #1



Logging in

- Each teacher should have a login and password given by the MAP Administrator
- Administration website can be used to:
  - Manage students being tested
  - Manage test sessions
  - View reports
- Teachers can generate MAP reports to retrieve the information they are seeking
- An introductory video can be seen here: https://www.youtube.com/watch?v=IjoMwa75QPA

Class Report

- The most basic report
- Shows students' scores in one specific testing window (for example Spring of 2012)
- Teachers will only be able to view students who are assigned to them in the uploaded roster
- To see how to generate this report and the information it yields, watch this video: https://www.youtube.com/watch?v=35r8vv7GEeQ

Suggested Guiding Questions

- What patterns do you notice in the data?
- What might be some reasons for these results?
- What can teachers do to help influence these results?

Achievement Status & Growth Summary Report

- This report allows teachers to compare students' MAP test scores from one testing window to another (for example: compare Student #1's math scores from Fall 2011 with Student #1's math scores from Fall 2012)
- Teachers will only be able to view students who are assigned to them in the uploaded roster
- To see how to generate this report and the information it yields, watch this video: https://www.youtube.com/watch?v=PFt5cqRiJEM

Suggested Guiding Questions

- What patterns do you notice in the data?
- What might be some reasons for these results?
- What can teachers do to help influence these results?

Student Progress Report

- This report shows an individual student's MAP test scores over time (for example: Each of Student #1's math scores from Fall 2011, Spring 2012, Fall 2012, and Projected Spring 2013)
- Teachers will only be able to view students who are assigned to them in the uploaded roster
- To see how to generate this report and the information it yields, watch this video: https://www.youtube.com/watch?v=cmnSpA6dNVo

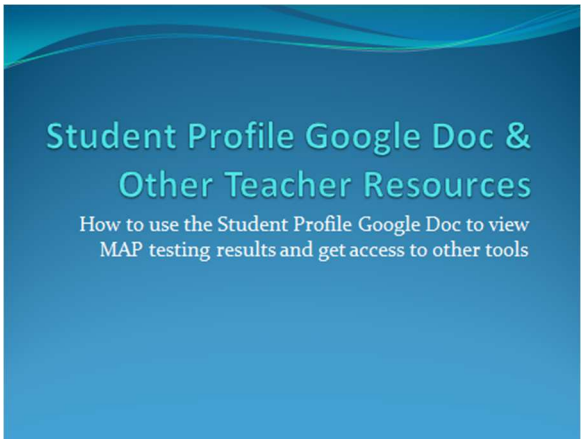
Suggested Guiding Questions

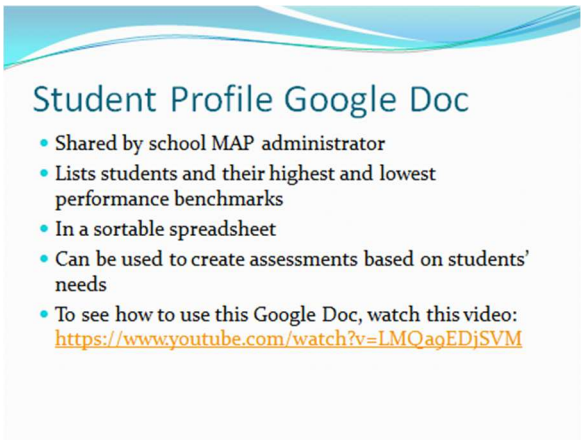
- What patterns do you notice in the data?
- What might be some reasons for these results?
- What can teachers do to help influence these results?

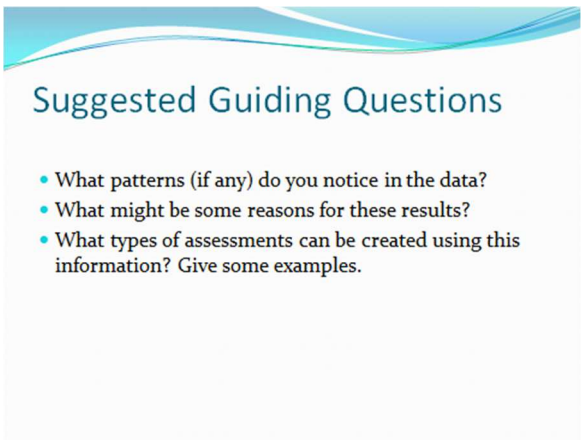
Conclusion

- We have seen:
  - MAP Administration Site
  - Class Report
  - Achievement Status & Growth Summary Report
  - Student Progress Report
- Teachers can utilize information from these reports in conjunction with other tools
- Teachers can create a more individualized learning experience for their students
- What specific, measureable action plans can we create to begin utilizing information from these reports?

Teacher Professional Development #2







NWEA RIT Reference Charts

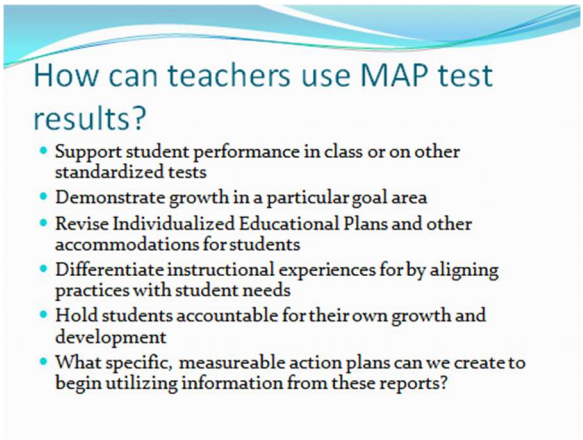
- Help teachers understand RIT scoring and question types at particular scoring levels
- Can be used to develop new work for students
- Available for all MAP tests
- Can be found online and are linked from each sheet in the Student Profile Google Doc
- To see how to use the RIT Reference Charts, watch this video: https://www.youtube.com/watch?v=mxyKiLzrPPM

Activity

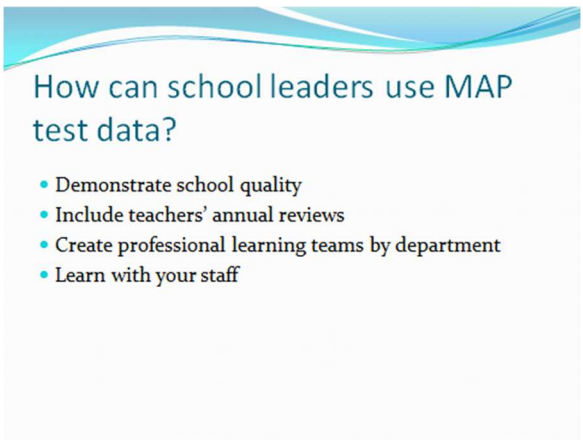
- Within departments or small groups, create five (5) MAP-style practice questions to use in class.
- Share your results aloud.

Student Goal Setting

- Teachers can assist their students with setting growth goals for MAP testing
- Helps students be more accountable for their progress on MAP tests
- Worksheets available on MAP administration website and online



Administrator Professional Development #3



Demonstrate school quality

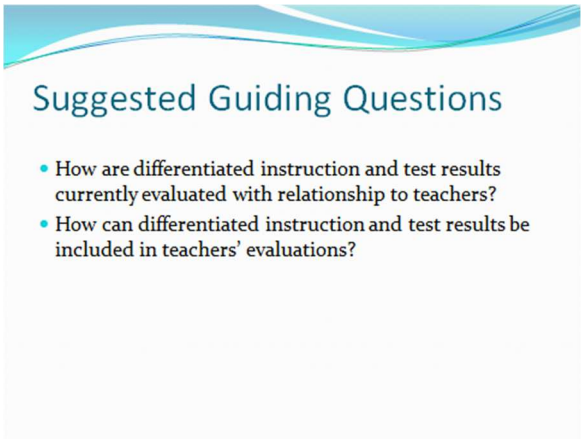
- Post on school profile to show student progress in tested subject areas
- Advertise the use of web-based, low stakes, adaptive formative assessment used to differentiate instruction to attract students
- Advertise the use of technology to attract and retain staff

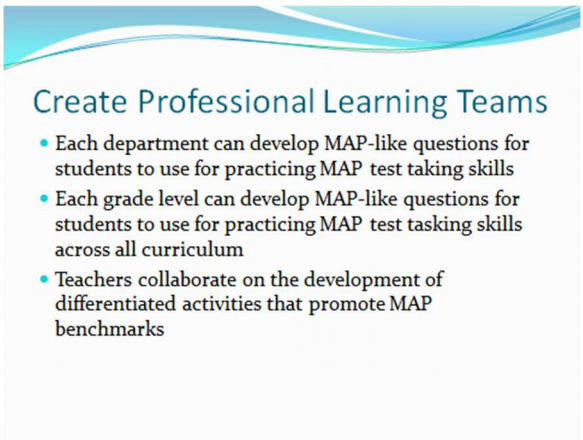
Suggested Guiding Questions

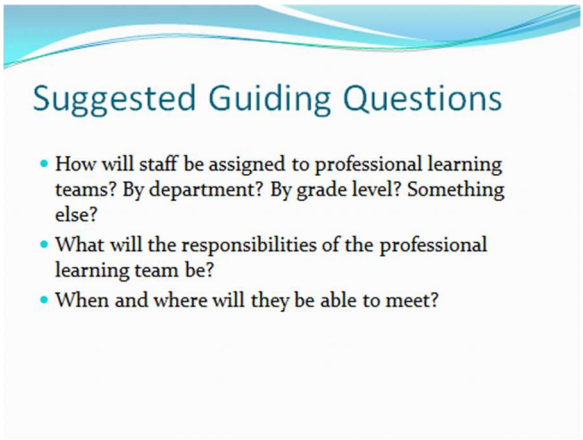
- How can MAP test results be used to demonstrate school quality to stakeholders?
- Is the school currently sharing the results?
- How can the results be shared, and by whom?

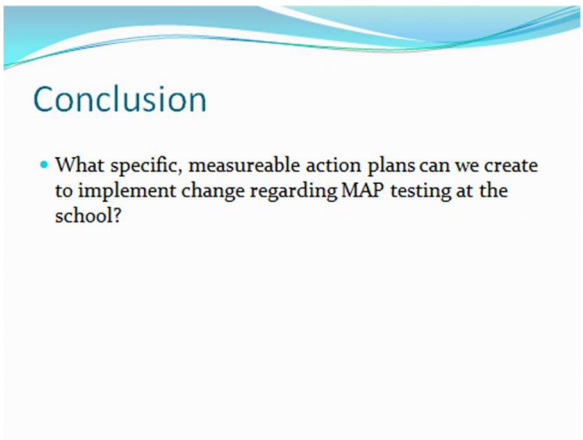
Include in Teachers' Reviews

- Annual review can include section on teacher's level of participation with MAP and related activities
- Potentially include a bonus compensation day for the teacher of the most improved class, or a field trip or other fun activity for most improved grade level
- Make MAP testing a focus for *all* teachers, not just teachers of tested subjects


Suggested Guiding Questions
How are differentiated instruction and test results currently evaluated with relationship to teachers?
How can differentiated instruction and test results be included in teachers' evaluations?


Create Professional Learning Teams
Each department can develop MAP-like questions for students to use for practicing MAP test taking skills
Each grade level can develop MAP-like questions for students to use for practicing MAP test tasking skills across all curriculum
Teachers collaborate on the development of differentiated activities that promote MAP benchmarks


Suggested Guiding Questions
How will staff be assigned to professional learning teams? By department? By grade level? Something else?
What will the responsibilities of the professional learning team be?
When and where will they be able to meet?



Links to Videos from Training Series

Teacher Professional Development #1

- Logging In: https://www.youtube.com/watch?v=Ij0Mwa75QPA
- Class Report: https://www.youtube.com/watch?v=35r8vv7GEeQ
- Achievement Status & Growth Summary Report: https://www.youtube.com/watch?v=PFt5cqRiJEM
- Student Progress Report: https://www.youtube.com/watch?v=cmnSpA6dNV0

Teacher Professional Development #2

- Student Profile Google Doc: https://www.youtube.com/watch?v=LMQa9EDjSVM
- NWEA RIT Reference Charts: https://www.youtube.com/watch?v=mxyKiLzrPPM

Follow-Up Questionnaire for Teachers

Please answer yes or no to the following questions.

1. Will you be able to access test results on the MAP administration website as a result of the training?

2. Will you be able to access the Student Profile Google Doc to assist in planning as a result of the training?

3. Will/Has your use of the MAP reports and Student Profiles increase as a result of the training?

4. Have you changed your instructional practices as a result of the training?

5. Do you feel like you still need additional training on MAP and its resulting reports/documents?

Appendix B: Teacher Questionnaire

Teacher Questionnaire: Differentiation and MAP

Thank you for agreeing to participate in this teacher questionnaire about differentiated instruction and MAP testing. Your honest participation is appreciated and your results will be kept completely confidential.

Statement of Consent:

I have read the above information and I feel I understand the study well enough to make a decision about my involvement. By clicking below, I understand that I am agreeing to the terms that were emailed to me with the link to this study.

The following questions are about you and your teaching background.

Please select your gender.*

Male

Female

How do you describe yourself?*

White

Black or African American

Hispanic or Latino

Biracial or multiethnic

Other

Is English your first language?

Yes

No

What was the grade level of the students you taught during the school year 2013-2014? *

Choose all that apply.

7

8

9

10

11

12

In what subject was your primary teaching assignment during the 2013-2014 school year?*

English/Language Arts

History/Social Studies

Mathematics

Science

World Languages

No primary affiliation with a single subject

Other, please specify:

In addition to your primary duties, did you have any secondary teaching assignments during the 2013-2014 school year? *

Yes

No

Do you hold a valid teaching certificate? *

Yes

No

How would you classify your teaching position for the 2013-2014 school year? *

Full time

Part Time

Including this school year (2013-2014), how many years have you worked either as a full or at least half time teacher? *

0-2 years

3-5 years

6-8 years

9+ years

The following questions are about professional development related to differentiated instruction and MAP testing, frequency of use of MAP data, and frequency of use of the Student Profiles Google Doc.

Please indicate all formal professional development related to differentiated instruction that you participated in or led during the 2013-2014 school year. For each activity, please indicate the number of hours. *

	Did not participate	Less than 4 hours	4-8 hours	9-32 hours	More than 32 hours	Not available
Traditional workshop provided by the school						
Traditional workshop outside of the school						
College course(s)						
Online course(s)						
Committee or task force						
Activities resulting from a partnership between your school and another school						
Mentoring, peer observation, and/or coaching as part of a formal arrangement						
Observational visit to another school						

During the 2013-2014 school year, how often did you use MAP data in the following ways? *

	Never	A few times	Once or twice a month	Once a week or more
To develop assignments or assessments in mathematics or reading				
To develop assignments or assessments in other subjects				
To adapt instructional activities to students' individual needs				
To do research or lesson planning				
To group students				
To see students' strengths/weaknesses				

In the 2013-2014 school year, did you have access to the student profiles Google document? *

Yes

No

During the 2013-2014 school year, how often did you use the student profiles for each of the following purposes? *

	Never	A few times	Once or twice a month	Once a week or more
Informing curriculum changes				
Identifying individual students' skill gaps				
Grouping students				
Planning tailored assignments or assessments				

The following questions are about your opinions and attitudes regarding MAP testing, Student Profiles, and related professional development.

How skillful are you in using the following? *

	Not at all	A little	Moderately	Very
MAP administrative site to proctor MAP tests				
MAP administrative site to see results of MAP tests				
Student profiles Google document				

To what extent did you use MAP data for the following general purposes? *

	Not at all	A little	A moderate amount	A lot
Plan instruction				
Deliver instruction				
Organize the instructional environment				
Assess student performance				

To what extent do you agree with the following statements about MAP data? *

	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
Formal professional development can improve teachers' use of MAP data.					
MAP data can be used to improve instructional practice.					
MAP data can be used to improve student learning.					
MAP data can be used to increase students' performance on standardized tests.					
MAP data can be used to narrow the achievement gap.					

To what extent were the following conditions barriers to your using the student profiles?*

	Not at all	A little	A moderate amount	A lot	Not applicable
Difficulty getting access to computers					
Your lack of technology skills					
Lack of professional development that prepared you to use them					
Lack of time to practice using the profiles					
Lack of planning time					
Difficulty making profiles relevant to your subject					
Lack of emphasis by administration					
Slow and/or unreliable internet connections					

If you have any other comments about MAP testing and/or the Student Profile Google Doc, please write it here:

Appendix C: Permission

Letter of Cooperation from a Community Research Partner

March 24, 2014

Dear Amanda Egan,

Based on my review of your research proposal, I give permission for you to conduct the study entitled What Affects Measures of Academic Progress Test Scores? within the XXX. As part of this study, I authorize you to email invitations to teachers to participate in an online questionnaire. Individuals' participation will be voluntary and at their own discretion.

We understand that our organization's responsibilities include allowing teachers to voluntarily participate. We reserve the right to withdraw from the study at any time if our circumstances change.

I confirm that I am authorized to approve research in this setting.

I understand that the data collected will remain entirely confidential and may not be provided to anyone outside of the research team without permission from the Walden University IRB.

Sincerely,

XXX

Walden University policy on electronic signatures: An electronic signature is just as valid as a written signature as long as both parties have agreed to conduct the transaction electronically. Electronic signatures are regulated by the Uniform Electronic Transactions Act. Electronic signatures are only valid when the signer is either (a) the

sender of the email, or (b) copied on the email containing the signed document. Legally an "electronic signature" can be the person's typed name, their email address, or any other identifying marker. Walden University staff verify any electronic signatures that do not originate from a password-protected source (i.e., an email address officially on file with Walden).

Appendix D: IRB Approval

Dear Ms. Egan,

This email is to serve as your notification that Walden University has approved BOTH your doctoral study proposal and your application to the Institutional Review Board. As such, you are approved by Walden University to conduct research.

Please contact the Office of Student Research Administration at doctoralstudy@waldenu.edu if you have any questions.

Congratulations!

Jenny Sherer

Associate Director, Office of Research Ethics and Compliance

Leilani Endicott

IRB Chair, Walden University

Study # 04-22-14-0286490