The Value of Proficiency Scales in Standards-Based Grading

Field Project Proposal

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This field project paper has been examined and approved.

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Abstract

Assessment is a critical component of student learning. Teachers must judge how well a student can meet learning objectives and then communicate that level of understanding. Traditional letter grades have dominated the world of education; however, there has been a growth in standards-based grading. The field project studied the effect of using proficiency scales to organize and communicate assessments. The research question was, "How does a standards-based grading system with proficiency scales affect student learning and student self-efficacy?" The project took place over four months where 5th and 6th grade Math classes had two units with traditional-letter grades and two units with proficiency scales. The quantitative data did not show an effect on students meeting the learning objectives but did show a significant impact on student self-efficacy. The post-unit student survey showed a positive attitudinal effect on the use of proficiency scales. It was concluded that proficiency scales can positively impact students, but more research is necessary to see the effect it has on student learning.

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Chapter 1: Introduction

Identifying the Issue

Teachers have many challenges in offering quality instruction to their students. One of those challenges is assessing students' understanding and application of skills. Assessment can provide a bridge from the instruction to the learning, which helps teachers decipher if their teaching has its desired effect (Wiliam, 2014). Formative assessment gives the teacher a quick check-up on student understanding during the lesson, while summative assessment communicates student learning after completing a lesson. Teachers use both assessment forms to adjust instruction for the student and communicate the level of proficiency to both students and parents. For many years, teachers have relied heavily on traditional letter grades as the primary form of communication for the summative assessment of students.

Many have questioned whether this traditional form of grading is the best practice for summative assessment and communication of student learning (Marzano, R. & Heflebower, T. 2011; Gusky & Brookhart, 2019; Scarlett, 2018). Researchers question whether providing one letter effectively communicates student learning and growth (Marzano, R. & Heflebower, T. 2011). More questions have been raised about the accuracy of using a percentage scale of 100 points (Guskey, 2020, Brookhart & Guskey, 2019). With these issues, educators are starting to ask themselves if there is a better grading system.

Importance of the Project

With the addition of Common Core State Standards, there has been a rise in the use of standards to organize learning objectives. Teachers use the learning objectives to

create lessons that communicate clearly to the student the purpose and desired outcomes of the lesson. Assessment must take place to see how well students meet the learning objectives. With instruction becoming more focused on standards, educators are testing standard-based grading and its effect on student learning over traditional letter-based grading.

One form of standards-based grading is proficiency scales. Proficiency scales organize the learning objectives into specific domains. Within these domains, the objectives are categorized from lower-order thinking and knowledge to higher-order application. Both teachers and students can see the level of understanding within the domain and what is needed to progress. If students are presented with a clear learning path, one may reason that this would boost their self-efficacy and achievement within the domain and subject area (Komarraju & Nadler, 2013; Bandura, Pajares, & Urdan, 2006).

Project Purpose

The purpose of this study is to answer the question, "How does a standards-based grading system with proficiency scales affect student learning and student self-efficacy?" With this study, the author hoped to gain insight into what effect proficiency scales have over traditional letter grades and grading systems. The knowledge gained through this study can add to the research on standards-based grading and give insight into the effect of using proficiency scales.

Definition of Terms

Classroom assessment is the process of gathering information on student learning and using that information to modify teaching and learning activities (Stiggins, Arter, & Chappuis, 2012; Wiliam, 2014).

Formative assessment is gathering information on student learning as the learning is taking place and is used for adapting instruction to meet student needs (Brookhart, 2011; Wiliam, 2014). In short, formative assessment can be defined as an assessment *for* learning (Stiggins, Arter, & Chappuis, 2012).

Summative assessment is done after the learning has taken place and is used to verify how a student meets the learning objective with evidence (Brookhart, 2011). In short, summative assessment can be defined as an assessment *of* learning (Stiggins, Arter, & Chappuis, 2012).

Grades are a mark, letter, or symbol to communicate the level at which a student shows understanding or performance of a skill. This form of communication can be shared with multiple stakeholders.

Multi-grade classrooms have multiple grade levels in the same classroom. The classroom in this study has four grade levels ranging from 5^{th} grade to 8^{th} grade.

Chapter 2: Literature Review

Current research points to flaws in using traditional letter grades and highlights the value and positive effects of using standards-based report cards (Duncan & Noonan, 2007; Guskey, 2020, Brookhart & Guskey, 2019; Iamarino, 2014; Marzano, 2011, Wiliam, 2018). However, more research needs to be done on using proficiency scales as the specific standards-based grading system and if it can positively affect student achievement and self-efficacy. A grading system aims to communicate students' performance to various stakeholders, including the students, the parents, the school district, and the community (Haptonstall, 2010). However, grades have evolved into much more than just a form of communication. Grades are now used to give feedback, make decisions on promoting or retaining students, identify special needs, affect scholarships and admission to higher education, control and manage behavior, and be a motivational tool for students to complete their homework (Knight & Cooper, 2019). Researchers question whether traditional letter grades are the best practice (Brookhart & Guskey, 2019; Scarlett, 2018; Iamarino, 2014).

Challenges of Traditional Letter Grades

Several flaws have emerged through the study and evaluation of traditional letter grading. One flaw is the focus. The focus of education should be student learning which centers on an objective to learn or accomplish. The instruction guides students to achieve the objective and uses assessment and grades to measure the student's knowledge and ability. A traditional letter-grade system focuses on numbers rather than on learning (Iamarino, 2014). Most grades on assignments are given based on a scale of 1-100, where 0-60, over half of the scale, is failing. This does not provide an accurate scale or indicator

of student mastery with proportions so highly skewed to one side (Wormeli, 2006). Most report card grades are a compilation of averaging those scores to accumulate a letter grade which does not give the student more opportunities to show their progression in learning. One letter grade lacks communication that provides specifics to the stockholders of where students are thriving and where specific skills and knowledge are lacking (Guskey, 2020).

Another flaw of traditional-letter grades is the matter of subjectivity. There are several teaching practices and variables that teachers may or may not consider, which leads to doubt of credibility and accuracy around a grade. Some teachers will include students' effort, participation, homework completion, and behavior (Guskey, 2010). Other teachers may offer students opportunities for extra credit or curve grades to raise scores (Gordon & Fay, 2010). At the same time, other teachers will consider individual circumstances for the students to adjust grades (Duncan & Noonan, 2007). When one considers the subjectivity of teaching practices for grading, one can wonder what an "A" means. Does it mean that a student thoroughly understands and achieves the learning outcomes, or does it mean that a student tries hard, completes their homework on time, is respectful, and performs well as "being a good student"?

The final flaw of traditional letter-based grading is using it for behavior modification. Teachers have been found to use grades to enforce classroom rules and encourage positive student behavior (Guskey, 2010; Scarlett, 2018). Students' grades for academic learning may be docked for misbehavior in the classroom, not completing homework assignments, homework turned in late, tardiness, absences, and effort (Scarlett, 2018). If grades take these into account, the grade is no longer communicating

the level of achievement a student is demonstrating for learning objectives, which means the communication method is no longer accurate (Iamarino, 2014). Using letter grades does not teach students the pathway to responsibility and accountability (Wormeli, 2006).

Benefits of Letter-Based Grading

Research also points to the possible benefits of using a traditional letter-based grading scale. When using a larger scale, like a 0-100 scale, there is a more extensive range of probable error because of the wide range of the scale (Guskey & Brookhart, 2019). A simple scale with three to four categories removes the minute details and borderline cases that can cause inaccuracy issues in grading on a 0-100 scale (Guskey, 2014). The typical letter-based scale has a 5-point system ranging from A to F. This simple scale provides fewer categories, similar to a standards-based report card, and still be used accurately without the percentage scores.

A significant part of the assessment is communicating student learning to parents, students, and possible stockholders. Some studies concluded that there are difficulties to be expected when implementing a standards-based grading scale (Haptonstall, 2010; Knight & Cooper, 2019; Proulx, Spencer-May, & Westerberg, 2012). Teachers, parents, students, and stockholders tend to understand a traditional letter based-grading scale as it is familiar to them. A school expecting to switch to standards-based grading will need to spend time, energy, and resources to train teachers, parents, and students how to understand a standards-based grading scale, otherwise communication becomes confusing to many involved (Knight & Cooper, 2019; Proulx, Spencer-May, & Westerberg, 2012).

Studies have also been done on the motivational factors and emotions that grades can affect students. A longitudinal study of secondary students found that student report card grades can affect their motivation for continued learning (Poorthuis, et al., 2015). Students who received higher grades were more motivated to learn and engaged, while the opposite was true for those with lower grades. Similar results were found for how grades affect student emotions (Pekrun, et al., 2017). Students with better grades demonstrated joy and pride in their learning, while lower grades demonstrated negativity and viewed education with anxiety.

Benefits of Standards-Based Grading

Standards-based grading shifts from a compilation of scores on assignments and tests to measuring the level of mastery a student demonstrates for a learning objective (Fisher et al., 2011; Knight & Copper, 2019, Scarlett, 2018). Districts, schools, and teachers use state standards to create learning objectives for each subject. As teachers instruct, they assess students based on proficiency for the objective (Haptonstall, 2010). Most scales are arranged with four levels: advanced, proficient, partially proficient, and unsatisfactory (Haptonstall, 2010; Fisher et al., 2011; Marzano & Heflebower, 2011). Teachers then use these scales to communicate the students' level of understanding for each standard.

Research has identified certain benefits of using standards-based grading. The first benefit is the shift from number-focused to learning-focused. With this change, the standards become the focus of instruction that teachers use to plan lessons and assessments. Students know the objectives and can continue practicing to meet those objectives (Marzano, 2017). Knight and Cooper (2019) found that moving to standards-

based grading made instruction and assessment more purposeful, with assessment driving instruction and more differentiation taking place. At the same time, Haptonstall (2010) found a correlation between the move to standards-based grading and improved standardized scores. Also, a study in San Diego high schools found that standards-based grading resulted in higher homework completion and an increase in their GPA and state scores (Fisher et al., 2011).

Another benefit of standards-based grading was a more accurate system and better communication. Standards-based grading removes the subjectivity and teacher practices that do not reflect student learning (Proulx et al., 2012). Students could also continue to practice and improve to show their knowledge throughout the year and update their scores (Marzano & Heflebower, 2011). Their learning was not limited to one quarter or semester. Proulx et al. (2012) found that standards-based grading decreased F's, D's, and A's over traditional letter grading. They attribute this change to more accurate measurements using standards-based grading. As accuracy improves, so does communication. Standards-based grading gave teachers clear objectives, which in turn, they communicated with the students. Students and parents accurately depict the student's learning and growth while also providing the student an avenue to create goals for improvement (Marzano, 2017; Hoegh, 2019). Knight and Cooper (2019) found that standards-based grading helped teachers offer more specific feedback, and students could communicate their learning progression.

The final benefit is a shift in student mindset. Students may shift to a growth mindset, encouraging them to take risks, accept mistakes, and use practice to meet the learning objectives (Fisher et al., 2011). With standards-based instruction, teachers are

revealing to students to ladder to move up to mastering a concept (Wormeli, 2018). Students can see the steps to take to improve their knowledge and understanding. Students and teachers can plan their next steps to move towards proficiency in a learning objective which may lead to students self-assessing and setting goals (Brookhart, 2011). The environment of schools also shifted. Traditional-letter grades could lead to a spirit of competition to be the top student. In contrast, Knight and Cooper (2019) saw a shift in the school environment with standards-based grading. It was more conducive to learning and students supporting one another instead of competing over GPA. They also observed students putting a higher value on feedback over grades.

With this shift in mindset, one may reason that standards-based grading would affect one's self-efficacy. Self-efficacy is perceived capability or one's perceived confidence in their ability to complete a task at that time (Bandura, 2006; Komarraju & Nadler, 2013). Self-efficacy is a predictor of student achievement and can affect student behavior, the levels of set goals, commitment to those goals, and the course of action to obtain those goals (Bandura et al., 2006; Klomegah, 2007). Students with high self-efficacy view intelligence as something that can be gained through work, effort, and persistence. They are more likely to take on challenges, set higher goals, and build self-esteem through their learning process (Bandura, 1993; Komarraju & Nadler, 2013). Those with low self-efficacy view intelligence as innate. They are more likely to struggle with complex tasks, set simple goals, fear mistakes, and suffer self-doubt, leading to flaws in critical thinking (Bandura, 1993; Komarraju & Nadler, 2013). With standards-based grading, students can identify what they learned and the effort it took to achieve mastery. Students who can see their learning progression and have control of their

learning are more likely to exhibit self-efficacy in their learning process (Brookhart, 2011).

Challenges of Standards-Based Grading

Moving to a standards-based grading system does come with challenges. Teachers need professional development and assistance to make this shift as it requires them to reexamine at all parts of instruction (Knight & Cooper, 2019; Fisher et al., 2011). Teachers will also need policies in place to help with student attendance and study skills since grades are no longer a factor in helping control this behavior (Knight & Cooper, 2019). Lastly, it is essential to communicate with stakeholders the reasoning behind a move to standard-based grading to help with buy-in (Proulx et al., 2012).

Proficiency Scales

Proficiency scales are a form of standard-based grading and organization of student objectives (Marzano, 2017). A typical standards-based grading system sets learning objectives, and students are assessed by their proficiency levels. Objectives are most often organized by grade, subject, and unit. The value of a proficiency scale beyond typical standards-based grading is the organization of the scale in the progression of student learning. The scale moves from lower-order thinking and basic knowledge at the bottom to higher-order thinking and application at the top. The students will need to know and meet level 2 objectives before they can fully comprehend and apply the higher levels of learning required at level 4. This scale gives students clarity on their current level and what is needed to continue progressing within the domain (Marzano & Hefelbower, 2011). The goal for each student is to show they are proficient in the learning objective: however, proficiency scales also provide an advanced level for

differentiation of the objective (Hoegh, 2019). Using proficiency scales correlates with the benefits of using standards-based grading in student-learning focused, accurate, improved communication, and a shift in student mindset.

There are a number of studies researching the effect of standard-based grading and the benefits and challenges of implementation of standards-based grading (Fisher et al., 2011; Knight & Copper, 2019; Marzano & Heflebower, 2011; Scarlett, 2018). Within these studies, typical standards-based grading systems were used. Currently, there is a lack of research that explicitly studies the use of proficiency scales based on the work of Marzano as a form of standards-based grading.

Summary

Assessment is integral to instruction and student learning within the classroom, and most teachers use a letter-based grading system. Questions are being raised about the accuracy and effectiveness of using traditional letter-based grades as the best assessment form. Some schools are moving to a standards-based grading system to provide a clear assessment framework that lays out standards for students to meet. Proficiency scales are one form of standards-based grading that lays out students' steps to achieve higher-level objectives.

Chapter 3: Project Design

Procedure to Investigate

This study used the instruction of Mathematics within the classroom. In a multi-grade classroom, the teacher instructed one grade level while the other students did other learning forms. When finished, the teacher rotated to the next grade level and began their math instruction. This rotation was done until all grade levels have received their math instruction for the day. Depending on the topic, different forms of instruction were used, from videos, online resources, and collaborative work, while other grade levels received their instruction.

Mathematics is a class subject with clear learning objectives that build from low to high cognitive function and complexity. It is also an area where people have high and low levels of self-efficacy where some believe they are innately good or bad at math and others use effort and strategies to achieve objectives.

The researcher selected four mathematical units for the 5th-grade class and the 6th-grade class. The topics of the units were based on the Everyday Math Curriculum that matched the Common Core Math standards and Critical Concepts for Math grades 5-6 (Simms, 2016). The units followed the order of the published math curriculum used in this classroom and the teacher's block plans. The researcher wrote out proficiency scales using the school learning objectives for 5th and 6th grade, Common Core standards, and proficiency scales from other school districts (Appendix B).

The proficiency scales were judged by three other Math teachers of 5th and 6th grade for accuracy on the learning progression of the domains within the standard. These teachers have at least five years of Mathematics teaching experience for 5th-6th grades and

from other associate WELS schools in the surrounding area. Each Math teacher received a copy of the proficiency scales and a questionnaire to direct their evaluation. Once the researcher received feedback from these teachers, any necessary adjustments to the proficiency scales will be made.

Before starting the study, a parent or guardian gave permission (Appendix A) for students to participate. For students who participated, their personal information and name remained confidential and was not be shared within the study and report. The researcher took the following steps to ensure the comfort level of all students within the classroom. At the start of each unit, the teacher thoroughly explained the proficiency scales and how they will be used in class. Students had the right to ask questions about the process without negative feedback from the teacher. The teacher also was available before and after school to answer questions and use a comparison model between student proficiency scale level and a letter-based grade to clarify any information that may have caused student confusion or anxiety.

The study followed a quasi-experimental research design with proficiency scales as the treatment and traditional letter grading as the control. The study took place over the course of 4 months during the school year. Two of the four Math units used traditional grading for assignments, quizzes, and tests. Students received traditional letter grades throughout the unit, which were averaged at the end of the unit. They continued to receive feedback and opportunities for practice throughout. The other two units used proficiency scales. At the beginning of the proficiency scale units, students will be given a copy of the proficiency scale. The teacher will discuss the different objectives and terminology for each level. As the students progressed through the unit, they practiced opportunities and received feedback on their mastery of the levels of learning within the

proficiency scale. Their final assessment was used to evaluate the level of understanding based on the levels of the proficiency scale for that unit.

At the end of each unit, students took a self-efficacy survey (Appendix B). Before the study began, students received an explanation of the purpose and use of self-efficacy scales. A comparison model of how far they believe they could jump using the same 0-10 scale was used to explain how to rate themselves using this type of scale. The ten-point scale is a better predictor than a smaller scale because it provides more differentiating information among the participants, and responses are better distributed (Pajares, Hartley, & Valiante, 2001). The self-efficacy survey asked students about their confidence level in the learning objectives of the given domain. It is based on the design of Bandura (2006), which uses a scale of 0-10 (Appendix C). At the end of the study, the teacher conducted interviews with the students to receive feedback on using proficiency scales compared to traditional grades (Appendix D).

Participants

Students

The students in this field project are fifth-graders and sixth-graders in a multi-grade classroom for grades 5^{th}-8^{th}. The school is located in a suburb of San Diego, CA. The fifth-grade class consists of four boys and four girls ranging from ages 10-11. The sixth-grade class consists of four boys and two girls ranging from ages 11-12. All students have English as their primary language, and all families are middle- or upper-income. There is a variety of academic achievement in Mathematics. Some show excellence, some are moderate, and others struggle with their proficiency in mathematics.

All students will be instructed by the same teacher and using the same Math textbook, Everyday Mathematics 2016 by McGraw Hill.

Teacher

The teacher participating in this field study has been teaching in multi-grade classrooms for eighteen years. He has taught grades 4th through 8th grade in all basic subjects, including Math. He is male, Caucasian, in his early 40's, and holds a Bachelor's degree with an emphasis on Social Studies.

Assessment Plan

This study will use mixed methods for data collection, looking separately at self-efficacy and attainment of the standards. The quantitative data for self-efficacy will come from a self-efficacy survey. Students will rate themselves at the end of each unit on how well they believe they can achieve the domain's learning objectives on a scale of one to ten (Appendix C). The survey data will be compiled into two tables: one will have data from using proficiency scales during the unit, and the other will have data from units using traditional grading practices. A paired T-test will be used to find the mean and see if there is a statistical difference.

Quantitative data will also be collected on the student's attainment of the learning objectives within the domain. End-of-the-unit summative assessments will be administered to the students based on the learning objectives within the domain. The traditional letter-based grades will be given a score of A=4, B=3, C=2, D=1, and F=0, and the proficiency scale will use the typical 0-4 scale (Appendix B). The survey data will be compiled into two tables: proficiency scales and traditional grading. A paired T-Test will be used to see if there is a statistical difference.

The qualitative data collected will come from student interviews (Appendix D) at the end of the study. The teacher will ask a series of open-ended questions about the pros and cons of using proficiency scales compared to letter-based grading. The data will be evaluated for reoccurring themes that involve self-efficacy and achievement.

Artifacts

Students in 5th grade had mathematical units of instruction in volume and place value, whereas traditional letter grades were used for homework and summative assessments. Following the first two units, 5th-grade students had units in fractions and decimals where proficiency scales (Appendix B) were used throughout the unit up to the summative assessment. (Appendix B). At the end of the unit, each student completed a self-efficacy form (Appendix B) with a rating from 1-10. Table 1a has the mean self-efficacy scores, and Table 1b has the letter grades for each student in 5th grade.

Table 1a
5th Grade Self-Efficacy Scores (Mean)

	Volume	**Place Value**	**Fractions**	**Decimals**
Student A	9.42	9.88	9.67	9.33
Student B	5.75	9.25	7.08	7.22
Student C	8.92	8.38	9.42	9.89
Student D	8.25	7.13	8.92	8.44
Student E	6.67	6.25	6.83	8.00
Student F	5.75	7.75	7.42	8.67

Table 1b
5th Grade Summative Assessment Grades

	Volume	**Place Value**	**Fractions**	**Decimals**
Student A	A	A	A	A
Student B	A	A-	B	A-
Student C	A-	A	B-	A
Student D	A	A	A-	A
Student E	B-	B	B-	B
Student F	C	A	D	C

Students in 6th grade had mathematical units of instruction in area and surface area where traditional letter grades were used for homework and summative assessments. Following the first two units, the 6th-grade students had units in ratios and multiplying/dividing decimals, where proficiency scales (Appendix B) were used throughout the unit up to the summative assessment. (Appendix B). At the end of the unit, each student completed a self-efficacy form (Appendix B) with a rating from 1-10.

Table 2a has the mean self-efficacy scores, and Table 2b has the letter grades for each student in 5th grade.

Table 2a
6th Grade Self-Efficacy Scores (Mean)

	Area	**Surface Area**	**Ratios**	**Decimals**
Student A	8.1	9.44	9.73	8.78
Student B	9	9.44	8.55	9.56
Student C	8.2	9.67	9.64	9.78
Student D	7.3	6.56	8	8.22
Student E	7.6	9.67	10	9.89
Student F	8	3.33	8.91	6.67

Table 2b
6th Grade Summative Assessment Grades

	Area	**Surface Area**	**Ratios**	**Decimals**
Student A	B+	B+	A	A-
Student B	B+	A-	A	A
Student C	A	A	A	A
Student D	B-	C	B+	B
Student E	B	A-	B	B
Student F	D	D	C	C+

At the end of the four units, all students who participated were given a three-question survey to collect qualitative data on proficiency scales. The survey measured the

students' thoughts on using proficiency scales in math and compared traditional letter grades to proficiency scales. The following is a summary of the responses to the survey.

#1 What are your thoughts on using proficiency scales in Math class? (Free Response)

Ten out of the twelve students responded positively. Many of the positive responses communicated that proficiency scales helped them see how they were doing with math and where they needed help. Two out of the twelve students responded in a neutral way – neither good nor bad. None of the students responded negatively.

2. Do you think using proficiency scales was helpful or harmful for your learning? Explain why or why not? (Free Response)

Ten out of twelve responded positively. Many of the positive responses shared that it helped them see their current level and where they needed help. Two out of the twelve students responded neutral – neither good nor bad. One student suggested adding examples to the scales to help with the understanding of the learning objectives. No students found proficiency scales harmful.

3. If you had a choice for a class to use proficiency scales or regular letter grades, which one would you pick? Why?

Twelve out of the twelve students responded with proficiency scales over traditional letter grades. Students shared that the proficiency scales helped them see their current level, what they need to work on, and how they can progress.

Results

The results from the quantitative data were evaluated to see if proficiency scales had an impact on student learning and student self-efficacy. At the end of each unit, students completed a survey ranking their understanding of the objectives within a

domain from 1-10. A paired T-test sample was used to compare the self-efficacy scores between units with letter grades and units with proficiency scales. The results from the T-test were $t(23)=-3.289$, $p=0.001$, demonstrating a significant average mean increase. For the most part, students had an increase in their self-efficacy scores with proficiency scales. A majority of the students had minor to minimal increases, but a few students had larger increases.

At the end of each unit, students also completed a summative assessment to test their understanding of the learning objectives. The grades were recorded and given a number, whereas A=4, B=3, etc. A paired T-test sample was used to compare student learning using units with letter grades and units with proficiency scales. The results from the T-test were $t(23)=-0.856$, $p=0.2$ demonstrating that there was not a significant average mean increase. There was no significant difference in students' grades from one unit of study to the other.

The results from the qualitative data were evaluated to see how students felt about using proficiency scales and if any themes appeared across the board. Overall, the opinion of students was very positive about using proficiency scales. A high percentage of students spoke positively about the value of proficiency scales and how the scales helped them understand their learning and their level of understanding of the math concepts within a unit. All of the students that were surveyed wanted to continue to use proficiency scales over traditional letter grades.

Chapter 4 – Reflection Essay

Introduction

Assessment is a crucial component of instruction. Teachers must assess students to see how well they understand and meet learning objectives and then communicate those results to the students and parents. This study investigated the use of proficiency scales and traditional letter grades in assessing students and communicating with them. This study also explored a possible connection between the use of proficiency scales and students' self-efficacy. If students have a clear path of learning objectives within a domain organized from lower-level to higher-level thinking, will it affect their self-efficacy?

Conclusions

5th and 6th-grade students each received four units of instruction in Mathematics. Two units were taught with a traditional letter grading scale, and the other two were taught with proficiency scales. Grades and scores were collected for review. Students also filled out self-efficacy forms (Appendix B) after all the units. The scores were collected and evaluated to compare any connection between self-efficacy and proficiency scales. Following the four units, the teacher met with individual students to gather data on their thoughts on traditional grading and proficiency scales.

Meeting the Learning Objectives

Based on the data, proficiency scales did not have a significant impact on students meeting the learning objectives within a unit. Some students showed increased student learning with proficiency scales, while others showed a decrease. I believe proficiency scales could have an impact, but there needs to be more preparation and organizational

work done by the instructor. One item is having multiple forms of practice and better forms of assessment. Although the learning objectives came from the published math curriculum that was used, the forms of assessment and practice did not always match well with the learning objectives. There also was a lack of assessment and practice for the lower-level objectives. Teachers and students would benefit from having assessments where everyone can see the connection between the question and the desired objective. Another item lacking is having practice available for the students. The proficiency scales help students see what objectives they need help with, but without a system for practice in place, they can struggle to make progress without a pathway for improvement.

Self-Efficacy

There appeared to be a clear connection between the students' self-efficacy for the learning objectives in the mathematics unit and the use of proficiency scales. Proficiency scales provided a way for the teacher and students to discuss where they were excelling and needing improvement. I would spend time each week checking in with students using the scale to discuss where they have shown mastery and where they may be struggling. Students could ask pointed questions about specific learning objectives, and the teacher could give clear answers and direct them to specific practice for improvement. As I studied the results from the survey questions, I was surprised at how many students spoke positively about proficiency scales. It helped them see where they were, how they were doing, and where they needed help. This was without coaching or telling them this was a hypothesized benefit of proficiency scales. I was also surprised that 100% of the students wanted to continue using proficiency scales over letter-based grades. Most students shared that proficiency scales give them more information about their learning than a letter grade.

Teacher's Role

The teacher's role in using proficiency scales is not an easy one. There is a large workload and learning curve for teachers to make this transition. Creating proficiency scales can be tricky, but many resources are available to help, along with the written curriculum. Once the scales are designed, several challenges appear. Having an effective way to record the scores and a way for the student to see and use the scale was challenging. I created two copies, one for myself and one for the student. As we talked, I would fill out both. I would keep a copy in my desk, and the student would keep one paperclipped in their book. Students would sometimes lose their form, which caused issues with their ability to use it. An electronic recording sheet that the teacher and student both have access to would be helpful, but this may be more difficult with younger students.

A large part of using proficiency scales is using assessment to see how they are doing with the learning objectives, providing more instruction and practice opportunities. I found that the assessments I had from the published curriculum did not always match up with the learning objectives, especially the lower and upper levels. I had to create assessments to hit each learning objective specifically. Over time, I started using questions where students would share their answers on whiteboards for a quick assessment. My suggestion for using proficiency scales would be to create assessments that precisely match each learning objective and then have different assessment forms to help the teacher have options to use as students take time to master the content.

Practice was another challenge. Students could see which objectives they needed help with, and I would take time to provide some individual or group instruction, but

there was not always an option for practice that was not already used in the lesson. When I taught a lesson, the published curriculum usually had 1-2 forms of practice built into the lesson. Once those were used, I would have to search to find more forms for the student to use. An online adaptive math program where the teacher can assign learning objectives to the student would be helpful.

The final challenge was time. I scheduled time on Fridays when students were doing individual math practice to meet with students individually to discuss the proficiency scale and the recording sheet. This was very valuable but also very time-consuming. I was working with twelve students, but there would be a large time commitment in a class with 20 – 25 students. One option would be to have the recording forms in an online format where the teacher can communicate in a written form, and students can always go to the report, check and see how they are doing, and ask questions as needed.

Recommendations

While most students found the use of proficiency scales helpful for their learning, and it appeared to affect their self-efficacy, more research is needed to continue to learn about proficiency scales. There are many studies on standards-based grading, but not specifically on proficiency scales.

After reflection, there were some limitations of this study. The number of students and grade level of the students was a limitation since it was a multi-grade classroom. I would recommend that more studies are done with single-grade classrooms and use students from all grade levels from K-12. I did find a limitation in my work with 5^{th}-6^{th} grade Math classes, as I was also teaching 7th-8th grade Math classes. Also, this study

was limited to only Mathematics instructions. Proficiency scales can be used for all subjects taught within a classroom. More studies should be done in other areas like Reading, Writing, Science, etc.

As more studies are done on this topic, I recommend having teachers with a background in using standards-based grading techniques. This may ease the transition to proficiency scales, and their background knowledge should assist them with proficiency scales. Another option would be for teachers to participate in professional development on standards-based grading and proficiency scales through Marzano and study its effects on student learning and self-efficacy.

Conclusion

In conclusion, this study shows that there is value in using proficiency scales for student self-efficacy as an alternative to traditional letter grades. More research is needed to see if proficiency scales can impact on student learning. Also more studies should be done to test the impact of proficiency scales for classroom subjects other than math and other classroom learning environments.

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Appendix A:

Parental Permission Letter

Dear Parents,

I am currently working on my Master of Education degree at Martin Luther College and will be completing the program with a final capstone project that will conduct a research study in my current field. I am hoping to study the effect that proficiency scales in the classroom. Proficiency scales are a scaled list of objectives for the student and teacher to guide instruction for a unit in a subject (See next sheet). I will be researching the effect of proficiency scales on student achievement and self-efficacy or how capable a student feels for a certain task. The study will be limited to Math class for one half of the school year. Attached is an invitation for your child to participate in this research project.

If you allow your child to participate in this study, they will be asked to fill out a survey after each unit of study in Mathematics. They will use the proficiency scales for 2 units in Math. I will collect information on their surveys and their achievement in Math class. All information will be confidential, and no personal information will be shared as part of the study. I will write a report of the research and the findings which will be submitted for my capstone project. Your child's participation in this study is voluntary, and no data will be collected if you chose not to have them participate.

Read the information below and ask any questions you might have before deciding whether to give your child permission to take part. If you decide to have your child participate in this study, this form will be used to record your permission.

Timothy Vogel

Parental Permission Form

Purpose of the Study

If you agree, your child will be asked to participate in a research study about proficiency scales in Math instruction. The purpose of this study is to see if using proficiency scales in the classroom has an effect on student achievement and self-efficacy.

What is my child going to be asked to do?

If you allow your child to participate in this study, they will be asked to do the following:

- Take a self-efficacy survey after each Math unit.
- Use proficiency scales in Math class.
- Respond to a three-question survey about using proficiency scales.

This study will take one semester of a school year, and there will be 12-15 other people in this study.

What are the risks involved in this study?

There are no foreseeable risks to participating in this study.

What are the possible benefits of this study?

The possible benefits of participation are an increase in self-efficacy and achievement in Mathematics. This will also benefit other teachers who study the use of proficiency scales in the classroom.

Does my child have to participate?

No, your child's participation in this study is voluntary. Your child may decline to participate or withdraw from participation at any time. Withdrawal or refusing to participate will not affect their grades. You can agree to allow your child to be in the study now and change your mind later without any penalty.

How will your child's privacy and confidentiality be protected if s/he participates in this research study?

Your child's personal information and name will remain confidential and not be shared in the report.

Whom to contact with questions about the study?

Prior to, during, or after your participation, you can contact the researcher Timothy Vogel at 319-389-2115 or send an email to sothprincipal@gmail.com for any questions.

Signature

You are deciding to allow your child to participate in this study. Your signature below indicates that you have read the information provided above and have decided to allow them to participate in the study. If you later decide that you wish to withdraw your permission for your child to participate in the study, you may discontinue his or her participation at any time. You will be given a copy of this document.

_____

Printed Name of Child

_____ _____

Signature of Parent(s) or Legal Guardian Date

_____ _____

Signature of Investigator Date

Appendix B:

5th Grade Math – Finding Area

Score 4.0	The student: • Can solve real-world problems that involve area of complex figures *No major errors or omissions regarding the score 4.0 content.*
Score 3.5	In addition to score 3.0 performance, partial success at score 4.0 content
Score 3.0	The student: • Can find area of complex figures involving the combination of squares and rectangles. • Can find area of rectangles and squares with one measurement having a fraction. • Can find area of rectangles and squares in real-world applications. *No major errors or omissions regarding the score 3.0 content.*
Score 2.5	No major errors or omissions regarding score 2.0 and partial success at 3.0
Score 2.0	The student: • Can use the following formula: Area = length x width. • Can identify length and width of a rectangle or square. • Can explain why the units of measurement in area are squared. • Can decompose figures into squares and rectangles. **Terminology**: length, width, area, *No major errors or omissions regarding the score 2.0 content.*
Score 1.5	Partial knowledge of the 2.0 content, but major errors or omissions regarding 3.0 content
Score 1.0	With help, partial success at score 2.0 content and score 3.0 content.
Score 0.5	With help, partial success at score 2.0 content, but not at score 3.0 content.
Score 0.0	Even with help, no success.

Self-Efficacy Survey – Finding Area

This survey is to help a teacher get a better understanding of the kind of things that are difficult for students. Please rate how certain you are that you can do each of the items described below by writing the appropriate number. This has no effect on your grade in the class.

0	1	2	3	4	5	6	7	8	9	10
Cannot Do it					**Maybe can do it**					**Certain can do it**

Confidence (1-10)

- I can use the following formula: Area = length x width. _____
- I can identify length and width of a rectangle or square. _____
- I can explain why the units of measurement in area are squared. _____
- I can decompose figures into squares and rectangles. _____
- I can solve real-world problems that involve area of complex figures _____
- I can find area of complex figures involving the combination of squares and rectangles. _____
- I can find area of rectangles and squares with one measurement having a fraction. _____
- I can find area of rectangles and squares in real-world applications. _____

5th Grade Math – Finding Volume

Score 4.0	The student: • Can design various three-dimensional figures with different shapes and edge lengths, but with the same volume. • Can estimate the volume of complex figures that require multiple rectangular prisms. *No major errors or omissions regarding the score 4.0 content.*
Score 3.5	In addition to score 3.0 performance, partial success at score 4.0 content
Score 3.0	The student: • Can find the volume in real-world situations. • Can use the volume formula - Base x Height - in real-world problem-solving. • Can use the volume formula - Length x Width x Height - in real-world problem-solving. • Can find the volume of figures with non-overlapping parts (Add volumes together of shapes that have multiple prisms). *No major errors or omissions regarding the score 3.0 content.*
Score 2.5	No major errors or omissions regarding score 2.0 and partial success at 3.0
Score 2.0	The student: • Can explain why volume is measured in cubes. • Can measure volume by counting cubes. • Can explain why the label for volume is in cubic units. • Can identify the formula: Volume = length x width x height and Volume = Base x height. • Can identify the measurements of a prism (length, width, and height). • Can decompose a figure into rectangular prisms. • Can estimate differences in volume between two three-dimensional objects. **Terminology**: area, base, cubic units, edge length, height, length, rectangle, rectangular prism, three-dimensional, cubit unit, volume, width. *No major errors or omissions regarding the score 2.0 content.*
Score 1.5	Partial knowledge of the 2.0 content, but major errors or omissions regarding 3.0 content
Score 1.0	With help, partial success at score 2.0 content and score 3.0 content.
Score 0.5	With help, partial success at score 2.0 content, but not at score 3.0 content.
Score 0.0	Even with help, no success.

Self-Efficacy Survey – Finding Volume

This survey is to help a teacher get a better understanding of the kind of things that are difficult for students. Please rate how certain you are that you can do each of the items described below by writing the appropriate number. This has no effect on your grade in the class.

0	1	2	3	4	5	6	7	8	9	10
Cannot Do it					**Maybe can do it**					**Certain can do it**

Confidence (1-10)

- I can explain why volume is measured in cubes. _____
- I can measure volume by counting cubes. _____
- I can explain why the label for volume is in cubic units. _____
- I can identify the formulas to find volume. _____
- I can use the formulas to find volume. _____
- I can identify the measurements of a prism (length, width, and height). _____
- I can decompose a figure into rectangular prisms. _____
- I can estimate differences in volume between two three-dimensional objects. _____
- I can find the volume in real-world situations. _____
- I can find the volume of figures with non-overlapping parts _____
- I can design various three-dimensional figures with different shapes and edge lengths, but with the same volume. _____
- I can estimate the volume of complex figures that require multiple rectangular prisms. _____

5th Grade Math – Place Value

Score 4.0	The student: • Can solve real-world problems involving powers of ten. • Can explain the place value system and how it is based on powers of ten. • Can solve number riddles using place values. *No major errors or omissions regarding the score 4.0 content.*
Score 3.5	In addition to score 3.0 performance, partial success at score 4.0 content
Score 3.0	The student: • Can write numbers to the billions place. • Can identify place values and the value of a number in the place value. *No major errors or omissions regarding the score 3.0 content.*
Score 2.5	No major errors or omissions regarding score 2.0 and partial success at 3.0
Score 2.0	The student: • Can identify place values and the value of a number in the place value. • Can multiply by powers of ten. • Can divide by powers of ten. • Can write numbers in expanded notation and multiplication of powers of ten. **Terminology**: place value, ones, tens, hundreds, thousands, ten-thousands, hundred-thousands, millions, ten-millions, hundred-millions, billions, expanded notation, powers of ten, *No major errors or omissions regarding the score 2.0 content.*
Score 1.5	Partial knowledge of the 2.0 content, but major errors or omissions regarding 3.0 content
Score 1.0	With help, partial success at score 2.0 content and score 3.0 content.
Score 0.5	With help, partial success at score 2.0 content, but not at score 3.0 content.
Score 0.0	Even with help, no success.

Self-Efficacy Survey – Place Value

This survey is to help a teacher get a better understanding of the kind of things that are difficult for students. Please rate how certain you are that you can do each of the items described below by writing the appropriate number. This has no effect on your grade in the class.

0	1	2	3	4	5	6	7	8	9	10
Cannot Do it					**Maybe can do it**					**Certain can do it**

Confidence (1-10)

- I can identify place values and the value of a number in the place value. _____
- I can multiply by powers of ten. _____
- I can divide by powers of ten. _____
- I can write numbers in expanded notation and multiplication of powers of ten. _____
- I can write numbers to the billions place. _____
- I can solve real-world problems involving powers of ten. _____
- I can explain the place value system and how it is based on powers of ten. _____
- I can solve number riddles using place values. _____

5th Grade Math – Decimals

Score 4.0	The student: • Can read and write decimals beyond the thousandth place. • Can compare, order, and round decimals beyond the thousandths place. *No major errors or omissions regarding the score 4.0 content.*
Score 3.5	In addition to score 3.0 performance, partial success at score 4.0 content
Score 3.0	The student: • Can read and write decimals to the thousandths place. • Can compare and order decimals. • Can round decimals to the thousandths place. *No major errors or omissions regarding the score 3.0 content.*
Score 2.5	No major errors or omissions regarding score 2.0 and partial success at 3.0
Score 2.0	The student: • Can visually represent decimals. • Can represent decimals in expanded notation. • Can round to the whole number place values. • Can identify decimal place values. • Can explain their process for ordering and comparing decimals. Terminology: *No major errors or omissions regarding the score 2.0 content.*
Score 1.5	Partial knowledge of the 2.0 content, but major errors or omissions regarding 3.0 content
Score 1.0	With help, partial success at score 2.0 content and score 3.0 content.
Score 0.5	With help, partial success at score 2.0 content, but not at score 3.0 content.
Score 0.0	Even with help, no success.

Self-Efficacy Survey – Decimals

This survey is to help a teacher get a better understanding of the kind of things that are difficult for students. Please rate how certain you are that you can do each of the items described below by writing the appropriate number. This has no effect on your grade in the class.

0	1	2	3	4	5	6	7	8	9	10
Cannot Do it					**Maybe can do it**					**Certain can do it**

Confidence (1-10)

- I can round decimals _____
- I can compare and order decimals _____
- I can read and write decimals to the thousandths place. _____
- I can visually represent decimals. _____
- I can represent decimals in expanded notation. _____
- I can round to whole number place values _____
- I can identify decimal place values. _____
- I can explain my process for ordering and comparing decimals. _____
- I can read and write decimals beyond the thousandths place. _____

5th Grade Math – Adding and Subtracting Decimals

Score 4.0	The student: • Can solve real-world problems that involve decimals. *No major errors or omissions regarding the score 4.0 content.*
Score 3.5	In addition to score 3.0 performance, partial success at score 4.0 content
Score 3.0	The student: • Can add and subtract decimals. • Can add and subtract decimals that require that addition of zeros. • Can explain the reasoning behind lining up the decimal places. *No major errors or omissions regarding the score 3.0 content.*
Score 2.5	No major errors or omissions regarding score 2.0 and partial success at 3.0
Score 2.0	The student: • Can estimate decimal addition and subtraction problems. • Can use visual or manipulatives to add decimal problems. • Can use visuals or manipulatives to subtract decimal problems. Terminology: *No major errors or omissions regarding the score 2.0 content.*
Score 1.5	Partial knowledge of the 2.0 content, but major errors or omissions regarding 3.0 content
Score 1.0	With help, partial success at score 2.0 content and score 3.0 content.
Score 0.5	With help, partial success at score 2.0 content, but not at score 3.0 content.
Score 0.0	Even with help, no success.

Self-Efficacy Survey – Decimal Addition and Subtraction

This survey is to help a teacher get a better understanding of the kind of things that are difficult for students. Please rate how certain you are that you can do each of the items described below by writing the appropriate number. This has no effect on your grade in the class.

0	1	2	3	4	5	6	7	8	9	10
Cannot Do it					**Maybe can do it**					**Certain can do it**

Confidence (1-10)

- I can estimate decimal addition and subtraction problems. _____
- I can use visual or manipulatives to add decimal problems. _____
- I can use visuals or manipulatives to subtract decimal problems. _____
- I can add and subtract decimals. _____
- I can add and subtract decimals that require that addition of zeros. _____
- I can explain the reasoning behind lining up the decimal places. _____
- I can explain the reasoning for adding a zero to decimals for subtraction. _____
- I can solve real-world problems that involve decimals. _____

6th Grade Math – Area of Parallelograms and Triangles

Score 4.0	The student: • Can solve real world problems involving areas of complex figures with triangles, parallelograms, rectangles, and squares. *No major errors or omissions regarding the score 4.0 content.*
Score 3.5	In addition to score 3.0 performance, partial success at score 4.0 content
Score 3.0	The student: • Can find the area of a parallelogram. • Can find the area of a triangles. • Can demonstrate how are of triangles and parallelograms compare to rectangles. *No major errors or omissions regarding the score 3.0 content.*
Score 2.5	No major errors or omissions regarding score 2.0 and partial success at 3.0
Score 2.0	The student: • Can identify the formula for finding the area of a triangle. • Can identify the formula for finding the area of a parallelogram. • Can identify the length and height of a triangle. • Can identify the width and height of a parallelogram. • Can explain why area is measured in square units. • Can estimate area of a triangle or parallelogram. **Terminology**: triangle, parallelogram, height, width, square units. *No major errors or omissions regarding the score 2.0 content.*
Score 1.5	Partial knowledge of the 2.0 content, but major errors or omissions regarding 3.0 content
Score 1.0	With help, partial success at score 2.0 content and score 3.0 content.
Score 0.5	With help, partial success at score 2.0 content, but not at score 3.0 content.
Score 0.0	Even with help, no success.

Self-Efficacy Survey – Area of Triangles and Parallelograms

This survey is to help a teacher get a better understanding of the kind of things that are difficult for students. Please rate how certain you are that you can do each of the items described below by writing the appropriate number. This has no effect on your grade in the class.

0	1	2	3	4	5	6	7	8	9	10
Cannot Do it					**Maybe can do it**					**Certain can do it**

Confidence (1-10)

- I can identify the formula for finding the area of a triangle. _____
- I can identify the formula for finding the area of a parallelogram. _____
- I can identify the base and height of a triangle. _____
- I can identify the base and height of a parallelogram. _____
- I can explain why area is measured in square units. _____
- I can estimate area of a triangle or parallelogram. _____
- I can find the area of a parallelogram. _____
- I can find the area of a triangles. _____
- I can demonstrate how are of triangles and parallelograms compare to rectangles. _____
- I can solve real world problems involving areas of complex figures with triangles, parallelograms, rectangles, and squares. _____

6th Grade Math – Surface Area

Score 4.0	The student: • Can solve real-world problems that involve surface area and volume. *No major errors or omissions regarding the score 4.0 content.*
Score 3.5	In addition to score 3.0 performance, partial success at score 4.0 content
Score 3.0	The student: • Can explain how to find the surface area of a rectangular prism. • Can explain how to find the surface area of a pyramid. *No major errors or omissions regarding the score 3.0 content.*
Score 2.5	No major errors or omissions regarding score 2.0 and partial success at 3.0
Score 2.0	The student: • Can explain the meaning of surface area using words and visuals. • Can match nets to the polyhedron and vice versa. • Can use a net to find the surface area of a prism. • Can use a net to find the surface area of a pyramid. • Can explain the difference between surface area and volume. • Can identify the correct measurement unit for volume, area, and surface area. **Terminology:** face, edge, vertex, base, surface area, net, three-dimensional, volume, square unit, cubic unit. *No major errors or omissions regarding the score 2.0 content.*
Score 1.5	Partial knowledge of the 2.0 content, but major errors or omissions regarding 3.0 content
Score 1.0	With help, partial success at score 2.0 content and score 3.0 content.
Score 0.5	With help, partial success at score 2.0 content, but not at score 3.0 content.
Score 0.0	Even with help, no success.

Self-Efficacy Survey – Surface Area

This survey is to help a teacher get a better understanding of the kind of things that are difficult for students. Please rate how certain you are that you can do each of the items described below by writing the appropriate number. This has no effect on your grade in the class.

0	1	2	3	4	5	6	7	8	9	10
Cannot Do it					**Maybe can do it**					**Certain can do it**

Confidence (1-10)

- I can solve real-world problems that involve surface area. _____
- I can explain how to find the surface area of a rectangular prism. _____
- I can explain how to find the surface area of a pyramid. _____
- I can explain the meaning of surface area using words and visuals. _____
- I can match nets to the polyhedron and vice versa. _____
- I can use a net to find the surface area of a prism. _____
- I can use a net to find the surface area of a pyramid. _____
- I can explain the difference between surface area and volume. _____
- I can identify the correct measurement unit for volume, area, and surface area. _____

6th Grade Math – Ratios

Score 4.0	The student: • Can use multiple methods to solve real-world ratio problems. *No major errors or omissions regarding the score 4.0 content.*
Score 3.5	In addition to score 3.0 performance, partial success at score 4.0 content
Score 3.0	The student: • Can give examples of different types of ratios that are used in real-life • Can give and justify equivalent ratios. • Can find unit price to find the best price. • Can solve real-life ratios problems *No major errors or omissions regarding the score 3.0 content.*
Score 2.5	No major errors or omissions regarding score 2.0 and partial success at 3.0
Score 2.0	The student: • Can draw and label ratios. • Can explain the idea of equivalent ratios. • Can use a double number line for equivalent ratios. • Can use ratios to compare different situations. • Can use tables to create and compare ratios. Terminology: ratio, double line graphs, tables, equivalent, unit price, *No major errors or omissions regarding the score 2.0 content.*
Score 1.5	Partial knowledge of the 2.0 content, but major errors or omissions regarding 3.0 content
Score 1.0	With help, partial success at score 2.0 content and score 3.0 content.
Score 0.5	With help, partial success at score 2.0 content, but not at score 3.0 content.
Score 0.0	Even with help, no success.

Self-Efficacy Survey – Ratio

This survey is to help a teacher get a better understanding of the kind of things that are difficult for students. Please rate how certain you are that you can do each of the items described below by writing the appropriate number. This has no effect on your grade in the class.

0	1	2	3	4	5	6	7	8	9	10
Cannot Do it					**Maybe can do it**					**Certain can do it**

Confidence (1-10)

- I can draw and label ratios. _____
- I can explain the idea of equivalent ratios. _____
- I can use a double number line for equivalent ratios. _____
- I can use ratios to compare different situations. _____
- I can use tables to create and compare ratios. _____
- I can use tape diagrams to solve ratio problems. _____
- I can give examples of different types of ratios that are used in real-life _____
- I can give and justify equivalent ratios. _____
- I can find unit price to find the best price. _____
- I can solve real-life ratios problems _____
- I can use multiple methods to solve real-world ratio problems. _____

6th Grade Math – Multiplying and Dividing Decimals

Score 4.0	The student: • Can solve real-world decimal problems with multiplication and division. *No major errors or omissions regarding the score 4.0 content.*
Score 3.5	In addition to score 3.0 performance, partial success at score 4.0 content
Score 3.0	The student: • Can multiply decimal by other decimals and whole numbers. • Can multiply decimals up to 3 digits. • Can divide decimals by other decimals *No major errors or omissions regarding the score 3.0 content.*
Score 2.5	No major errors or omissions regarding score 2.0 and partial success at 3.0
Score 2.0	The student: • Can use US method to multiply. • Can use US method to divide. • Can use estimation to know where to place the decimal point. • Can use powers of ten to know where to place the decimal point. • Can explain their method and reasoning behind the location of the decimal point. Terminology: product, factors, dividend, divisor, quotient, decimal point, powers of ten, *No major errors or omissions regarding the score 2.0 content.*
Score 1.5	Partial knowledge of the 2.0 content, but major errors or omissions regarding 3.0 content
Score 1.0	With help, partial success at score 2.0 content and score 3.0 content.
Score 0.5	With help, partial success at score 2.0 content, but not at score 3.0 content.
Score 0.0	Even with help, no success.

Self-Efficacy Survey – Multiplying and Dividing Decimals

This survey is to help a teacher get a better understanding of the kind of things that are difficult for students. Please rate how certain you are that you can do each of the items described below by writing the appropriate number. This has no effect on your grade in the class.

0	1	2	3	4	5	6	7	8	9	10
Cannot Do it					**Maybe can do it**					**Certain can do it**

Confidence (1-10)

- Can use US method to multiply. _____
- Can use US method to divide. _____
- Can use estimation to know where to place the decimal point. _____
- Can use powers of ten to know where to place the decimal point. _____
- Can explain their method and reasoning behind the location of the decimal point. _____
- Can multiply decimal by other decimals and whole numbers. _____
- Can multiply decimals up to 3 digits. _____
- Can divide decimals by other decimals _____
- Can solve real-world decimal problems with multiplication and division. _____

Appendix C

Self-Efficacy Survey

This survey is to help a teacher get a better understanding of the kind of things that are difficult for students. Please rate how certain you are that you can do each of the items described below by writing the appropriate number. This has no effect on your grade in the class.

0	1	2	3	4	5	6	7	8	9	10
Cannot Do it					**Maybe can do it**					**Certain can do it**

Confidence (1-10)

- I can estimate decimal addition and subtraction problems. _____
- I can use visual or manipulatives to add decimal problems. _____
- I can use visuals or manipulatives to subtract decimal problems. _____
- I can add and subtract decimals. _____
- I can add and subtract decimals that require that addition of zeros. _____
- I can explain the reasoning behind lining up the decimal places. _____
- I can explain the reasoning for adding a zero to decimals for subtraction. _____
- I can solve real-world problems that involve decimals. _____

Appendix D

End of the Study Student Interview Questions

1. What are your thoughts on using proficiency scales in Math class?

2. Do you think using proficiency scales was helpful or harmful for your learning? Explain why or why not?

3. If you had a choice for a class to use proficiency scales or regular letter grades, which one would you pick? Why?