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The Benefits And Challenges Of Integrating Self-Assessed Grading Into A 7th Grade Math Classroom

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THE BENEFITS AND CHALLENGES OF INTEGRATING

SELF-ASSESSED GRADING INTO A 7TH GRADE MATH CLASSROOM

by

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To my family for your unending reserves of patience and enthusiasm for my journey through completing this capstone. Thank you to my Capstone Committee and classmates for the time you spent working with me and the advice you shared.

"Were all instructors to realize that the quality of mental process,
not the production of correct answers, is the measure of educative growth
something hardly less than a revolution in teaching would be worked."
— John Dewey, Democracy and Education

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CHAPTER ONE

Introduction

As a middle school teacher since 2016, I have observed how our students transition from the highly involved teachers of their elementary years to the high school teachers who are counting on them to know how to study and accomplish needed tasks with much less scaffolding. It is clear to me that to succeed in high school and beyond, students need both the intrinsic motivation to complete school-related tasks and the ability to self-assess their skills and their needs. As students develop these skills, they need opportunities to practice them with guidance from a teacher so they can refine their abilities. The transitional nature of middle school makes it an ideal place to guide students into a higher degree of self-reliance.

On the spectrum of self-reliance, my time in a middle school classroom has given me students falling anywhere from 0 to 100. Some students have planners and fill them out religiously; these students are often the ones who are also reviewing their own work and checking in with me about how to fix any problems. On the other end of the spectrum, I see students who rely exclusively on teachers and parents to remind them about the work they need to complete. These students are often the ones who put in just enough work to finish an assignment (if they finish it at all), but do not take the time to consider their work carefully and refine it to a higher standard. Regardless of their starting point, all students can use more practice on assessing themselves and working to

become better students in the process. If middle school students are to develop the ability to assess their work honestly, they need experience doing just that. I hope to help teachers give students this opportunity by exploring my research question: *"What are the benefits and challenges of integrating self-assessed grading into a 7th grade pre-algebra curriculum?"*

Overview

This chapter will cover the personal experiences I had as a beginning teacher that led me to the idea of teaching self-assessment and incorporating it into my instructional practices. It will also define key terms that are necessary for understanding the rationale behind self-assessment and the benefits it can bring to teachers and to students in the classroom.

Background

The seeds for this research question were planted in 2016, my first year of teaching. I taught five sections of the same pre-algebra class, managing math curriculum for 160 students in total. That meant that when I assigned a worksheet for turn-in, I could expect nearly 160 sheets of paper the next day that I would then have to check and enter into the gradebook. About halfway through the year, I took on the additional challenge of coaching one of the school's basketball teams, which meant I gave up two hours after school that I could not use for grading time.

During the depths of basketball season, I would have weeks where I fell up to three days behind on grading. Three days of worksheets, combined with any late work that was being turned in, could mean I would be staring at almost a ream of paper that I

would have to sort through. Not only was that a lot to go through, but with that volume, I

was not giving myself any time for substantive student feedback. I was mostly grading

for completion, but just the process of moving 500 sheets of paper from one pile to

another and marking each one complete in the gradebook could take two hours or more.

It was a lot of time, and it did not feel like time spent effectively. As a teacher, I trained

in curriculums, behavior interventions and community building; I did not expect basic

data entry to become such a predominant part of the package.

As the year wore on, the data entry was wearing me down. I knew I needed to

give students work to do, and I wanted to hold them accountable for that work by

entering it into the gradebook, but I also knew the current balance of my workload was

not sustainable. I talked to colleagues about their grading strategies, but in the end I was

too overwhelmed by other teaching responsibilities to follow their ideas. For instance,

several teachers I talked to said they often did their grading during class, when students

were working independently and only coming up to the teacher's desk to ask intermittent

questions. Given the difficulties I was sometimes having with classroom management, I

was spending most work times walking around the class and helping students or

addressing behaviors. That left me unable to fit grading into my class periods.

When I ended my first year of teaching, I sat down to make a list of what worked

and what needed improvement in my classroom. Paper management and daily grading

stood out, both in terms of what I needed to do personally and in terms of what my

students needed from me as a teacher. Essentially, my own self-assessment at the end of

my first year led me to further consider the benefits of students self-assessing in my classroom.

The Roots of the Idea

I came to teaching after fifteen years as a journalist and that experience plus lessons learned as I trained to be a teacher led me to believe communication is an essential part of success in mathematics. To that end, I became the math department's representative on a school committee dedicated to implementing a Literacy Collaborative strategy across the school. The Literacy Collaborative is a data-driven professional development program designed to provide a comprehensive approach to literacy instruction from kindergarten through eighth grade. At its heart, the Literacy Collaborative is based on a constructivist philosophy that preaches increasing student engagement and achievement through offering students choices and letting them follow their curiosity. Loosely defined, constructivism looks for students to construct their own learning, starting with their personal experiences then having a teacher guide them through new material.

During one meeting of this committee, a sixth-grade teacher shared an experience that was revelatory for me and marked the start of my journey toward this research project. She said as she reviewed her electronic gradebook at the end of a trimester, she had seven pages of assignments in her math class. Each page consisted of 20 individual assignments, meaning there were in the range of 140 unique assignments in her gradebook after just one-third of the year. She said the volume of assignments, and the corresponding grading and late work that came attached each one, left her feeling more

like a secretary than a teacher. With the start of a new trimester, she decided on a new approach for her first unit, knowing that if it did not work she could revert to her usual approach for the second unit.

Her approach was to give students a volume of information each week, then to let them choose how they wanted to learn it. Her materials included video lectures, worksheets and bookwork. Students were given a suggested pace to follow and reminded that their goal was to study the information deeply enough to be successful on the quizzes and tests. At the end of each week, the only homework grade that went into the gradebook was one the students gave themselves. They were asked to grade themselves on the level of work they put in to learning the material throughout the week. She said she was shocked at the early results.

For one, the new approach seemed to make students more interested in watching the video lectures than they had been previously. Now that they were told they were responsible for their own learning, the teacher said some students who had previously skipped watching the video lectures entirely were now watching videos multiple times until they understood the work they needed to do. She also said students were refreshingly honest about their effort levels, often docking themselves points even in weeks where they appeared to learn the material well.

I was inspired by her approach and found several opportunities over the next few weeks to talk to her about it and try to understand if it was something I could implement as a first-year teacher. I also conducted some cursory Google searches to see if I could find anyone online who had written down a methods for implementing this approach in a

middle school classroom. I learned from my conversations and my web searches, but in the end I did not have enough confidence to bring this idea into my classroom in the middle of the year. Unfortunately as a first-year teacher, I fell into the trap of "getting through" the material rather than carefully planning weeks, or even days, ahead. Implementing a new grading approach, on top of everything else that I was experiencing for the first time, felt overwhelming. Even though I did not implement it in my classes, the idea stuck with me as I prepared to cap off my graduate program. Eventually, it led me to choose this research question.

Key Terms

There are a handful of key terms that will be used throughout this paper. The four most important terms are named and defined below; these definitions need to be understood in order to follow the ideas outlined in this paper.

Constructivism: The constructivist theory of education developed collectively by Dewey, Piaget, Vygotsky and Bruner essentially posits that learning comes from experience; students use prior learning, social interactions and new experiences to construct their understanding of new information (Jones, Jones & Vermette, 2010). Further, learning should be an active process, with students working to transfer their ideas into new contexts so they can develop new understandings (Jones et al., 2010).

Self-assessment: Self-assessment is the process by which students judge their own performance and the depth of their understanding of a topic (Noonan & Duncan, 2005). Self-assessment and self-evaluation are used somewhat interchangeably in the

literature; this paper will primarily use self-assessment because that term has a clearer connection to academic growth (Klenowski, 1995).

Self-efficacy: Self-efficacy is defined as a personal evaluation of one's ability to succeed in a given situation (Bandura, 1977). If a person has a higher sense of self-efficacy related to a given task, that person will be more confident they can succeed at that task (Bandura, 1977).

Self-regulated learning: Self-regulated learning is the process by which students continually improve on their learning skills by planning, monitoring, reflecting, and then adjusting their strategies (Zimmerman, 2002). It is seen as a cycle of continuous improvement, where students reflect on their past learning then move ahead by using the results of those reflections to improve their future learning (Zimmerman, 2002).

Benefits

As I look over this material, I see the research and methods outlined in this paper being helpful to teachers and to students.

For me personally, implementing the self-assessment approach outlined in this paper should curtail the "data-entry" time I found so distasteful early in my teaching career. That time that I spent dealing with more than a ream of paper per week could now be used for planning and responding to student work, activities that are more central to my identity as a teacher. And if I benefit, my students should benefit as well by having a teacher who has more time to dedicate to the parts of teaching that have a direct effect on their learning. But the benefits for students do not stop there.

Having students stop to think about their own work and what they have to do to be successful should help them to strengthen their sense of self-efficacy. If students pause to assess themselves and to think about the skills they have used, they should be more able to recognize the variety of internal skills they already have when they are faced with new and difficult situations. Recognizing the skills they already possess can make them more confident with their ability to succeed in challenging situations.

Practicing self-assessment can also help students to develop their skills as self-regulated learners. In the example above, my colleague's students were given the latitude to decide on the amount of work they would do, then given the responsibility to grade themselves on the work they did. Instead of completing worksheets because the teacher was telling them to, they were deciding for themselves what to work on and working not to let themselves down. My hope is that students who work in an environment such as this one will come up themselves with the answer to one of the biggest questions that teachers hear from recalcitrant students: "But WHY are we doing this?" With this method, the "why" is no longer "because the teacher said so." Instead, the "why" becomes "because the choices you make affect your learning." If students can internalize this idea, they can become stronger self-regulated learners.

Outside of improving my practice and helping my students regulate their learning, I also hope this paper will be helpful for the broader teaching community. The logistics of setting up a gradebook and managing paperwork can be a surprise to beginning teachers. Publishing this implementation model could help teachers – particularly those who are still early in their careers – who are feeling overwhelmed by the paper crush like I was.

Incorporating a system of self-assessed grading will still involve set-up work for new teachers, but the frameworks in this paper will help those teachers to develop a system that brings students in to the grading process, eventually decreasing the amount of time that teachers have to spend on independent grading and increasing the time they have for more educationally valuable pursuits.

Summary

This introductory chapter reviewed the genesis of my interested in self-assessed grading in a middle school classroom, summarizing the events in my career that led to my interest in this topic. It also defined key terms necessary for understanding this topic and outlined potential benefits that could come from implementing a program of self-assessment.

In Chapter Two, I will review research that is relevant to the idea of self-assessment in middle school, focusing on constructivism, self-regulated learning and self-efficacy. Chapter Three will summarize a curricular framework to introduce self-assessment into a classroom, following the guidelines of the Understanding by Design model (Wiggins & McTighe, 2005). Chapter Four will be a reflection on the Capstone process and a look ahead to future implications of the research in this paper.

CHAPTER TWO

Literature review

Overview

Before answering the question "What are the benefits and challenges of integrating self-assessed grading into a 7th grade pre-algebra curriculum?" I will be breaking the question down into three subcategories that are important for understanding the rationale and the utility of such a program: constructivism, self-regulated learning and self-efficacy. I will also review research that covers the implementation of such a program.

First, because self-assessment involves the teachers giving up some level of control to their students, I will examine the student-centered teaching philosophy of constructivism developed by foundational educational philosophers such as Vygotsky, Piaget, Dewey and Bruner (Jones et al., 2010). In contrast to some traditional views of teaching that see it as a one-way process where teachers simply deliver information to students, constructivism posits that students should be participants in constructing their own understanding of material. In a classroom that includes self-assessed grading, proponents believe students will participate even more deeply in their learning by participating in the assessment process as well.

Second, the paper will address self-efficacy, which is defined as a student's belief in his or her ability to succeed (Bandura, 1993). This section will look at factors that contribute to student self-efficacy and motivation in middle school, including how perceived self-efficacy can contribute to success in math class. Self-assessment connects

to self-efficacy because students who practice assessing their own progress can gain a deeper understanding of their capabilities and of what they need to do to succeed. Once they know more about what is necessary to complete a task, they will be more likely to feel that they can complete it successfully.

Third, I will cover self-regulated learning, the process by which students continually improve on their learning skills by planning, monitoring, reflecting, and then adjusting their strategies (Zimmerman, 2002). Within the cycle of self-regulated learning outlined below, self-assessment is a key tool for students to have in their educational toolbox. Giving students practice with the skills and procedures necessary for accurate self-assessment will help them to become more effective self-regulated learners.

Finally, this literature review will examine some of the practical considerations tied to implementing a self-assessment program in a middle school classroom. This section will address the effects of self-assessment on student achievement and will include quantitative comparisons between student performance under self-assessment and other types of assessment. This section will also cover research on how to implement a program of self-assessment in a 7th grade math class and will explore the use of rubrics as a self-assessment tool.

In combination, the topics covered in this literature review – constructivism, self-regulated learning and self-efficacy – will provide a foundation for understanding the benefits and challenges of incorporating self-assessed grading into a middle school math classroom. Each of those topics will be elaborated in the remainder of this literature review.

Constructivism

Constructivism is a classroom philosophy that revolves around enhanced student involvement in the learning process, allowing them to construct their own understanding of the material covered in class (Schnuit, 2006; Parkison 2014). In a constructivist classroom, the teacher is a facilitator for student learning but is not regarded as the singular expert; instead, the teacher offers opportunities for students to use their experiences and interactions to arrive at their own conclusions about the material (Schnuit, 2006).

Looking specifically at math class, Jones et al. (2010) outline a key set of principles that should be readily apparent in a constructivist classroom. Jones et al. (2010) say such a classroom should include the following: reflection on learning, the use of prior knowledge to construct new understandings, and social interaction that facilitates the learning process. In a constructivist math classroom, teachers should provide students with activities that lead them to interact with others and develop a personal understanding of the way mathematical principles can be applied to a variety of problems (Hennessey, Higley & Chesnut, 2011). Hennessey et al. (2011) outline the ideal result of a classroom based on constructivist principles: "By asking the students to take responsibility for their learning (through discussion and problem solving) they learn more and participate in the needed reflection to grasp the ideas of the lesson." (p. 192) On assessment in such a classroom, Chen and Bonner (2017) have this to say: "In a constructivist classroom, teachers implement learning activities that embed assessments so that both learning and assessments are contextual, meaningful to learners, and individualized to meet student

needs." (p. 20) Instructing students on self-assessment fits into this idea of a constructivist classroom because it involves them in the process of assessment and gives students a way to consider how well they are fulfilling their individual roles as a learners. With self-assessment, students become directly accountable to themselves, making the assessment process more individualized and more meaningful.

As students take on more responsibility for constructing their own learning in a constructivist classroom, teachers take on the role of facilitators, collaborating with students instead of transmitting knowledge to them, then expecting that information to be repeated back on a later assessment (Schnuit, 2006). Parkison (2014) says shifting to a more collaborative methodology in the classroom means the teacher needs to give up control, but that the commensurate increase in student motivation helps maintain classroom structure. In a case study, Parkison (2014) found that teachers may need to spend extra time on establishing a collaborative environment in the classroom because many students will be unfamiliar with the demands of such a democratic setup. Parkison (2014) says this extra time may need to include discussions on participation requirements, accountability measures, and the changing roles of students and teachers in such a classroom. This finding is important for teachers who would like to introduce self-assessment to a classroom: When students are asked to take on responsibilities they have not been given in the past (such as self-assessment), they need instruction and guided practice so they can effectively manage this change in expectations.

As outlined above, a constructivist classroom asks students take on an expanded responsibility for their learning. For students, managing this responsibility begins with

having the belief and the confidence that they will be able to take on new tasks successfully. This concept is explored in the idea of self-efficacy, which will be described in the next section.

Self-Efficacy

Bandura (1993) sees self-efficacy, which is defined as a student's belief in his or her ability to succeed, as a key component of academic development. According to Bandura (1993), students with higher levels of self-efficacy have two positive learning outcomes: higher goals and sustained focus. First, students with stronger perceptions of their self-efficacy set higher goals for themselves and are more committed to achieving those goals. Second, students with a strong sense of self-efficacy can stay focused on tasks even under stress; the goal orientation and task focus of students with strong self-efficacy help them to become stronger students. Given these positive learning outcomes, working to improve student self-efficacy is a worthwhile goal for teachers.

Schunk (as cited in Bandura, 1993, p. 135) found that students could increase their perceived self-efficacy through a program of self-directed learning. Giving students the latitude to map out their own goals – and the strategies they would use to reach those goals – and assess their own progress led to an improvement in their academic performance. Adding a component of self-assessed grading to a middle school classroom gives students the opportunity to assess their progress, a key part of Schunk's findings.

In a parallel to Schunk's work, Parkison (2014) found that bringing democratic processes into the classroom and involving students in the decisions being made led to an improvement in intrinsic motivation among students; essentially, focusing on student

independence can help increase their sense of self-efficacy. Self-assessment can play a role here as well. When students are allowed to take on a greater role in judging their own work, the teacher is making grading a more democratic process, which in turn leads to an increase in self-efficacy.

Self-Efficacy in Math Class

Self-efficacy has been shown to be an important contributor to student motivation and success in math class (Usher, 2009; Cleary & Kitsantas, 2017). Researchers have found that self-efficacy can be tied to successful learning behaviors (Cleary & Kitsantas, 2017) and it can also be correlated with academic achievement (Usher, 2009).

Cleary and Kitsantas (2017) worked to develop a model that would connect middle school math performance with a number of outside variables, including self-regulated learning behaviors and motivation variables such as self-efficacy. Prior performance was the most impactful factor on performance, but the researchers found that both student beliefs about self-efficacy and manifestations of self-regulated learning behaviors were key factors in predicting students' mathematical performance. Cleary and Kitsantas (2017) say high-performing self-regulated learners harness a variety of strategies and behaviors that help them to succeed, changing their approach as dictated by their success or failure in meeting a goal. The researchers say those students' feelings of self-efficacy give them the confidence to attempt a variety of strategies in pursuit of their academic goals.

Usher (2009) found a correlation between self-efficacy and achievement in math class; students with high self-efficacy reported high levels of achievement while

low-achieving students or struggling students had low feelings of self-efficacy. Usher

(2009) found that students with high self-efficacy also showed evidence of confidence

about their math skills and their academic performance. They interpreted their success in

math class and on standardized tests as evidence of their superior math ability. Students

with low self-efficacy demonstrated low grades and talked about the difficulty of the

topics covered in math class. Given the connections between self-efficacy and success in

math class, math teachers would be well-served to find methods of increasing student

self-efficacy. Self-efficacy also plays an important role in the cycle of self-regulated

learning, which will be discussed in the next section.

Self-Regulated Learning

As they manage the transition from elementary school to high school, middle

school students are becoming more self-reliant and Parkison (2014) sees independent

motivation as a key component of these students' growing independence: "As middle

level learners struggle to find identity and a sense of empowerment, it is critical that

teachers and schools provide frameworks or schemas through which the students can

learn the requisite skills of an independent, autonomous learner." (p. 49) One framework

used to explain the way that individuals manage their own learning is known as

self-regulated learning, which is the process by which students continually improve on

their learning skills by planning, monitoring, reflecting, and then adjusting their strategies

(Zimmerman, 2002).

Zimmerman (2002) further identifies a number of sub-processes at each of the

three phases of the overall self-regulated learning cycle; those three phases are

forethought, performance and self-reflection. The forethought phase incorporates the sub-processes of task analysis, where the student sets goals and makes plans to meet them, and self-motivation beliefs, which include students' thoughts about their skills and their expected results. After forethought comes the performance phase, which includes the sub-processes of self-control and self-observation.

Self-control covers the actual implementation of strategies that the student arrived at in the forethought phase; self-observation is the process of students noticing their progress toward their goals. The third phase, self-reflection, involves the sub-processes of self-judgment and self-reaction. Self-judgment covers self-evaluation and attribution: How do students think they did and to what do they attribute that performance? Self-reaction then goes a step further: How do students feel about their level of performance? The self-reflection phase is then followed by a forethought phase about a future task, continuing the self-regulated learning cycle.

Within the cycle of self-regulated learning, self-assessment comes into play most heavily in the self-reflection phase, although it also plays a part in the other two phases of the cycle. Klenowski defines self-assessment as "the evaluation or judgment of 'the worth' of one's performance and the identification of one's strengths and weaknesses with a view to improving one's learning outcomes" (as cited in Ross, 2006, p. 1). This definition looks backward, at the work that a student has completed, and forward, at the possible improvements that a student could make in the future. The dual nature of this definition explains why self-assessment is a key component of that self-regulated learning cycle defined by Zimmerman (2002).

Despite the presence of the word "self" in their titles, the processes of self-assessment and self-regulated learning are not purely independent activities; they also depend upon outside input in order for students to reach optimum efficiency. Hattie and Yates (2014) say that accurate self-assessment depends on the feedback that students receive on their performance; in areas where they receive frequent and accurate feedback, self assessments tend to match up more closely with actual performance. Therefore teachers who plan to incorporate self-assessment should still plan to deliver feedback to help students make their self-assessments more accurate. The next section will discuss the benefits of practicing self-assessment and giving students feedback on their work in that area.

Implementation of Self-Assessment

As students progressed through middle and high school, Usher and Pajares (2008) found that students reported decreasing confidence in their self-regulatory skills. The researchers hypothesize that as students progress into older grades and lose some of the structure and close monitoring they experienced in elementary school, they lose confidence because their learning skills are put to the test in ways they had not experienced previously. Usher and Pajares (2008) recommend that administrators and teachers keep this possible organizational deficit in mind as they develop curriculums for older students, providing opportunities to practice and improve upon those skills. Practicing self-assessment, as outlined in this paper, can help increase students' confidence in their self-regulation, as well as improving their overall performance as self-regulated learners.

Zimmerman (1990) says teachers can offer direct instruction on each part of the self-regulated learning process – including self-assessment – to help increase student motivation and achievement. Ross (2006) reviewed research on self-assessment and concluded that "There is persuasive evidence, across several grades and subjects, that self assessment contributes to student learning and that the effects grow larger with direct instruction on self assessment procedures." (p. 9) Like any other educational skill, students can improve at self-assessment through guided practice. One clear conclusion drawn by several researchers (Ross, 2006; Sadler & Good, 2006; Zimmerman, 1990) is that students need direct instruction in self-assessment methods to make it a successful strategy for them. Because self-assessment will often be a new experience for students, they need guidelines and feedback to help them as they pick up the skills necessary to assess their achievement effectively. Teachers can help students to practice not only self-assessment, but other self-regulatory activities as well, and practicing these skills may help alleviate a confidence deficit sometimes seen in secondary level students.

Pape, Bell and Yetkin (2003) worked in a middle school mathematics classroom to develop a curriculum promoting the skills necessary to become self-regulated learners. Researchers Pape and Yetkin worked with Bell, the teacher, to implement and measure the impact of the curriculum. As part of the project, students were asked to record and reflect on the strategies they used to study – several students noted that the self-assessment helped them to realize the connections between the work they did and the results they saw in class. In general, Pape et al. (2003) noted "very slow" growth in students' self-regulation of their behaviors and said both high-performing students and

struggling students were less likely to follow through on the strategies they listed before quizzes. But overall, they found the process left students more capable of choosing and discussing study strategies, and more likely to connect their decisions and study habits to the results they were seeing in class. In a classroom like this one that incorporates goal-setting and self-assessment, Parkison (2014) says giving students a list of learning skills and objectives helps them to establish specific goals for themselves.

Based on the research outlined in this section, scaffolding the introduction of self-assessment with guided practice, targeted learning materials and teacher feedback offers benefits to students not just in the area of self-assessment, but also within the broader framework of self-regulated learning.

Validity of Self-Assessment

As the use of self-assessment has become more widespread, researchers (Parkison, 2014; Sadler & Good, 2006; Ross, 2006) have variously looked into the validity, the reliability and the accuracy of student self-assessments.

In a review of self-assessment research, Ross (2006) found that "self-assessment, when properly implemented, produces valid and reliable information about student achievement." (p. 10) In looking at research comparing self-assessed grades to those given by teachers, Ross (2006) concluded that self-assessments are often higher than teacher grades, but said the difference can be minimized through student training. Potential strategies for training students are discussed later in project portion of this Capstone.

Sadler and Good (2006) compared two types of grading that could occur without teacher involvement: self-grading and peer-grading. The authors define self-grading as having students correct their own tests and peer-grading as having students grade the tests of other students in their class. They found that the scores students arrived at through self-grading were a closer match to teacher grades than when students graded the work of their peers. To summarize, they wrote: "Self-grading has the potential of outperforming peer-grading, being a closer substitute for teacher grades in terms of correlation and also of agreement." (p. 24)

Sadler and Good (2006) also measured the learning impact of self-grading and peer grading. Some peer graders showed a gain, but Sadler and Good (2006) found that only one ability subgroup had scores that were significantly increased compared to the control group. In contrast, with self-grading, Sadler and Good (2006) describe how "students at all levels appear to benefit from self-grading, with significant gains at the lower and middle levels" (p. 25). The researchers also asked students to reflect on the self-grading activity after it concluded. In the following quote, one student from their study discussed the learning benefits of grading their own work: "This felt strange at first . . . but by the end . . . I realized grading was another way of learning" (p. 25).

One caveat noted by Sadler and Good (2006) was in regard to lower performing students. In their research the authors noted that lower performing students may have a greater tendency to inflate their own grades, making that an area where accuracy checks are especially important. Sadler and Good (2006) define an accuracy check as a comparison between a student's self-assessed score and the score given by the teacher on

the same assignment. To improve student accuracy, Sadler and Good (2006) suggest adding the incentive of extra credit points for those students whose self-grading most closely matches the scores given by the teacher. Possible concerns about accuracy and teacher interventions are discussed later in this chapter in the section on implementation.

Teaching Students to Assess Themselves

The end goal of a self-assessment program should be for students to be capable of judging their own progress and understanding their growth and their limitations; reaching that goal takes a variety of instructional tactics from teachers. McMillan and Turner (2014) found that students feel better about assessments that clearly and directly relate to the effort they expended in learning the material. That is, student opinion of an assessment depends on whether they feel it reflects the work they put in ahead of time. Any self-assessment strategy should take this reality into account as well.

Ross (2006) outlines a four-step process to teach students how to assess themselves: 1) involve students in determining criteria for success, 2) teach them how to use the criteria, 3) talk to students about how their assessments compare with teacher judgements and 4) help students to use their self-assessments to change and improve the way they work in the future. Ross (2006) further argues that three key conditions are needed for self-assessment to be beneficial: teachers should negotiate criteria with students, teachers and students should discuss evidence for their opinions and the self-assessments should be a part of the class grade. Rubrics are an assessment tool that, if used properly, can meet those three conditions laid out by Ross.

Use of Rubrics

When considering different methods of self-assessment, several researchers say using a rubric gives students the greatest opportunities for growth (Sadler & Good, 2006; Ross, 2006). In developing a rubric that can be used for self-assessment, teachers have a number of factors to consider. McGatha and Darcy (2010) define four ways to categorize rubrics commonly used in math class. Rubrics can be either holistic or analytic, then those categories can be further subdivided into specific and general categories. Holistic rubrics can include a variety of criteria, but they give just one score for the entire work. Analytic rubrics break the task down into essential dimensions and give a score for each dimension. Those scores are then added together to arrive at a final score. The other two categories – specific and general – apply to the focus of the rubric. Specific rubrics apply only to the task at hand, meaning a new one would need to be created for each task. General rubrics use broader language and can be applied to a variety of tasks.

The project attached to this paper will include general rubrics that can be used for students to grade their daily work in math class. It will also look at creating analytic rubrics for class projects because they give students more ways to consider their work and more possible areas that they can focus on for improvement. Instead of arriving at one score and then just being able to focus on improving their overall mark, analytic rubrics allow students to consider a variety of elements that they might be able to improve.

In order to have students use those rubrics effectively, Ross (2006) says teachers should both model how they would apply the rubrics and give students opportunities to

apply the rubric to examples of other students' work. As a check on rubric accuracy, Sadler and Good (2006) suggest that teachers first sort the performance tasks and accompanying rubrics from highest to lowest based on student scores. Once they are sorted, the teacher can read through the performance tasks and rubrics to see if any change in the rank order is necessary. Then the final grade can be calculated with a mix of student and teacher judgement.

Accuracy in Self-Assessment

Self-assessment by students is not a purely individual activity; in order for students to be able to assess themselves accurately, researchers have developed a number of recommendations for teachers to follow so that students can find success in what is often a new skill for them. The basic message is that students need guided practice in self-assessment before they can use it successfully. Ross, Rolheiser and Hogaboam-Gray (1998) found that training students in self-evaluation led to an increase in accuracy when students were asked to assess their own work; students who did not receive the training had a greater tendency to overestimate their own achievement levels. The researchers also found that the training led students to a deeper understanding of expectations in the math curriculum. If self-assessment is going to be used, the benefits of training students on its use are clear.

Ramdass and Zimmerman (2008) were successful in training students to improve their accuracy in self-evaluation judgments and concluded that accurate self-evaluation is an important component of learning in mathematics. Ramdass and Zimmerman (2008) suggest having students practice by predicting their ability to solve certain math

problems, then comparing their predictions to the actual results. This process, they argue, would give students a way to practice and improve the accuracy of their self-assessments. This predictive work can be one part of a broader overall training program on self-assessment. Sadler and Good (2006) suggest a self-grading program needs to include checks on accuracy between student grades and teacher grades, and an incentive system to encourage accurate grading by students. They suggest offering academic incentives for students whose grades most closely match those assigned by the teacher.

Meier, Rich and Cady (2006) note that even among trained teachers, scoring discrepancies can occur when using a rubric. The researchers say minor discrepancies in specific categories are to be expected because the process still involves some subjectivity. Teachers in the study attended a two-day workshop on the use and grading of work examples with the related rubrics, but researchers found that even this time was not necessarily enough for teacher scores to match with their expected results. The researchers recommend time for teachers to meet, discuss actual examples of student work and practice grading that work with rubrics. If this study shows trained professionals need time to practice this procedure, students will also need time to practice using rubrics with their own work.

Student Opinions on Self-Assessment

Along with accuracy, student doubts about the value or the utility of self-evaluation can be an issue that needs to be addressed when introducing such a program into a classroom. Ross, Rolheiser and Hogaboam-Gray (1997) convened focus groups of students who were participating in self-evaluation and found the following

concerns: students felt they were not experts in grading and thus were worried about being inaccurate; other students could cheat by grading themselves too highly, making the process unfair; the process could be a repetitive waste of time because the teacher would still be doing his or her own assessment. Ross et al. (1997) suggest that for the implementation of a self-evaluation program to be successful, it is important for teachers to regularly discuss student opinions about the self-evaluation process and to address their possible misconceptions.

But Ross et al. (1997) also heard positive feedback in that study: some students found the self-evaluation more meaningful because the students had information about themselves (the amount of effort they expended, for example) that was not available to the teacher. Further, students were able to identify weaknesses in their learning processes and procedures that they could improve upon for future assignments; and students liked the immediacy of self-evaluation because they did not have to wait for the teacher to return a grade.

Summary

In Chapter Two, I reviewed research relevant to my capstone question about implementing self-assessment practices in a 7th grade math classroom. The research shows connections between self-assessment and broader themes of constructivism, self-regulated learning and self-efficacy. Using this research as a foundation, Chapter Three will summarize a curricular framework to introduce self-assessment into a classroom, following the guidelines of the Understanding by Design model (Wiggins & McTighe, 2005).

CHAPTER THREE

Methods

Overview

This capstone project was created to explore the question "What are the benefits and challenges of integrating self-assessed grading into a 7th grade pre-algebra curriculum?" Chapter Two reviewed relevant research related to self-assessment in a middle school classroom. The literature review covered constructivism, self-assessment, self-efficacy and self-regulated learning.

This chapter will summarize a curricular framework that can be followed to introduce self-assessment into a classroom. The implementation of this curriculum will follow the guidelines of the Understanding by Design model (Wiggins & McTighe, 2005). This chapter will review the Understanding by Design process and elaborate how the ideas contained within it can be applied to a system of self-assessment. It will also summarize the content of the curriculum and discuss the timeline and the proposed audience.

Curriculum Implementation

Understanding by Design (Wiggins & McTighe, 2005) is a research-based model of curriculum implementation that encourages teachers to work backwards in developing lesson and unit plans, starting with the learning goal then proceeding through the materials and activities. The authors of the Understanding by Design process place a great deal of importance on teachers working with students to enhance their ability to apply learned concepts across a variety of subjects. As they write: "The ability to transfer

our knowledge and skill effectively involves the capacity to take what we know and use it creatively, flexibly, fluently, in different settings or problems, on our own" (Wiggins & McTighe, 2005, p. 40). I chose to use Understanding by Design as a curricular framework for this project because I want to see middle school students take the self-assessment lessons they learn in math class and apply them to other areas of school, and even to other parts of their lives. Showing them the power of self-assessment and giving them a generalized method for applying it in other areas should help them to develop as life-long learners.

Understanding by Design has a three-stage process that teachers can use to develop units of study in a way that encourages deeper learning than other methods of curricular development (Wiggins & McTighe, 2005). Those three steps are as follows:

1. Identify desired results

2. Determine acceptable evidence

3. Plan learning experiences and instruction

Considering the first step of the Understanding by Design template, the curriculum created for this capstone project will be structured with the desired result of students having the ability to accurately assess their own progress towards the academic goals they set in math class. The major outcome is that working with the teacher, students should be able to set achievement goals that relate to the material covered in class. Then, after lessons and practice, students should be able to accurately identify their own level of mastery in the subject. A secondary goal of these units of study will be for students to show an increase in self-regulated learning skills, self-efficacy and motivation. Checking

for these improvements comes with the second step in the Understanding by Design process.

The second step in the backward design process is to determine the acceptable evidence for the success of the unit. Evidence for student growth in self-assessment can be gathered in a variety of ways. A measurement tool based on the Students' Adaptive Learning Engagement in Science questionnaire (Velayutham et al, 2011) can be used by teachers to collect data about student motivation, goals, self-efficacy and task-value beliefs. This tool can be used as a pre-test before instruction about self-assessment begins, then used afterwards to check for growth in the specified areas. Beyond using this measurement tool, teachers can conduct periodic checks on the accuracy of student assessments. In conducting these checks, both students and teachers would use the same rubric to grade selected student work. As the classroom work on self-assessment progresses, a higher correlation between teacher assessments and student assessments will serve as evidence that students are assessing their performance more accurately.

The third step, planning the learning processes and instruction, will be contained in in the Capstone Project, which will include unit plans, materials and instructions for their use in class. The planning stage will follow the steps outlined in the acronym "WHERETO," which Wiggins and McTighe (2005) recommend to help teachers focus on the key considerations in their plan. "Where and Why" tells teachers that students need to understand where the unit is going and why. "Hook and Hold" is a reminder about gaining and keeping student attention. "Equip" means students should be given appropriate experiences and tools to know how to reach their goals. The "Reflect and

Revise" step leads into the "Evaluate" step; both are reminders for teachers to give students the chance to review, reflect on and possibly redo their work if necessary to meet learning goals. These two steps will be focal points of the lessons outlined in the Capstone Project. "Tailor" tells teachers to include options that allow individual students to have a learning experience that feels personal to them. And finally the "Organize" step involves thinking critically about the sequence of the learning activities to ensure that they are aligned in a way that supports the overall goal of the unit.

Project Description

Curriculum developed using the Understanding by Design framework should start with an essential question or questions to guide the overall direction of instruction (Wiggins & McTighe, 2005). As I worked to develop my project, I focused on two essential questions that I hope to have students contemplate: 1) "How do the choices I make affect my academic success?" and 2) "What changes can I make to be more successful at school?" The self-assessment package covered in this capstone consists of four main implementation sections: one section on general uses for self-assessment, followed by three units that can be used at different points of the year for self-assessment practice.

The focal point of the general section is a method and materials for using daily and weekly self-assessment to grade daily work in math class. Beyond that, the general section includes a method for quick self-assessment check-ins that the teacher can use throughout the year, as well as a draft of a letter to explain self-assessment to parents.

After the general section, there are three individual units that can be used to give students practice at different aspects of self-assessment. The first unit introduces students to the idea of self-assessment and includes a questionnaire to establish a baseline for student motivation and for students' understandings about self-assessment and self-regulated learning strategies. Once students have had the chance to practice with self-assessment and to develop an understanding of its purpose, the curriculum will move on to implementing it in classroom activities. The second unit includes activities that a teacher could use to implement student self-assessment in facilitating small group work. The third unit gives teachers instruction on working with their students to create rubrics that will allow them to apply self-assessment to a variety of academic activities in the classroom.

The first step in introducing self-assessment is to make sure students understand the ideas behind it and the personal gains they can see from it. Because many students will not have worked extensively on self-assessment in the past, this introductory unit will prepare students for the idea that they will be the ones responsible for grading and assessment activities that they may have assumed were the exclusive purview of teachers. It will also give them opportunities to practice and refine their self-assessment skills with feedback from the teacher. It begins with a non-academic activity (learning classmates' names) in order to make the idea of self-assessment more approachable.

The second step, having students use self-assessment to evaluate their group work, is a research-backed method of improving student outcomes related to group work (Ross, 1994). Group activities are increasingly a part of modern math classrooms, making

this section relevant to a wide variety of teachers. Because it is not tied to any specific learning targets, teachers have the flexibility to decide where it would fit best as they plan out their curriculums for the year.

The third step in this capstone will give teachers instruction on developing rubrics with students, managing guided practice and gauging the accuracy of student's self-assessed grades. This step puts self-assessment in an academic context by outlining a cooperative process between students and teacher to develop rubrics related to curriculum learning goals. Teachers will also be given guidelines for providing guided practice time for students to understand how to use rubrics and how to assess themselves accurately. Once students have assessed themselves, an accuracy check should be performed by checking student grades against grades assessed by the teacher to see how closely the two grades match. This section also gives suggestions for a developing rubrics tied to future learning activities in class.

Audience and Setting

The project I am developing will be appropriate for teachers of middle level classrooms ranging from 6th grade to 8th grade. In these school years, students are navigating the transition from the near-constant support of their elementary teachers to the more impersonal environment that exists in high school and beyond. In order to be successful in high school, it is important for students to use their middle school years to learn the skills necessary to independently manage their own learning. Learning how to assess their progress towards learning goals will help them be successful as they age out of the learning supports available in middle school. The ideas contained in this capstone

could be used for elementary or high school classes as well, although modifications would be necessary at the teacher's discretion.

<div align="center">**Timeline**</div>

This self-assessment program is designed to be implemented over the course of one academic year. The program is broken into pieces, giving teachers some leeway about how they choose to implement it and how much of the materials they want to use. For teachers who are just getting used to the idea of a constructivist classroom where students are entrusted with some of the learning responsibility usually held exclusively by teachers, introducing the idea of self-assessment and surveying students about their motivation and self-assessment abilities may be enough to start with. But for teachers who want to take it further than that, this project provides a variety of other ways to incorporate self-assessment throughout their classrooms.

<div align="center">**Summary**</div>

Chapter Three summarized my approach to implementing self-assessment strategies in a 7th grade math classes through a series of curriculum activities. My project includes both general tools that can be used for year-round self-assessment and multi-day units that can be used for extended instruction on self-assessment.

I will use Chapter Four to explore lessons I learned throughout the capstone process, to revisit the literature review, to explore policy implications of my project, and to summarize its possible implications and limitations.

Chapter 4

Conclusion

As I examined the benefits and challenges of integrating self-assessed grading into a 7th grade pre-algebra curriculum, a key lesson I picked up is that self-assessment is not a procedure that happens only at the end of a learning task. For it to be successful, students should understand their learning goals and be able to make a plan for achieving those goals. Then, when they assess themselves they have a clear set of criteria they can use to judge themselves. This allows them to focus on concrete learning steps that they can choose to follow during the learning process, instead of having them wait until the end of a unit to think back on actions they already took and cannot change. Ideally, self-assessment should be incorporated into the learning process and it should be used to adjust future learning plans as well.

Broadly, my research led me to explore the value of improving clarity for students about the grading process. Rubrics, which are commonly seen in classes focused on the humanities, can also be used in mathematics class to make the grading process less of a "mystery box" for students. When grading criteria are unclear, students might turn in a project without really knowing or understanding what their grade might be. If teachers instead use a rubric, students can use that as a guidepost for their work and ensure they meet the criteria that teachers are looking for. In turn, when students can be confident that the work they are doing will have a beneficial result, they often see an increase in motivation and, research shows, increased motivation can lead to improved educational outcomes.

Revisiting the Literature Review

The research conducted by Sadler and Good (2006) comparing self-assessment to other types of assessment gave me an early sign that I was on the right track with my project. Seeing that self-assessment could be as accurate as teacher assessment was revelatory for me and it also gave me a concrete example I could point to in in my parental information sheet, showing reluctant parents the benefits of having students assess their own work. It was another piece of information that helped me feel better about the direction I was choosing for my research.

As I dug deeper into the topic, the work done by John Ross proved to be one of the most impactful parts of my research. Ross and his co-investigators conducted several studies with students at or around the age I was targeting with my question. The methods used by Ross in his 1995 study even gave me a template I could adapt for use in the section of my project dealing with self-assessment on group work norms.

Outside the realm of self-assessment, it was heartening to read the research conducted by McMillan and Turner (2014) looking into students' thoughts about the validity of assessments in general. When I get mired in the day-to-day struggles of teaching, overheard complaints from students can sometimes make it feel like the work I am doing is not resonating with students. It was good to know that students generally understand the utility of assessments and appreciate how assessments can give information about expertise they are gaining. McMillan and Turner's work also discussed the need for students to understand what assessments are asking and the student sentiment that they appreciate assessments that track what they are studying in class. This

project will hopefully help students feel better about the connections between their work and their assessments. When they are examining intended results and making a plan to reach those results, they should be considering the connection to the assessment for the entirety of their work time, rather than simply skimming material and following a teacher's plan until a test comes.

Broadly, the entire experience using databases such as EBSCO and ERIC reminded me of the wealth of resources available outside of Google, Pinterest and Teachers Pay Teachers. Not only that, but it also gave me a chance to take a step back from finding individual daily activities to consider how these activities can fit into my broader philosophy of teaching. Immersing myself in the Understanding by Design process was also a good reminder of the best practices I should be following as I think about lesson plans and assessment activities.

Policy Implications

The research reviewed in this project shows the value in giving students the power to define and assess success on their own terms, but I also realize it may run counter to the emphasis that some education stakeholders place on standardized test results and externalized measures of success. Fortunately, the research summarized in this project shows the possibilities for growth when students learn to assess themselves accurately. Research also shows the need for explaining grading to students and including them in the grading process so they have a clearer idea of teacher expectations and a clearer idea of what the grading process entails.

The research in this paper shows that students could benefit from increases in self-assessment in math class, but it also shows that any effort to do so should be done carefully. Any teacher who wants to implement a self-assessment program in class should do so with the involvement of administrators or supervisors in the building. Research supports the implementation of self-assessment programs, but in this age of data-driven decision making, the benefits of such a program might be harder to convey. Any implementation of this program should also be careful to clarify that there are still right and wrong answers in math – this is not a "give yourself a grade" program by any means – but that different students might have different methods for getting to the correct result. The curriculum outlined in this project is about the process of learning and giving students a way to understand how the work that they put in has a direct correlation to the overall results they see.

To be very clear: This paper does not propose that all assessment in math class should be self-assessment. The text of Chapter 3 and the contents of the project should make it clear that there is still a high degree of teacher involvement in the assessment process. What this paper proposes is that math class has plenty of room for students to make choices about their learning and to assess themselves on the learning choices they make.

Using This Project to Benefit the Profession

This project is a benefit to the profession because it not only encourages greater student input in the learning and assessment process, but it also gives math teachers concrete activities they can undertake to pull self-assessment into their classrooms. As

students become more proficient at assessing their own progress, the skills they develop should be useful to them in math class, in other classes and even outside the school setting.

I plan to use the materials from this project in my own classroom as I work towards my ideal of a constructivist classroom. The district I work in also has a middle school math specialist who manages professional development opportunities for middle school teachers. I plan to share this project with him so that he can spread it around as a resource that other teachers in the district might choose to use.

To expand on the work in this paper, I would like to see math textbooks include an element of self-assessment. Similar to the way we spiral other types of math throughout the curriculum, it would be helpful for students to have an expectation of self-assessment throughout their school years.

Potential Limitations

While I believe in the project as constructed, I also recognize that some of the ideas contained in it may not be readily accepted by parents or administrators.

Parents may be hesitant to accept a different system of grading than the one they were accustomed to during their time as math students, and administrators who hear from those parents may find it easier to ask teachers to stick with traditional grading. My hope is that the parent letter that accompanies the project will help to alleviate parent concerns. Any teacher who implements this program should go into it with the expectation that its use may need to be justified to administrators, parents and even to other math teachers who prefer to teach in more conventional ways.

One limitation I found as I developed the project for this capstone was the reliance on student input to guide some of the self-assessment work. There are some parts of the project that can be standardized from class to class, but the variability of student input could make this challenging for some teachers to implement. For instance, in the lesson plan related to the video project, the final rubric is one that is developed by the teacher based on contributions from students. While this gives students some feeling of ownership over the end product, it also makes it difficult to give teachers a standardized plan for using the rubric. In the end, I chose to accept this uncertainty because I believe student participation will lead to greater buy-in from students.

Student pushback could be an issue as well. There are parts of the project that are designed to give students a smooth transition into self-assessment, but this project still contains elements that students might not have experienced in the past. In particular, students who focus primarily on the end result rather than the process of learning might be hesitant to work in a system that pushes them to better themselves, rather than a general standard they might have reached easily in the past.

Closing Thoughts

Even if a reader does not incorporate all the ideas in this paper, I hope it would encourage teachers to think about the self-assessment opportunities they offer in their classes. These opportunities should extend beyond cursory questions such as "how do you expect to do on this test?" that are asked and then forgotten. Instead, self-assessment should be incorporated early and often into learning units, along with questioning students about their standards for success. Engaging students and bringing their ideas of

accomplishment into the curriculum can lead them to have more of a personal stake in the outcomes. The self-assessment options outlined in this project still need skilled input from a trained educator, but treating students as valuable sources of information should help with their engagement and in the process help them to grow as learners.

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