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Math Engagement in Middle School Students

Elizabeth M. Rieman

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Elizabeth M. Rieman

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The signature of the individual below indicates that the individual has read and approved the project of Elizabeth Rieman in partial fulfillment of the requirements for the degree of Master of Education.

Catherine L. Meyer-Looze   *April 16, 2023*

Catherine L. Meyer-Looze, Project Advisor   Date

Accepted and approved on behalf of the   Accepted and approved on behalf of the

Educational Leadership Program   Educational Leadership Unit

Rick Vandermolen   *Catherine L. Meyer-Looze*

Richard Vandermolen, Graduate Program Director   Catherine L. Meyer-Looze, Unit Head

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          Date   Date

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Libby

Abstract

Student engagement is something with which teachers around the world struggle. There is an enormous amount of literature available with various ideas, tips, tricks, and suggestions for teachers to help engage their students in learning the required content. The techniques chosen, are specifically used to help middle school math teachers engage their students in the required content. From there, it offers a way to implement those strategies in a middle school math class.

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Chapter One: Introduction

Problem Statement

In a perfect world, middle school students would be fully engaged in math every time they interact with it. Whether that be in math class, doing math homework, or even while out shopping. However, this ideal situation tends to be further from reality than one might hope, and parental support or lack-there-of has much to do with this issue (Sağkal & Sönmez, 2021). Another aspect that impacts a student's engagement in math is their level of anxiety surrounding math tasks and math class (Çağırgan & Soytürk, 2020). Ideally, students would not be anxious about math and would receive consistent support from teachers and parents in a variety of formats (Abo-Alhija, 2021). Currently, only seven percent of students studied had only positive experiences in math from kindergarten through college (Çağırgan & Soytürk, 2020). This is a stark contrast from the ideal situation and has negative effects on student engagement.

There are many factors that contribute to students' lack of engagement in math. One set of factors effecting math engagement is a lack of individualized math instruction and classroom environment (Wang et al., 2020). Another contributing factor is math anxiety. Typically, students who enjoy math or math class have less anxiety than those students who do not like math or math class (Çağırgan & Soytürk, 2020). A certain level of anxiety can make it difficult for students to focus on what they are learning, thus making them less engaged. The third factor, and root cause, is self-efficacy (Miller et al., 2020). That is, students, come to class with the mindset that math or math class is bad or boring and that they won't be able to understand the assignment(s).

Rationale

After looking at the data from Middle School at Parkside's fall Northwest Evaluation Association (NWEA) Measures of Academic Progress (MAP) math test results, it became clear that students needed support in math. The percentage of students who met their projected growth in the sixth grade was forty-nine percent; for students in seventh grade, it was fifty-one percent; and for eight grade students it was fifty-six percent (Patterson, 2022). While not every student was tested due to the pandemic, these percentages are a good indicator of how the school, as a whole, is doing. With that, it was determined that the best way to help raise student test scores was to get students more engaged in their learning, specifically in math class.

Surveys seemed to be one way to get students and parents more actively involved in the learning process. The goal of the proposed surveys and their implications is to engage middle school students in their math lessons by the end of the first trimester. The surveys and classroom adjustments will be used by all math teachers (in varying ways depending on survey results) to benefit all students. The adjustments needed will be determined by each individual teacher, although they can ask other teachers for input, and they will use the skills from their toolbox to implement these changes.

Background of the Problem

Student engagement is a broad term that often gets used but rarely gets defined. According to the National Survey of Student Engagement (NSSE), student engagement is a collection of ideas on how students' experiences affect their learning and development (NSSE's Conceptual Framework, 2013). This collection includes how effectively students participate in educational activities and the learning that takes place (Kuh, 2001; 2009, as cited in NSSE's

Conceptual Framework, 2013). While student engagement will look different for every child in every classroom, one way to determine how engaged a student is would be to assess knowledge gained.

As of 2020, only seven percent of students studied had only positive experiences in math from kindergarten through college (Çağırgan & Soytürk, 2020). Students are not currently displaying high levels of engagement in the math classroom, and parental support, or lack-there-of has much to do with this issue (Sağkal & Sönmez, 2021). An additional factor affecting math engagement is a lack of individualized math instruction and classroom environment (Wang et al., 2020). Another aspect that impacts a student's engagement in math is their level of anxiety surrounding math tasks and math class (Çağırgan & Soytürk, 2020). Typically, students who enjoy math or math class have less anxiety than those students who do not like math or math class (Çağırgan & Soytürk, 2020). A certain level of anxiety can make it difficult for students to focus on what they are learning, thus making them less engaged. The third factor, and root cause, is self-efficacy (Miller et al., 2020). That is, students come to class with the mindset that math or math class is bad or boring and that they will not be able to understand the assignment(s). The reason this is the root cause is because studies have shown that students' mindsets, or self-efficacy, have the biggest impact on their engagement. Think of the example of the student that has failed math class every year. Odds are they are not going to come to class excited for math because they have been shown time and time again that they cannot do it, or do not understand it. This continuous reinforcement of their perceived negative thoughts greatly impacts their attitude towards math and math class, thus effecting their engagement.

Statement of Purpose

The purpose of this project is to engage Middle School at Parkside students in the math content they are learning. Surveys will be used to establish parental involvement and classroom environment, as well as determine student self-efficacy and math anxiety. The results from these surveys will be used to inform teachers of ways to better engage their students in their own learning, such as improving classroom environment (Wang et al., 2020), which can help lower anxiety levels, and determining levels of parental involvement, which can impact the workload students are expected to complete at home. One of the surveys, parental involvement, will only be completed once a year while the others will be given more frequently to help show how the various changes have impacted student engagement. Once the data has been collected from the surveys and placed into the database, teachers will use their toolboxes to implement new teaching methods, as well as make adjustments to the physical layout of their classroom.

Objectives

Audience	Middle school math students
Behavior	Will be engaged in their lessons
Condition	By the end of the first trimester
Degree	Through the interventions provided by their math teachers

The goal of the proposed surveys and their implications is to engage middle school students in their math lessons by the end of the first trimester. The surveys and classroom adjustments will be used by all math teachers (in varying ways depending on survey results) to benefit all students. The adjustments needed will be determined by each individual teacher, although they can ask other teachers for input, and they will use the skills from their toolbox to implement these changes.

Definitions

Math anxiety: When a student experiences discomfort from activities or events requiring mathematical performances (Çağırgan & Soytürk, 2020), or a general dislike of doing math.

Math engagement: When students concentrate on lessons and homework, actively participating in their learning (Sağkal & Sönmez, 2021).

Parental support: A parent or guardian encouraging and praising the efforts and achievements of their child (Sağkal & Sönmez, 2021).

Self-efficacy: An individual's belief in his or her capacity to execute behaviors necessary to produce specific performance attainments (Carey & Forsyth, 2009).

Scope of the Project

This project will address student engagement in middle school math at Middle School at Parkside. While some of the results will be able to be applied to most middle school math classes, some will be specific to Parkside. The project will look at various methods to better engage students in their learning but will not detail how those methods were received by the students and staff. Rather it will just outline which methods were chosen due to the potential survey results.

Factors that are beyond the control of the study are the number of parental responses received, teacher buy-in, and student buy-in. While we can hope all parents will respond it is not reasonable to think that will be true. Also, we can give teachers the tools to help improve engagement, but if there is no buy-in, all the tools in the world will not help. And the biggest factor that we cannot control will be the student buy-in. All students, but especially middle

school students, have their own agendas and while their teachers may have the best intentions for them, we ultimately cannot force a student to believe what their teacher is telling them or trying to help them understand. How the students respond to any of the suggested interventions can only be determined by the students in the moment. Because of this, it is vital that each individual teacher knows their students and what will work best for that class.

Chapter Two: Literature Review

Introduction

Getting students engaged in learning math can be a difficult feat. This chapter will focus on reviewing several articles about student engagement and breaking down the pros and cons of each one. The first few articles are about student engagement in general and as the review goes on, the articles become more focused on engaging students at the middle school level in their math curriculum. During the evaluation, conclusion, and summary, keep in mind that engagement in learning is defined as a "multidimensional construct consisting of at least three components: behavioral, cognitive, and emotional engagement" all of which play a vital role in learning math (Wang et al., *More than growth mindset* 2021, p. e958).

Evaluation

Upon looking at the literature, many perspectives were brought to light about student engagement in math. However, the bottom line is that every student is going to be engaged in different ways by different things, but if we, as teachers, can find and utilize a number of different strategies, then maybe we can get through to more kids.

One article indicated that the struggle to get students engaged in math class is not just something that just one school is facing, but something that spans to other countries and grade levels as well (Prescott et al., 2020). In 2020, Australia was seeing a decline in participation for STEM subjects and to do something about this, the Maths Inside Project was formed (Prescott et al., 2020). By creating and implementing an initiative that developed resources to help teachers bring math to life for high school students, the numbers of students taking advanced math and science in high school and in college increased (Prescott et al., 2020).

Similarly, a study by Abo-Alhija (2021) found that many high school students are bored in math class. While this study looked at high school students taking classes online, what was discovered is still relevant to in-person middle school classes. The teachers in this study used various forms of social media to help engage their students in their learning. It was noted that social media sites can share the same formal educational settings learners need to cultivate curriculum-based activities in a more creative way (Abo-Alhija, 2021). By using something most students are attracted to, social media, the educators were able to see higher levels of engagement from their students and thus better academic performance (Abo-Alhija, 2021). It also allowed students to experience a more personalized learning environment which is known to be beneficial to students (Lee et al., 2021).

The study and subsequent article by Miller, Perera, and Maghsoudlou (2020) looked at students' multidimensional profiles of math engagement. The study gives definitions for math self-efficacy as well as math outcome expectations and compares the two. Math self-efficacy is a student's judgments about their capabilities to complete math-related tasks, while math outcome expectations focus more on probable outcomes the student expects if they engage in certain math activities (Miller et al., 2020). While the two are very similar, and they often go hand-in-hand, they effect how students engage with math content differently. Outcome expectations contribute to motivated actions above self-efficacy beliefs whereas the outcomes are only weakly tied to a student's quality of performance (Miller et al., 2020). The more a student expects a positive consequence for completing certain tasks, the more likely that student will be to actively engage in the task (Miller et al., 2020). This means students are more likely to engage in their learning when they know there will be a positive consequence for doing so.

In Çağırgan and Soytürk's (2020) study they had students use two different Likert scales to rate their engagement in math class, as well as their anxiety level. The Student Engagement in Mathematics Scale was adapted by Sacide Güzin Mazman-Akar and her colleagues in 2017 (Güzin Mazman Akar et al., 2017). This specific survey had thirteen statements on it and used a four point-Likert scale for students to rank their level of engagement from "No, not all true" to "Yes, very true" (Çağırgan & Soytürk, 2020). Çağırgan and Soytürk (2020) also looked at the relationship between math engagement and parental involvement. They found that students who have more involved parents often feel more pressure to succeed and thus an increased anxiety level. Likewise, students whose parents show more warmth and love tend to be more confident and thus more successful in math (Tian & Chen, 2020). In the study by Teoh, Mohamed, Mohd, Rasid, and Yusof (2022), they found that just like students need support from teachers, parents also need similar support. Assisting parents with assisting their student is beneficial to all parties involved (Teoh et al., 2022). Teachers often teach more than just the kids in their classrooms and those interactions go a long way in helping students learn and grow.

The paper by Lee, Huh, Lin, Reigeluth and Lee (2021) indicates that a personalized learning model is the best option for student engagement and academic achievement. While personalized learning is the dream, and it has been shown to increase student learning (Lee et al., 2021) it is not realistic to think that a middle school teacher with on average, one hundred-twenty students, will be able to create a personalized learning plan for each of their students that allows them to choose various projects and follow their passions. Personalized learning works best in smaller, more affluent schools/classrooms where the teacher can give more time and focus to each student. However, what teachers everywhere can strive to do is what is suggested by Hsieh, Simpkins, and Eccles which is to move away from the 'one size fits all' interventions towards

more tailored intervention components based on current students' motivational beliefs (Hsieh et al., 2021).

A study conducted at Bradley University implemented the use of "math journals" as a way to help students reflect and process what they were learning (Benson-O'Connor et al., 2019). This simple activity of giving students time to reflect allowed them to make real-life connections which cultivated a more positive outlook towards math (Benson-O'Connor et al., 2019). Students with a positive thought process regarding math are more likely to be engaged and ultimately be more successful in math class than their counterparts who dislike math (Sağkal & Sönmez, 2021).

Another aspect the study by Çağırgan and Soytürk (2020) focused on was student responsibility. Student learning responsibility can be defined as the student managing their own learning process. Learning responsibility is a key component in students' success in school because it is essentially their buy in (Çağırgan & Soytürk, 2020). In other words, if a student doesn't take ownership of what they are learning and the effort required to learn, then their success will be limited, and very little learning will occur.

This leads to an article by Özkal (2018) which discusses the relationship between students' engagement and their teacher's support. The study found that middle school students were more engaged in math class when they had a positive relationship with their math teacher (Özkal, 2018). It also indicated that students tended to have lower anxiety levels in math class when they had a supportive relationship with their teacher (Özkal, 2018). Along the same lines, the study by Mulvey, Mathews, Knox, Joy, and Cerda-Smith (2022) found that students tend to be more engaged in STEM classes when their teacher is more inclusive and less discriminatory.

Just as a teacher's support and inclusion can help motivate a student, so can peer support (Kilday & Ryan, 2019). While it makes sense that children are often influenced by their peers, this is not always a good thing. Peers can fulfill one's psychological need to fit in and be liked (Kilday & Ryan, 2019). Because of this, peers are consequential for engagement in school (Kilday & Ryan, 2019). One way to create positive peer interactions is through small group work. Rowan-Kenyon, Swan, and Creager (2012) state that small group cooperative work fosters a supportive learning environment, thus creating more opportunities for engagement.

The study by Eason, Scalise, Berkowitz, Ramani, and Levine (2022) looks at the relationship between student engagement and fluency and family engagement in math. The researchers investigated the general learning environment that students experienced at home and how it impacts a student's academic motivation (Eason et al., 2022). They found that the more families engaged with math and supported their child's learning, the more engaged and successful the child would be in math (Eason et al., 2022). The conclusions drawn by Eason, Scalise, Berkowitz, Ramani, and Levine (2022) echo those discussed by Sağkal and Sönmez (2021). Sağkal and Sönmez (2021) focused on middle school students and how parental support impacted student engagement. They determined that parental support is directly and positively related to students' engagement in math (Sağkal & Sönmez, 2021).

Summary

Getting students engaged in their learning is challenging. Teachers at all grade levels across the globe struggle with getting students to focus and learn. There are many reasons students might not play an active role in their learning such as a lack of resilience, persistence, and effort (Mendler, 2021) or negative thoughts about their ability in any give subject area. Many

articles and books such as *Motivating Students Who Don't Care: Proven Strategies to Engage All Learners*, have been written with various tips and tricks to actively engage students, and yet there is no one right answer.

Personalized learning is a great way to get students engaged in their learning, but it works best in smaller, more affluent schools/classrooms where the teacher can give more time and focus to each student. Therefore, it is not realistic for a large public school, like Parkside, unless it can be done in a unique way like that suggested by Abo-Alhija (2021) or Hsieh, Simpkins, and Eccles (2021).

One way to lean into personalized learning is to gather information from students that can help teachers better understand where their students are coming from. Çağırgan and Soytürk's (2020) and Mazman-Akar's (2017) works laid the foundation for what this project aims to do. By using scales to have students rate their engagement and anxiety levels, they were able to gather information that can help shape the way teachers teach and the various approaches they use to help make students more comfortable with learning math.

Özkal's (2018) study showed that students have less anxiety and higher levels of engagement in math class when they have a positive relationship with their teacher. Instructional coaches, professional development leaders, and veteran teachers everywhere collectively said I told you so when this study was concluded because this is something that is drilled into new teachers. Build relationships with your students and classroom management will be so much easier, if you have a relationship with the students, they will be more respectful and pay more attention in class, and yet it takes a study with actual data to back up the claims for it to click. If a student's basic needs are not being met, they cannot learn. So, if a student doesn't feel safe in

math class, they are not going to learn or engage in the learning process. Sometimes, we as teachers, forget that students are people, too, and that they need relationships just like we do. And not only relationships with teachers, but with their parents as well. The study by Tian and Chen (2020) found that students that experience more love and warmth at home tend to do better in school. This makes sense because a student that isn't worried about their home life is able to focus more on school and less on other issues. A hostile home environment is not conducive to learning or feeling confident in any area of life and therefore, is not conducive to higher levels of achievement in school (Tian & Chen, 2020).

Math teachers everywhere have encountered a student who walks in the classroom, day one, saying that they hate math or that they are bad at it. In that moment, the student is setting themselves up for failure because mindset makes a difference. Encouraging students to use positive self-talk will help reduce the anxiety surrounding math class as well as boost self-efficacy, thus helping them to improve academically (Sağkal & Sönmez, 2021). On the same idea is the use of a positive reward system to help influence students' outcome expectations. Most teachers have seen students rush to turn in numerous assignments before the end of the semester to improve their grades before report cards go home, or a student that was promised a candy bar if they got their homework done complete the assignment in record time. When students know there will be a positive reward for completing tasks and actively engaging in their learning, they are more likely to do so because the outcome expectations outweigh any negative self-efficacy they might have (Miller et al., 2020).

Çağırgan and Soytürk (2020) also looked at students' learning responsibility and found that students that did not take ownership of their learning often do not do well academically. Middle school teachers everywhere know the full extent to which this is true. In elementary

school parents have a great deal of responsibility for their student's learning because the child is too young to do many things on their own. However, in middle school parents often loosen the reigns and allow the kids to be more in control of their learning. Because of this there tends to be a dip in grades and work ethic in middle school students because they are trying to figure out how to balance school and free time without having their parents there to hold their hand. As middle school teachers, we try to assist in this process by gradually taking away some support students have throughout the year. This is not to say we leave the kids hanging, we just adjust how we help them and guide them to align more with high school and less with elementary school.

Similarly, in middle school, how your peers perceive you becomes much more important. Kilday and Ryan (2019) looked at how peers, and either their support for or against engagement in math class, impacts how students do. If a student's friend claims that doing well in math is for nerds, then there is a strong chance that student will start doing poorly in math, even if they have been successful in the past. On the flip side, if a student really cares about math and is engaged in their learning, peers that see this might try to emulate them and thus become more actively engaged in class, as well. Adolescence, especially middle school, is a time when kids are concerned with social status (North et al., 2018) and following the crowd can often lead to less engaged students and more disruptions. Disruptive behavior is a negative factor when trying to engage students in math (Rowan-Kenyon et al., 2012) as it draws the focus away from the lesson and students lose focus and interest.

With the added pressures of middle school, it is not unreasonable to assume some students face burnout. By the end of middle school, 21% of the students studied had either low motivation or low emotional well-being (Parhiala et al., 2018). With that information in mind, it

makes sense that students are often disengaged in class and end up falling behind. Additionally, we must question how many students who were surveyed answered honestly Most middle school students will do anything they can to save face in front of their peers, even if they are assured no one will find out. Because of that, it is reasonable to assume that the 21% of students with low motivation or emotional well-being is the lower percent of those students who do face burnout, which ultimately makes it harder to get them engaged.

Conclusion

From these studies it is clear to see that middle school students have a great deal going on in their lives pulling them in all different directions. Our students have grown up in the era of immediate gratification and because of this their attention spans and ability to stay engaged in content has dramatically decreased. It makes sense that not every student in every classroom is engaged in their learning all the time, but that doesn't mean teachers should not try. There are numerous strategies and proven methods to get students engaged in their learning and help them be successful. And while math is only one subject, it is important and often, the most unliked. Because of this, math teachers need to be intentional with their engagement strategies and be prepared to teach not only their students but their students' parents as well. Getting middle school students engaged in math class is not an easy task, but it can and will be done.

Chapter Three: Project Description

Introduction

There is a global problem of getting and keeping students engaged in their learning. This project addresses that issue and aims to help teachers actively engage their students in their math curriculum. Below is an outline of a project that can be implemented at any school to help get and keep students engaged in math class.

Project Components

The main aspect of this project is the implementation of various surveys, the Parental Involvement survey (Appendix A), the Math Anxiety and Self-Efficacy survey (Appendix B), and the Classroom Environment survey (Appendix C), to gather information and create data to support teachers in their efforts to engage their students in the math curriculum. The Parental Involvement survey (Appendix A) will be used to gather data on how involved parents or guardians are in their student's schooling, specifically homework. The survey titled Math Anxiety and Self-Efficacy (Appendix B) is a student survey to help determine students' preexisting thought about math and their ability levels. The final survey is entitled Classroom Environment (Appendix C) and will help teachers get a feel for how students perceive their classroom and if anything needs to be adjusted in the room to better help students stay engaged. Once the surveys have been returned, all math teachers will gather to record the data in one form (Appendix D) and determine which steps to take next. After two weeks of implementing the changes to classroom environment and parental involvement, teachers will once again use the two student surveys (Appendices B, C) to see if the changes have made an impact. This process will be repeated until the end of the first trimester with the goal that student engagement will

have increased. Overall, student engagement will be tracked in the same form that the initial data was recorded in (Appendix D).

This project will take place at Middle School at Parkside in Jackson, Michigan. Jackson is a mid-sized town (32,440 people) in south central Michigan. The students come from the city of Jackson as well as from some of the smaller communities around the area. Just over sixty percent of the population is Caucasian, and many students come from low socioeconomic families (all students receive free breakfast and lunch). The participants will be students in grades six through eight, so roughly, nine hundred students, as well as the seven middle school math teachers, and the students' parents. This sampling is purposive because the students were selected based on where they attend school, the parents are selected based on their child, and the teachers were picked because they teach math.

Project Evaluation

The data analysis will be completed using mixed methods. This is because students will be rating themselves on some items based on scales, while other information will be collected using an open-ended model. The data will be collected throughout the first trimester and entered into one shared document (Appendix D) where the teachers involved will be able to see student and parent answers. Having a shared document will help expand the toolbox by sharing strategies amongst teachers. The two teacher leads will be looking for correlations between implemented strategies and increased engagement, or lack of engagement, from students within the data throughout the trimester and will create a summative report after all data has been collected.

To determine how effective the project was, all seven math teachers will get together to review the summative report. They will look at student test scores from the beginning of the trimester to the end, as well as their general feelings on how engagement improved. This will be a time of reflection and conversation to see what went well and what might still need work. But the ultimate way to tell if students are more engaged is to ask them how they feel. This is why there will be an end of the trimester survey for students to fill out about how they think they did during the trimester and if they felt that the changes made by their teacher had an impact on their learning. Getting this information from the kids will be what determines the actual success of the project.

Project Conclusions

This project will take place at Middle School at Parkside in Jackson, Michigan. Most of the population is Caucasian, with a number of other races (including African America, Hispanic and Asian students) making up the other percent. A large number of students come from low socioeconomic families, so all students receive free lunch and breakfast. The participants will be students in grades six through eight, so approximately, nine hundred students, as well as the seven middle school math teachers, and the students' parents.

The main source of data collection will be the surveys given to students and their parents (Appendices A, B, C) with the results being gathered (Appendix D) and analyzed by the teachers. The survey sent out to parents and guardians (Appendix A) will be sent out at the beginning of the year so there is a baseline of information for each student. This survey will be completed at home on the parents' time and will include questions about how much the parents help their child with homework, if they are home when the student gets home from school, or when the child is working on homework. It will also include questions about the importance of school to their

family and when the adult works. Next, the students will complete the Math Anxiety and Self-Efficacy Survey (Appendix B) for the first time during the first week of school in math class. Again, this information will be used to establish a baseline. This survey will include questions about how students perceive their math ability and anxiety level. A scale will be used on which students can rate their feelings. The Classroom Environment Survey (Appendix C) will be completed by students at the end of the second week of school, also in their math class. This will be used to help the teachers make adjustments to their room, as necessary. It will include questions about how the classroom layout impacts their learning, if the student feels comfortable asking the teacher for help, and if there is anything the teacher can do to improve the student's learning and engagement. All the data from each survey will be compiled in one shared database (Appendix D) so all teachers involved have access. This database will be used to help analyze the data to draw conclusions to help teachers make the necessary changes to their teaching and classrooms to better promote engagement in class.

The Math Anxiety survey (Appendix B) will be completed by students every two weeks and the Classroom Environment survey (Appendix C) will be given to students once a month. Both surveys will always be given in their math classrooms, during math class. This process will continue all trimester to show levels of student engagement and whether the process and changes are working.

Implementing this plan will impact student achievement by helping to improve math test scores as well as overall math grades. By raising test scores, Parkside will be on the path to reaching building goals of having more students in the proficient category on the yearly standardized tests. Along that same line, having students more engaged in their learning will help facilitate the Jackson Public School district's vision that all students become lifelong learners.

Getting students to engage and enjoy their learning will help put them on the path to success, ultimately helping the community as the students get older and give back to the community in various ways. Achieving the goal of getting students engaged in their learning, specifically in math, will help not just the students but also the school, school district, and the community of Jackson.

Plans for Implementation

Surveys will be used to establish parental involvement and classroom environment, as well as determine student self-efficacy and math anxiety. The results from these surveys will be used to inform teachers of how their students are feeling to help them better prepare ways to engage their students in their own learning such as improving classroom environment which can help lower anxiety levels (Wang et al., 2020). The parent survey will help determine the various levels of parental involvement, which can impact the workload students are expected to complete at home. Once the data has been collected from the surveys and placed into the database, teachers will use their toolboxes (some of the "tools" are explained below) to implement new teaching methods, as well as make adjustments to the physical layout of their classroom to better serve their specific group of students.

References

Abo-Alhija, W. (2021). Action research to examine the effects of integrating Facebook, Twitter, and YouTube in online math classes on students' engagement. *Technium Social Sciences Journal*, *18*, 146–157.

Benson-O'Connor, C. D., McDaniel, C., & Carr, J. (2019). Bringing math to life: provide students opportunities to connect their lives to math. *Networks: An Online Journal for Teacher Research*, *21*(2). https://doi.org/10.4148/2470-6353.1299

Çağırgan, D., & Soytürk, İ. (2020). The relationship between math anxiety, student engagement in mathematics and responsibilities towards learning among middle school students. *İlköğretim Online*, *20*(1), 456–467. https://doi.org/10.17051/ilkonline.2021.01.040

Carey, M. P., & Forsyth, A. D. (2009). *Teaching Tip Sheet: Self-Efficacy*. American Psychological Association. Retrieved April 1, 2023, from https://www.apa.org/pi/aids/resources/education/self-efficacy

Eason, S. H., Scalise, N. R., Berkowitz, T., Ramani, G. B., & Levine, S. C. (2022). Widening the lens of family math engagement: A conceptual framework and systematic review. *Developmental Review*, *66*. https://doi.org/10.1016/j.dr.2022.101046

Hsieh, T.-yang, Simpkins, S. D., & Eccles, J. S. (2021). Gender by racial/ethnic intersectionality in the patterns of adolescents' math motivation and their math achievement and engagement. *Contemporary Educational Psychology*, *66*. https://doi.org/10.1016/j.cedpsych.2021.101974

Jackson at a Glance. Jackson, MI - Official Website. (2019). Retrieved July 8, 2022, from https://www.cityofjackson.org/

Kilday, J. E., & Ryan, A. M. (2019). Personal and collective perceptions of social support: Implications for classroom engagement in early adolescence. *Contemporary Educational Psychology*, *58*, 163–174. https://doi.org/10.1016/j.cedpsych.2019.03.006

Lee, D., Huh, Y., Lin, C.-Y., Reigeluth, C. M., & Lee, E. (2021). Differences in personalized learning practice and technology use in high- and low-performing learner-centered schools in the United States. *Educational Technology Research and Development*, *69*(2), 1221–1245. https://doi.org/10.1007/s11423-021-09937-y

Mazman Akar, S.G., Birgin, O., Göksu, B., Uzun, K., Gümüş, B., & Yıldırım, E. S. (2017). Matematik Dersine Bağlılık ölçeği'nin Türkçeye Uyarlama çalışması. *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, 28–28. https://toad.halileksi.net/wp-content/uploads/2022/07/matematik-dersine-baglilik-olcegi-toad_0.pdf

Mendler, A. N. (2021). *Motivating students who dont care: Proven strategies to engage all learners* (Second Edition). Solution Tree.

Miller, C. J., Perera, H. N., & Maghsoudlou, A. (2020). Students' multidimensional profiles of math engagement: Predictors and outcomes from a self-system motivational perspective. *British Journal of Educational Psychology*, *91*(1), 261–285. https://doi.org/10.1111/bjep.12358

Mulvey, K. L., J. Mathews, C., Knox, J., Joy, A., & Cerda-Smith, J. (2022). The role of inclusion, discrimination, and belonging for adolescent science, technology, engineering and math engagement in and out of school. *Journal of Research in Science Teaching*, *59*(8), 1447–1464. https://doi.org/10.1002/tea.21762

North, E. A., Ryan, A. M., Cortina, K., & Brass, N. R. (2018). Social status and classroom behavior in math and science during early adolescence. *Journal of Youth and Adolescence*, *48*(3), 597–608. https://doi.org/10.1007/s10964-018-0949-8

NSSE's Conceptual Framework. Evidence-Based Improvement in Higher Education. (2013). Retrieved July 8, 2022, from https://nsse.indiana.edu/nsse/about-nsse/conceptual-framework/index.html

Özkal, N. (2018). Relationship between students' math engagement and math teachers' motivational support. *Turkish Journal of Education*, *7*(2), 85–97. https://doi.org/10.19128/turje.339944

Patterson, J. (2022, February 4). Annual Education Report (AER) Cover Letter. Middle School at Parkside Homepage. Retrieved July 7, 2022, from https://www.jpsk12.org/Domain/16

Parhiala, P., Torppa, M., Vasalampi, K., Eklund, K., Poikkeus, A.-M., & Aro, T. (2018). Profiles of school motivation and emotional well-being among adolescents: Associations with math and reading performance. *Learning and Individual Differences*, *61*, 196–204. https://doi.org/10.1016/j.lindif.2017.12.003

Prescott, A., Coupland, M., Angelini, M., & Schuck, S. (2020). Making School Maths engaging. *SpringerBriefs in Education*, 1–94. https://doi.org/10.1007/978-981-15-9151-8

Rowan-Kenyon, H. T., Swan, A. K., & Creager, M. F. (2012). Social cognitive factors, support, and engagement: Early adolescents' math interests as precursors to choice of career. *The Career Development Quarterly*, *60*(1), 2–15. https://doi.org/10.1002/j.2161-0045.2012.00001.x

Sağkal, A. S., & Sönmez, M. T. (2021). The effects of perceived parental math support on middle school students' math engagement: The serial multiple mediation of math self-efficacy and math enjoyment. *European Journal of Psychology of Education, 37*. https://doi.org/10.1007/s10212-020-00518-w

Teoh, S. H., Mohamed, S. R., Mohd, A. H., Rasid, N. S., & Yusof, M. M. (2022). Creating engagement opportunity for math learning. *International Journal of Technology*, *13*(5), 1013. https://doi.org/10.14716/ijtech.v13i5.5858

Tian, Q., & Chen, B. B. (2020). The associations among parental warmth and hostility and student engagement in math and the mediating role of effortful control among Chinese children. *PsyCh Journal*, *9*(3), 339–349. https://doi.org/10.1002/pchj.337

U.S. Census Bureau quickfacts: Jackson City, Michigan. (n.d.). Retrieved April 2, 2023, from https://www.census.gov/quickfacts/fact/table/jacksoncitymichigan/PST045221

Wang, M.-T., Hofkens, T., & Ye, F. (2020). Classroom quality and adolescent student engagement and performance in mathematics: A multi-method and multi-informant approach. *Journal of Youth and Adolescence*, *49*(10), 1987–2002. https://doi.org/10.1007/s10964-020-01195-0

Wang, M. T., Zepeda, C. D., Qin, X., Del Toro, J., & Binning, K. R. (2021). More than growth

    mindset: Individual and interactive links among socioeconomically disadvantaged

    adolescents' ability mindsets, metacognitive skills, and math engagement. *Child*

    Development, *92*(5). https://doi.org/10.1111/cdev.13560

Appendix A

Parental Involvement Survey

Please complete this form and return it to Parkside by _____. Thank you!

Student(s) Name(s) _____

Student(s) Grade(s) _____

Your Name _____

Relation to the student(s) _____

When do you work? _____

Do you help your student(s) with their homework? _____

Why or why not? _____

_____

Is school a priority in your home? _____

Why or why not? _____

_____

Additional comments _____

_____

Appendix B

Math Anxiety and Self-Efficacy Survey for Students

Appendix C

Classroom Environment Survey for Students

Classroom Environment

Please fill out this form completely and honestly. Your responses are anonymous and will only be used to help your teacher teach better.

👁 **libby.rieman@gmail.com** (not shared) Switch account ☁ Draft saved

* Required

Math Teacher *

Miss Rieman ▾

How does your teacher's classroom impact your learning? *

Your answer

What could they improve (in their classroom) on to increase your learning? *

Your answer

How comfortable are you asking your teacher for help? *

	1	2	3	4	5	
Not comfortable at all	○	○	○	○	○	Super comfortable! I do it all the time.

What can your teacher do, while teaching, to help you learn better? *

Your answer

Additional comments

Your answer

Submit   Clear form

https://docs.google.com/forms/d/e/1FAIpQLSdM0R8UODTYztlaiPvXAFYPsHlcnzIqWDUfJIR8KY_tEnOtww/viewform?usp=sf_link

Appendix D

Response Forms

Classroom Environment Responses

Math Anxiety and Self-Efficacy Responses

Parental Involvement Responses

All these response forms are in one Google Doc that can be shared with all math teachers.

https://docs.google.com/spreadsheets/d/1zZUH86tFvbpDXA1BUOPFk8UNnJtNJ3QEvopcdRBY0xs/edit?usp=sharing