

# **How to engage the “disengaged”?**

TE 855  
Brandon Cook  
December 15, 2010

## **Introduction**

A sword smith's job requires their complete attention. In order to obtain the final product, a sword, the smith must follow a series of steps that follow sequentially. The smith obtains a long block of metal, usually of an iron composite and begins by chipping off excessive pieces of metal. Then he proceeds to treat it in the intense heat of a furnace, removes it and presses the metal against an anvil and hammers the metal to flatten it. Then the smith treats it in water and then returns the metal to the furnace to continue to remove the impurities of the metal. This is repeated multiple times in order to develop the shape of the sword and to create the steel alloy blade that is much stronger than the original iron composite.

While there are many more fine details involved in the creation of a good sword, I believe this is a good analogy to how engagement can look like in a math class. The sword smith needs to be continuously engaged with the process of making the sword and follow each sequential step carefully. If he loses focus by being careless or forgets a significant step, he risks producing an inadequate sword for combat and puts the user in potential harm. If I were to equate the engagement of the making of a sword to the engagement involved in the math class, many of my students would be making swords that are sorely inadequate and unfit for battle since they periodically lose focus on the task at hand. In fact, many would not even have more than a block of metal that could barely resemble anything fit for battle due to the lack of effort put into the task. So is the crisis that many teachers face when students are seemingly unable to focus on any mathematical content that could actually produce some sort of mathematical reasoning.

So this brings up the very issue of how we do we engage the "disengaged" in the classroom. Our purpose as math teachers is to produce students that can reason mathematically

and problem solve by themselves. However, too many students come to class completely unequipped for the tasks presented to them or they simply refuse to do anything at all. I believe there to be many reasons as to why this is since so many students are different but I want to focus on two hypotheses as to why this is. The first is this:

*Students need to be part of a class every year where they will be expected to engage in the math involved. The mathematics courses should be developmentally appropriate according to the abilities and skills the students have developed over time. Students also need to have a healthy respect for themselves, their colleagues and the instructors providing the opportunities to become engaged in the curriculum. All of this is intended to help students pursue goals in the future outside of the math classroom.*

Being that this hypothesis can be best tested over the school-life of a child, I felt it best to gather information of the history of my students prior to when they entered my class. However, this doesn't completely answer the question of how to currently engage my students who are not engaging. So I found it necessary to produce another hypothesis on how to engage a disengaged population of students.

*Since there is only so much time to fill in the gaps for many of these students in their understanding, most of what can be done to engage these students can be leveled to their confidence in themselves mathematically and the respect they have for the instructor and instruction. A lot of what helps students is at the relational and emotional level and so those very links need to be developed by the instructors and students. Also, time spent individually with students help with engagement when the opportunity is provided.*

Both of these hypotheses are not mutually exclusive to each other since the past experiences of a student play a huge role in a current student's level of confidence involving math. The first hypothesis better addresses the issue of how students got into their current situation and the second is more about what can we currently do since we can't exactly fix their past. I will be exploring both of these ideas with my current group of students. Since so many students are different, much of what I research may be more subjective to a certain group of students. Therefore, my conclusions will probably not be all encompassing conclusions that can provide answers to all teachers. Ultimately it is my goal to answer some of the reasons why students, that disengage, got to be where they are and also provide some sound ways to engage these very students effectively.

## **Review of Literature**

There is a lot of literature out there intended to help us math teachers teach better. Some of the resources are good and some of these ideas I quickly send to the trash can. The one thing I know to be true of student engagement is that it cannot be summed up with a few basic reasons, nor can it be solved with a few simple steps. All of the literature that I will be discussing translates in some significant way to the very students that I currently work with. As a result, much of what I am receiving will probably be anecdotal and may result in conclusions that best pertain to the culture I teach in.

In this review, I will be discussing how I used the literature that I have investigated in my own classroom. Some of what I read will build off of each other as they have similar attributes but all play a significant role in this research.

To put into context on how to engage students, I wanted to understand my students' experiences prior to coming into my class. In order to do so, I wanted to put together a survey on where students were to, hopefully, give me honest responses about their experiences from home, previous math courses and about school in general. One of the articles that helped me put together the very survey questions that I asked was an article by Paula Schornick, "Looking at High School Mathematics Education From the Inside Out," published in 2010 in the *NASSP Bulletin 94(1)*. In this article, research was done to investigate the academic environments students worked in as well as their social environment that impacts their day to day lives. My goal was to recreate the research that was done and compare my results to that which was published in this bulletin.

Originally, Paula's investigation was "based on the assumption that educators hold the responsibility of educating students at a level that ensures that all students will be college and work ready upon graduation from high school." (2010, p. 31) Her goal was to explore what elements of a student's learning environment in school could ensure this. She investigated two major themes: the academic environment (which included subthemes of course sequences, rigor, technology and relevance) and the social environment (which included subthemes of teachers, students and parents). Paula not only shared comprehensive results from her research but she even goes as far as to state the implications of the themes and subthemes she describes. For example, after researching students' experiences with a wide variety of math teachers, she noticed that students most students not only "spoke about their high school teachers continually" (2010, p. 32) but that most of the discussions were about "the teachers' level of care toward the students". (2010, p. 32) Paula is very forward about the implications she interprets from the

research and what are the needs of students, not just in the math class, but at home and with school leadership.

My survey consisted many of the same themes as is investigated by Paula. In the survey, I asked all of my students in my class about their experiences in school and at home to get a good idea of their experiences relating to their academic and social environment. Paula interviewed recent high school graduates about these very things. While there are pros and cons to both methods of investigation, I did find her information powerful in that these very students that were interviewed had the opportunity to experience education away from high school and may offer a more reflective view. I did no such thing as I surveyed my current students. Paula's efforts in interviewing may also offer a better picture than my survey as students may be more likely to take the interview serious. This could result in a major difference in our results but this may also offer a comparison with my results.

Part of my goal was to develop comprehensive data to investigate my students' experiences and how this pertains to their current level of engagement. Another thing I intended to do was to compare my observations with work done by other people investigating on how to engage students. Another author that gave me a lot to consider when making my survey and results to compare was Daniel Chazan in "Beyond Formulas in Mathematics and Teaching: Dynamics of the High School Algebra Classroom" published in 2000 by New York: Teachers College. In chapter two of this book, Chazan focuses on how to engage students and reasons why students lack the motivation to succeed.

Part of the investigation involved a graduate student from Michigan State working alongside a group of students that were paid for their involvement. Much of what was investigated, issues relating to homework and social groups, was incorporated into my research

since I wanted to investigate the reasons why students disengage. However I did not look into have a third party do the investigation in the same way Chazan was able to. The time that I could invest in interviewing students was also limited. Either way, I worked to compare my results of my investigation with that of Chazan's to see any correlation or similar observations.

Another aspect that I gathered from Chazan was the use of my instruction and how that can help with student motivation. He does not go into great detail in chapter two about what takes place but I still incorporated a variety of lesson strategies recommended to see the interactions that are produced between the students and the lessons. Throughout the most recent unit that I taught, I attempted many task-centered lessons and other real-world examples. I was currently trying to implement these sorts of lessons anyways but it served me to do the research with these ideas. Chazan and others offered a lot that helped me investigate ways to engage my students.

Some of what I read helped me consider my interactions and how that produces positive student engagement. One article that challenged the ways I go about teaching in a class was an article by Llana Horn, "Why Do Students Drop Advanced Mathematics?" published in 2004 in *Educational Leadership*. Another part of my research was to see if the methods of teaching can produce more effective means of engagement that will allow students to retain knowledge that makes sense to them. This article gave me a lot to think about in regards to my own attitude towards my students as well as concerns that would indicate a change in the culture of the school.

The purpose of this article was to show that high expectations and teacher collaboration can encourage students to persist through a challenging curriculum. One comment that struck me was "expectations do not simply reside in the math teachers' heads and hearts; they come to

life in the experiences students have in mathematics classrooms – and in their cumulative math-related experiences in school.” (2004, p. 62) The author follows the path that two students make in their math experiences throughout high school. I think the results of her research are important to my hypothesis relating to how the many years of math experience is interrelated to help produce confidence in a student that would increase engagement.

In this way, Llana points out “four factors – three of which point beyond classroom practice to aspects of the way each school’s math department” (2004, p. 63) should be organized that can support a student’s success:

1. *High expectations built into the curriculum* – the lack of remedial classes to fall back on can help foster the idea that students should expect more from themselves.
2. *Scheduling that facilitates a second chance* – the author points out that block scheduling meant that classes met for double periods every day. With the current trend towards trimesters, this might offer better second chances within the same school year.
3. *Teacher Collaboration* – Having teachers on the same page can only help reduce the jolting variations as students moved from teacher to teacher.
4. *Awareness of status issues* – Much of our instructor may negatively impact the insecurities of students that may not be as strong.

After reading this list, I recognize that there are some things that I can immediately do that relates to my expectations in my class to awareness of social issues. Some other things related to departmental communication and scheduling are more systematic that I can only help with in the long run. I will not be able to identify the effects these issues have on my students in the time frame I put together in this project.



One of the other ways that I believe can have an impact on whether students will engage in a math class is related to the social and emotional aspects of a classroom culture that can impact students. I believe that respect for each other and the instructor play a pivotal role to the decision that a student makes on whether to engage or not. An article that outlines this very thing is written by Jennifer Jones, Karrie Jones, and Dr. Paul Vermette in “Using Social and Emotional Learning to Foster Academic Achievement in Secondary Mathematics,” published in 2009 in *American Secondary Education* 37(3). In this, they make the argument that “teaching social-emotional skills to secondary students has been linked to higher student achievement, more positive student motivation and more socially acceptable classroom behaviors.” (2009, p. 4) I utilized the very things mentioned in this article to enhance my current class structure and instruction. This is to help me in the long run as a teacher as the effects of this may be hard to notice for the purposed of this research.

In considering the social-emotional impact of a student’s experience in the math classroom, I also included questions related to the environment of previous math courses and other courses in general. My hope is to witness confidence levels of students related to previous classes that had such elements. This is because “decades of studies examining into the effect of classroom climate have indicated that a students’ academic achievement is strongly correlated with their feeling of connectedness in their classroom community”. (2009, p. 6)

All of these ideas from these articles are currently being explored already in my classroom and other classrooms. While much focus is put into the classroom culture, a lot is dedicated to the curriculum we desire to help influence the engagement of students. For that, I want to turn to a video of Dan Meyer on “Math Class Needs a Makeover” in 2010 on Ted Talk. In this video, Dan describes the very dilemma that teachers faces within the mathematics

classroom. That is “I sell a product to a market that doesn’t want it but is forced by law to buy it.” (2010)

The problem that Dan sees and that many other teachers see is that students lack initiative, lack perseverance, lack retention, have an aversion to word problems and are eager for a formula. Often students feel that much of math should be convenient to them and that there is a formula that students could just plug numbers into to get an answer. In other words, our math curriculum can reinforce the disengagement in many levels.

The idea that Dan is attempting to get across is called “patient problem solving”. A lot of what needs to take place is classroom discussions where the discussion “doesn’t serve the math being discussed” but rather that “the math serves the conversation.” (2010) Dan quotes Einstein by stating “The *formulation of a problem* is often more essential than its solution, which may be merely a matter of mathematical or experimental skill.” This very concept of patient problem solving and formulating ways of reasoning is emphasized in so many articles on math curriculum reformation. By doing so, teachers are more likely to get students that would most likely disengage in a classroom to think about the advantages of math for the purpose of the conversation.

Like I said before, patient problem solving is something that we are currently implementing more into our classrooms. Many of the lessons in the past months have been geared into this direction. I will be discussing one such lesson and look at the formative assessments from my students that I kept track of. It is interesting to note that it took Dan Meyer a whole semester before students were able to actually participate in the very design of his classrooms.

The literature that I used to guide much of my research is not limited to this. Before I even took this course I have been working on how to engage these very students and have been part of multiple discussions related to this issue. Many of these ideas are far-fetched to the current classes I have (either due to the class sizes I have or the lack of technology I have access to) but most of what I read helped me produce a positive trajectory of where I want my instruction to be in the future. Right now, I hope to reveal the most recent impact these ideas have had in my classroom.

### **Modes of Inquiry**

Throughout the month of November 2010, I gathered data through a variety of means to investigate my students' past experiences with math and their beliefs about learning mathematics. I also tracked three students from each of my classes to see how the very lessons I present impact their engagement. So in this portion of this research, I will discuss the methods I went about using to investigate the very group of students I work with on a daily basis.

One of the key themes that impact student engagement is strongly correlated to previous experience in math. To better understand the student environment, I sought the help of the middle school teachers of Pattengill Middle School (a feeder school to Lansing Eastern High School) and tried to get a better understanding of the environment these students come from and what their expectations were throughout these three pivotal years. Fortunately for me, we actually had a vertical alignment department meeting between these middle school teachers and my colleagues at Eastern high School. The purpose of this meeting was to investigate the significant gaps in our students and the causes for those gaps. Interestingly enough, much of what was talked about was used in this research as it gave me a better understanding of the educational environment my students are coming from.

In addition to the discussion that took place at the vertical alignment meeting, a survey was also given to students as a way of gathering information about their impressions of their own mathematical abilities and their experiences in school. The statements that they were to respond to are below:

1. Math does make sense and can be made sense of.
2. I believe that the math I have learned in school will be used by me in the future.
3. I feel uncomfortable whenever I am presented with a situation that requires me to use math.
4. I live in a home where math is used by those I live with and in their job.
5. I consider my parents/guardians to be good at math.
6. My parents/guardians have helped me be successful in math.
7. My parents/guardians care about my success in math.
8. My parents/guardians care about my success in school.
9. Before this year, I was used to having success in math.
10. My math teachers, prior to this year, have been helpful to me.
11. Math teachers, before attending high school, have helped me understand the math concepts taught.
12. I was challenged by teachers to succeed in my math classes before high school.
13. I feel that my math teachers in high school care about my success in their classes.
14. I have always enjoyed learning math.
15. I feel that I am currently learning a lot in my math classes.
16. Math classes should only be centered on the things that I am interested in.
17. I was challenged by teachers to succeed in all of my classes before high school.
18. I felt that a lot was asked of me in my math courses before high school.
19. I did homework on a regular basis for my math classes before high school.
20. I currently try to do all of my homework.
21. I currently try to do my homework outside of school and not during a class.
22. I try to get help outside of class when I do not understand something in my math classes.
23. My math teachers have encouraged me to get help if I do not understand something in class.
24. All the math courses I took prior to high school have helped prepare me for the high school math courses I am currently taking.
25. I believe if I put more effort into my math work, I could be more successful.
26. There are too many distractions in my math class that prevent me from succeeding.
27. There are too many distractions in all of my classes, in general, that prevent me from succeeding academically.
28. The learning environment in this school allows me to learn and to succeed to the best of my abilities.
29. I care about whether or not I graduate from high school.
30. I want to graduate from high school.
31. I want to go to college and pursue a degree.

Much of what is asked of my students is based on their opinions as I try to ascertain their current attitudes towards math. I also took a chance on asking questions about the support they have received at home and in school. Much is also asked to see what their projections of themselves would be after they have left high school. All students are to respond to these questions by filling in a number according to how they feel from 1 being that they “strongly disagree” with the statement to 5 where they “strongly agree” with the statement. The number 3

was intended for students who felt neutral about an issue, which might have been a drawback for this ethnographic survey.

This survey was also used to explore the different sub-groups according to their responses. For example, I explored how the students that “strongly disagree” and just “disagree” answered the other statements in the survey. I also used this survey and compared the responses of many of the students with the experiences I have had with them all year. I will discuss more of what stood out to me as a surprise.

I also performed student interviews with students that I came across and found time to interview. This interview was not directed to any specific group of students as I attempted to get a wider breadth of student ideas. The interview questions are stated below:

- 1. Do you think you are good at math?**
- 2. What did you like about the teaching style of your previous math teachers? What did they do that was helpful to you?**
- 3. Have you often sought help when you did not understand something from the homework?**
- 4. Do you think that teachers care about your success in general? How do you know?**
- 5. If you could change anything you have done in previous math classes, what would it be?**
- 6. If you could change anything in my class, what would it be?**
- 7. What do you remember of today’s lesson?**

I improvised my questions as I have felt needed in order to probe for more information. The hope is that students may take the interview more seriously and I would be able to attain more honest answers. As was hypothesized by Daniel Chazan, this might not have been the best

way to acquire information from my students. While this might be true, I didn't exactly have a better alternative to seek more honest information from my students.

The final method of inquiry that I incorporated into this research was the tracking of three separate students from each of my classes as a form of a case study. The students that I chose are students that I have found to have a difficult time focusing in my classroom on a day-to-day basis. So I could have more comprehensive information to interpret, I chose students that have a better attendance record in order to find consistency with these students.

At the start of the class for each day, I have my students work on a "warm-up" that works more as a formative assessment to see what students retained from the previous day and to hopefully help prepare them for the upcoming lesson. This is something I already incorporate into my classes as I have used the feedback provided by these students to help me in my instruction. Most of these assessments contain a few short questions that they are to answer within five minutes. I look to see the work that students perform in order to answer the questions and what their thinking was. There are even reflective pieces in these assessments.

So these students (fifteen in all) will be tracked by me as I evaluate what they write on these assessments. I will be able to get a decently good impression as to whether these students' level of engagement. In addition, I will be tracking their progress throughout the most recent unit from my four geometry classes and my only Algebra 1 class. It is my intention to see if student engagement had improved over this most recent unit. I also hope to get an idea as to whether my lessons have produced more engagement by how they are planned. In fact, we will be looking at one of these lessons (see page 21) that was intended to foster better involvement from my classes.

Many of the modes of inquiry that I have incorporated into this research may not be the best ways of measuring engagement but I have decided to stick with it due to my situation. I had hoped to have my class taped but the cameras that were intended to be used for this purpose were stolen during a fire drill and so I chose not to pursue that avenue.

Many other issues stood out to me as I put together this project. One issue that may be of a concern is the fact that I am only evaluating my students during a single month over a single unit. Many teachers would agree that student engagement can fluctuate according to the materials and so I have to make sure I account for that possibility. Other issues that became a concern was whether or not students would be honest as they filled out the survey and the student attendance that can suddenly change for no apparent reason. So while I do not argue the idea that my methods are perfectly sound, I will say they are sufficient to the task at hand.

## **Results**

### ***From the Vertical Alignment Math Department Meeting on November 9, 2010***

On this day, math teachers from Lansing Eastern High School and Pattengill Middle School met to discuss the apparent gaps in what many of our students are receiving as they enter high school. There were a few things that stood out to me as significant:

- 1- Approximately thirty percent of all middle school students from Pattengill enter high school *never* passing a single mathematics course over the last four years.

This is complicated for a couple of reasons. First of all, the middle school promotes according to age and is allowed to fail one class per semester. This policy is often criticized for taking the self-esteem issues of students too strongly but upon further investigation, it is also a safety issue. As one of my colleagues said, "I wouldn't want sixteen year old guys in the same class as my twelve year old daughter in this same environment."

The fact that students are allowed to fail one class per semester is significant. This often means that students will deliberately choose to skip their math classes knowing that they can get by never taking it. The students know very well what they are doing and the middle school teachers are very sympathetic to those of us in high school receiving these students that are so clearly behind before they ever step foot in high school. As a result, we have a huge population of students that have spent three years completely disengaging from their math courses and are now very adept at disengaging when they enter high school where they cannot afford to do so.

- 2- We also concluded that math courses from 6th to 8th grade have significant and unnecessary overlap which results in less time spent on specific subjects. There was also a significant and unnecessary overlap between middle school and high school.

One of the things that we tried to emphasize in this meeting is the need for more in-depth studies of materials. Instead, we found that many students were being bombarded with too much information at times where it wasn't necessary. While I feel that teachers in high school currently do that anyways, we felt that more time could be spent on a single objective in the lower grades for more in-depth understanding that could prevent future disengagement from students not understanding the materials.

### ***From the Student Survey***

One hundred twenty students took this survey on November 5. Students in this survey responded to each statement by circling a number between one to five with one as "strongly disagree" and five as "strongly agree". Chart 1 on the next page contains the results of the initial survey and student responses. Chart 2 lists the percentage of students that disagreed, agreed or were neutral. This was to allow better synapses of the overall student impressions.



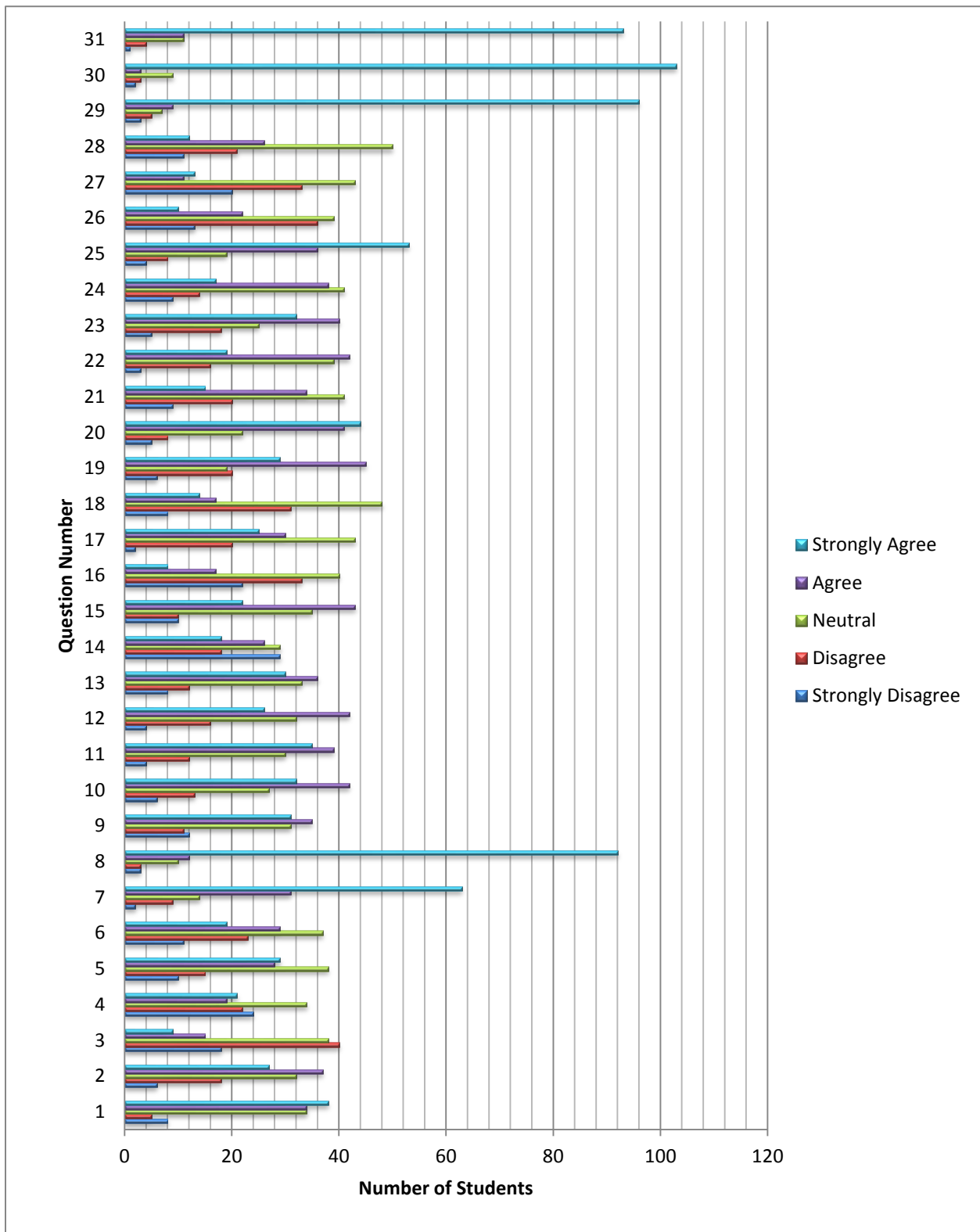


Chart 1: This chart shows the number of students that chose one of the five possible ways to respond to each statement in the survey (to see the statements, please see page 7). The hope of this was to see any student choice that stands out significantly and to also see a discrepancy between students that disagree and agree.

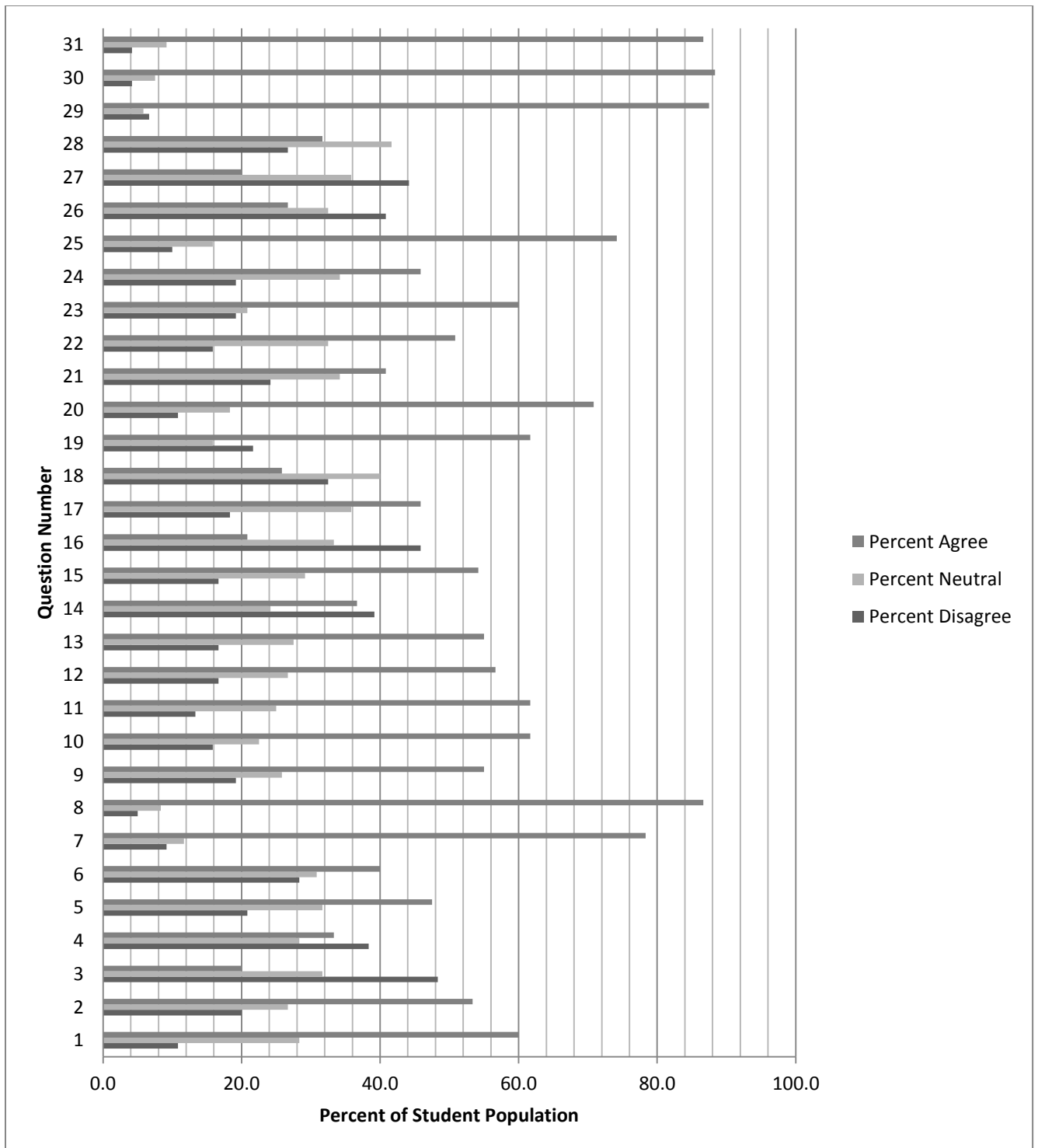


Chart 2: In this chart, I decided to combine both students that “strongly disagree” and “agree” with each statement and “strongly agree” and “agree” with each statement. This chart is intended to help witness a better discrepancy between the opposite impressions that students could be implying.

Based on the initial analysis of this data, there were a few statistics that presented a strong view of what my students firmly believed. The percentage of students who felt that their parents cared about their success in math and in school was about 78.3% and 86.7% respectively. While these numbers seem high from my experiences with parents, it caused me to appreciate the view that some of my students have for their parents.

Another statistic that jumped out at me was that 70.8% of all my students claim that they try to do all of their homework. This seemed odd to me since 45% of all my students complete any homework on a regular basis in my classes. However, 74.2% of all my students do agree that they could be more successful in math if they were to try harder. Knowing that many of students agree that they could succeed if they were to try harder begs the question “Why don’t you try harder?”

At the very end of the survey, I asked questions about what my students want they want to be able to get out of high school. These are the very last three statements in the survey and approximately 87% of all my students say they want to graduate and go to college. This also begs the issue about what the personal projection of my students really is since such data is not what I see of my current students. It might also suggest appeasement by the students.

The one statistic that really did stand out to me was that 25.5% of all the statements answered by all my students stated they were neutral to each statement. This became noticeable as I was sorting through the surveys and found 10 students who answered neutral to each statement. While many students legitimately answer neutral to statements when they should, this still reinforces the idea that student engagement seems to be heavily correlated to the amount of apathy that I find in many of my students.

As this data presents a picture of the entire student body, I wanted to focus on the students that are more prone to disengage. In doing so, I choose a few statements where there seems to be a strong differences in the student population view. For example, I looked at the first statement “Math does make sense and can be made sense of” and separate the students according to how they responded. I removed the students that responded with neutral and analyzed how the students that responded with a disagreement to the statement above responded to the other questions. I did the same thing for the students that responded with an agreement to the statement. After I separated each group according to their response to the other thirty questions, I calculated the average choice for each statement to generalize the statement made by each group to each statement. This was intended to see if there were major differences in opinion between the two groups.

In this case, the students that responded with a disagreement towards the first statement has a higher correlation to not having role models using math at home or on the job as the average response was approximately 2.5 compare to 3.2 for the other group. Both groups have a strong differing opinion to statement 13 about whether teachers care about their success. In this case, the average response by those in the “disagreement group” was 2.5 while the “agreement group” had an average response of 3.82. To statement 24, the average response from the “disagreement group” about how they felt they were prepared for high school is a 2.5 while it is a 3.7 for the group that felt that math does make sense. Interestingly enough, more students in the “disagreement group” felt that a lot was asked of them in their math courses as they responded with a 3.3 than in the “agreement group” that responded with a 2.93. This may reveal the trend that many of our students are being held behind as we try to compensate for the major gaps in our students. Also of interest is the fact that the “disagreement group” responded with a

2.5 to the statement about the school being a good learning environment compare to the “agreement group” that responded with a 3.2.

Stark differences were noticed between the students who feel that math does make sense and those that don't. One of the most common trends that show a disparity between the two groups is related to the relationship between the student and the teacher. For example, in statement number ten about if teachers have been helpful to students. The students that did not feel math made sense answered with an average of 2.6 while the other group responded with a 4 indicating they felt teacher have been helpful to the latter group.

I found that there can be much that can be explored by this form of research looking at the surveys. The major problem I encountered to doing this item analysis of the students according to how they respond to each statement is that it would take me up to five hours just to analyze my students according to one question alone! As a result, I tried to focus on just a few statements.

### ***From the Student Interviews***

Twelve students were interviewed. These students were chosen more when it was convenient than at random like I had hoped to do. For this portion of the results, I will give the general impression of how these students responded.

#### **1. Do you think you are good at math?**

Seven of my students just answered with a no with the remainder stating that they can be at times with some confusion. No student said that they simply felt they were good at math.

#### **2. What did you like about the teaching style of your previous math teachers? What did they do that was helpful to you?**

Most students explained how they appreciated the efforts of many of their teacher in explaining concepts. However, 5 of the 8 that responded with that statement felt it did not

help much. Three of them said they liked the personal one-on-one attention and 4 more explained that they sought help from family members when the teachers did not help enough.

**3. Have you often sought help when you did not understand something from the homework?**

Four of the students state that they sought help from teachers. Some of these same students and 4 more state that they seek help from classmates and seven out of the twelve state that they seek help from family members and from other people outside of class.

**4. Do you think that teachers care about your success in general? How do you know?**

All twelve students stated that they felt their teachers care. Five of the students did not provide much further information than that, while the other seven stated specific situations where a teacher showed their concern for them.

**5. If you could change anything you have done in previous math classes, what would it be?**

Nine of the twelve students stated that they would do the homework when assigned. Three of them added that they also wanted to stop forgetting their homework. Five of the twelve also stated that they wished they would pay more attention.

**6. If you could change anything in my class, what would it be?**

Interestingly enough, four of these students stated that they wish they had a better seating arrangement. Four of these students stated that they wanted something other than homework. Only one stated that homework should only be done in class. The other four stated things in relation to allowing more coloring, activities and more excitement in general.

**7. What do you remember of today's lesson?**

Only three of these students could state exactly what the lesson was about from the day I interviewed them. Eight of them had a decent idea as to what was discussed and one could not remember much as it asked her of what she remembered from the previous day (I interviewed her in the morning).

The only problem with the data that I collected from this interview process is that I did not get a good enough sample of students in my opinion. However, the results are unsurprising at this point as this also leads to a strong correlation between the interactions of students and teachers and their level of confidence in the class.

### *From the Formative Assessments*

In this part of my research, I tracked 15 students through the use of daily formative assessments. The use of these formative assessments helps me reflect on my instruction and how I can improve it. It also helps me to see if the students retained any information from the previous day as it would be (in theory) indicative to becoming more engaged in the classroom. The very last formative assessment that I give after a test is to help students become reflective in what they have learned and how they can do better in the future of my class. There were eleven assessments given in all for this unit.

In this part, I am going to label each student as student 1, 2, or 3 and according to their class. For example Student 1 from Class 1 is going to be “C1S1”. I am going to give a brief overview as to the progress that was made by each student as well as outline their final assessment after they took their test at the end of the unit. The final assessment has two parts, the first is their immediate impression of how the students felt they did. The second part is done after we go over the test and discuss as a class what students did for each problem on it. The final assessment is this (see below)

- 1.) In at least 2 sentences, explain how you felt about the test yesterday and why?**
- 2.) Of the themes below that were discussed in the past unit, which did you have the most trouble understanding?**
  - **Calculating triangle measurements**
  - **Bisectors, medians and altitudes of triangles**
  - **Properties of Angles**
  - **Proofing Triangles are congruent (proofs in general)**
- 3.) Of these, which was the best?**

### Post-test Reflection

- 4.) **How do you think you did now on the test?**
- 5.) **What could you do differently to improve?**
- 6.) **What, if anything, helped you the most to prepare for this test?**

#### C1S1:

Of the eleven assessments that were assigned, this student worked on nine of them with one assessment missing due to an absence. She started the assessments well but soon showed signs of struggle as she doesn't even answer the right question and ends up just re-writing the questions without an answer and turning them in. She started to spend more time on them at the end of the unit when some of the questions were easier (in my opinion).

Her final assessment read like this.

1. I felt the test was kind of hard. I didn't like it. My notes helped me through it. I didn't understand a lot of the test.
2. Calculating triangle measurements and properties of angles.
3. Bisectors, medians, and altitudes of triangles.
4. I think I still need help but I did okay.
5. Study more.
6. The practice test we took.

#### C1S2:

This student only attended for two days during the entire month for whatever reason. She is retaking this geometry class for the third year in a row. She was actually passing until she



stopped showing up for whatever reason. She has a child and is suspected of having drug habits. I don't have much of anything on her.

### C1S3:

Of the eleven assessments that were assigned, this student did only five of them and was not in attendance for the final formative assessment. His assessments were done mainly in the start of the unit and indicated a decent grasp of the materials. Then he stopped after the fifth one altogether. Most recently I changed the seating chart and this student has actually improved tremendously since even though it does not show through the use of these assessments.

### C2S1:

Of the eleven assessments given, this student completed ten of them. The only one he missed was when he was taking the PLAN test. This is a student that I also interviewed and he stated near the beginning of the unit that he can be okay in math but needs lots of help. At the start of the year, he really did not do too much. After the interview, I tried to encourage him continuously and he started to respond in a very positive way (he is now passing my class as this is being written).

This student demonstrates that he does struggle with concepts that require much deeper thinking and reasoning. He shows his work on a consistent basis and shows progress over the course of the unit. There is every reason from these assessments that this student is increasing in engagement as the class went further. He is now becoming a participant in classroom discussions.

His final assessment read like this:

1. I felt that it was a shorter test than usual. I think that this test made everyone less stressed. I feel that I did a little better.
2. Proofing triangles are congruent
3. Bisectors, medians, and altitude of triangles.
4. I think that I did pretty good.
5. Study at home and make a note sheet for the test.
6. Listening in class, and memorizing everything I could.

C2S2:

This student was in attendance every day for this unit. She only completed 3 assessments the entire time, one of which she just copied the answers from another student. She argued every day that she didn't understand anything but instead spent her time reading and talking to other students in the classroom. She would even refuse to do the simplest of tasks. In the assignment that I will describe later, she said she didn't know how to cut something in half. I've called her home on multiple occasions so that we can get a plan together to help her get caught up (if that was really the problem) but I never got an answer back nor did this student ever take my recommendation that she needs to seek extra help. She has refused to do anything from the start and has made her stance that she would not.

C2S3:

This student was absent for four days of this month. She only completed one assessment (the final one) and didn't even answer more than two questions. She shows up to class without anything (book, pencil, folder, notebook) and never once did an assessment. The only time I got

her involved in the class is when we worked on a class-wide project. She has not attempting anything else the entire year.

C4S1:

This student stopped showing up after the first two days of the new Algebra 1 unit (yes, this is my only algebra 1 class).

C4S2:

This student only completed the final assessment. He started the year and was gone for a month. For this unit, he was in attendance every day. He has very low math skills and has struggled tremendously doing the most basic computations. When investigating, I found that he never passed a middle school math class. Near the end of the unit, I was able to get him involved more but he still comes to my class without anything.

His final assessment read like this:

“It was ok, I think I did a good job. I tried my hardest but I think I got at least a C or D+. I don’t know now. I’m not good at math at all. I can try to go and get some help.”

C4S3:

This is another student that did not do a single assessment until the last one. From the start, I have encouraged her to try to do even the simplest of tasks and she has stated repeatedly that it is not worth her effort in trying since “it will only get harder.” I have also called home constantly to see if something can be done to encourage her but I have yet to get a response back.

His final assessment read like this:

1. Honestly, I hated it. Math is not my best subject. I made no sense.
2. Special relationships between lines
3. Creating a line of best fit.
4. I think I got a lot right!
5. I could try to work harder.
6. Make a note sheet and study!

C5S1:

Of the eleven assessments given, this student only work on four. However, four assessments that he work on were at the end of the unit. This student is an SE student and is very social. After constant encouragement, this student started to become more involved in the class. It showed as he demonstrated some proficiency in the assessments that he did do. He has now become a regular in classroom discussions.

His final assessment read like this:

1. I think it was ok. Next time, more exploration and I need to study more.
2. Proofs
3. Bisectors, medians
4. I think I did ok on the test.
5. Follow instructions
6. The teacher.

C5S2:

Attendance was an issue as she was absent for six of the days. In the days that she did come to class, she only completed three assessments (including the final). She has shown some proficiency in the class but often forgets to do the homework and talks to neighboring students (this class is my largest and changing the seating chart becomes a fruitless exercise the six times it has been done). In fact, this is the other main reason why she remains disengaged so often.

His final assessment read like this:

1. I didn't like that I wasn't very awake so I rushed. I also forgot some of the material.

Overall, I think I did okay.

2. Proofs
3. Properties of angles

She didn't do the other half.

C5S3:

This is another student that has refused to do anything in my class, no matter the task. His response as to why he refuses is that he "doesn't care." I don't have anything on him.

C6S1:

Of the eleven assessments that were given, only nine were completed. This student entered the year stating that she has always struggled. Indications of this are apparent as she shows signs that she is less than proficient throughout the unit. Progress was apparent as the unit went on with encouragement by myself and some of her classmates even. She is a student that is not confident and I have to be conscientious about constantly encouraging her when some of the materials become difficult.

His final assessment read like this:

1. I felt like it was a hard test. I feel like I should of done better. I feel like I don't like Geometry.
2. Properties of angles; I don't understand it
- 3.
4. I think I still did really bad.
5. I could study and do better
6. Doing homework the night before helped me.

C6S2:

Of the eleven assessments that were given, this student only completed four. This student does not have attendance issues and likes to be involved in discussions. From the discussions themselves, it is clear that understands a little of what is taking place during a lesson but is often mistaking information. This is also evident in the assessments for the few that are done really indicates what he is thinking. He did not work on the final assessment.

C6S3:

This student began the year passing with a C. Since then, she has completely disengaged. This is evident by the fact that I do not have a single assessment done by her. The reason for the sudden disengagement is still a mystery even after we had a conference with her, a counselor and her father. Apparently a lot of things have been going on in her life and neither of us have any idea of what it is. However, as of the past two weeks, she has gotten on track more and even engaged in some classroom discussion. This is after the most recent unit was done.

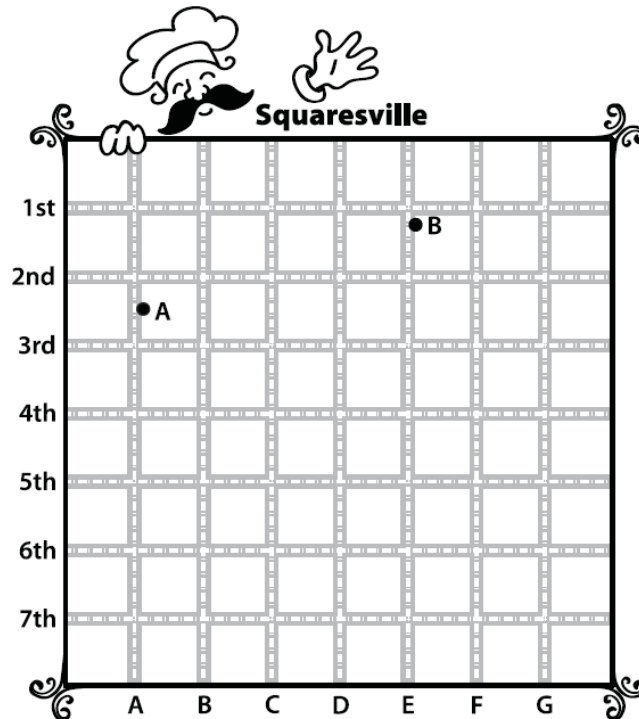
When looking at these results, I have to prepare myself for the lack of involvement and assessments as I am choosing to track students who have the tendency to disengage. This part of the research indicates that there are students who can be encouraged to engage more and some that might require alternative measures.

Assignment provided on November 18

## Regions for Two Pizzerias

NAME \_\_\_\_\_

Determine how the town of Squaresville should be divided into two regions so that each house has their pizza delivered from the closer of the two pizzerias.



1. What did you have to construct to create these two regions?
2. If a house located at the corner of C Street and 5th Street called for a delivery, which pizzeria would take the order?
3. What is the approximate area of each region to the nearest half block?

## **Conclusions and Limitations**

The meeting that took place with the middle school math teachers brought up a concern about issues that were brought up by Llana Horn in her article. She stated that there were four factors that can contribute to the student's success. The one thing she pointed out is the need for teacher collaboration. As it turned out, even the middle school math teachers have trouble collaborating much at all as there were significant gaps and unnecessary overlap. As a result, there are too many "jolting variations as students moved from teacher to teacher." (2004, p. 64)

The other issue that was brought up was the fact that too many students are missing too much math by skipping their classes when they are allowed to get away with it. This means that when they get to high school, they are already behind and cannot get instruction that is developmentally appropriate. This departmental meeting affirms much of my first hypothesis on what is probably needed even though we cannot say that the choices these students make causes them to disengage.

The survey revealed to me the importance of the teacher-student relationship. The interviews that were performed with the twelve students also suggest this. Paula Schornick also points out from her investigation that "students in this investigation spoke about their high school teachers continually." (2010, p. 32) From looking at the data, students who struggled were more likely to feel that their teachers did not care to help them. This would not surprise most people but it would suggest that a positive relationship between the student and teacher could have a positive effect. This is not to say that in order to get students to engage that all of us teachers must continually assist all students. There is not enough time in a day and if you have a class of 38 students, then what are the chances that one teacher can fulfill the needs of even half the



students in the class? If anything else, this points towards the need to having smaller classroom sizes and even the need to have team teaching.

I have also concluded that a very large number of my students are simply apathetic towards school. This has much to do with how they responded to on the survey since much of it does not reflect the facts. As was stated earlier, most of my students claim to do homework while I have it recorded that 45% of all homework is completed. Another reason why it seems as though the student population is too apathetic can be seen by the fact that 25.5% of all the responses were neutral. This gives rise to the concern about expectations that my students grow up. As was also stated by Llana Horn in “Why Do Students Drop Advanced Mathematics?” students need to have “high expectations built into the curriculum.” (2004, p. 64) I would also argue that high expectations need to be built into the school culture so as to develop better respect for each other and teachers.

In page 14 of this research project, I also pointed out that struggling students appear to feel like that which is asked of them is too much while other students feel the opposite. This brings up another concern that I have along with Daniel Chazan in “Beyond Formulas in Mathematics and Teaching: Dynamics of the High School Algebra Classroom”. Chazan describes a “preppie” that is now “concerned that the other students in the class and our teaching style were holding him back.” (2000, p.46) So now we have two potential problems, one group of students that struggle so much that they are likely to disengage. The other group of students may “retreat further into” (2000, p.46) themselves and disengage. While this could provide an argument for placement of students, I do not intend to as this is more indicative of the kind of instruction that needs to take place inside the classroom.

Dan Meyer speaks of the need to use more “patient problem-solving” (2010) in the classroom. On page 21, I have a worksheet that was to launch all of my classes into such an activity. The idea was to have students consider what it means to “split the distance” on a map. In this case, many of my students were able to develop some idea of what that means in a variety of ways to consider. Many of my students even participated in this activity. In order to make this lesson work, I also had to develop a Social and Emotional Learning Environment that I was working on from the start of the school year. This is also important as Jennifer Jones, Karrie Jones, and Dr. Paul Vermette notes that “students’ academic achievement is strongly correlated with their feeling of connectedness in their classroom community, their learning environment.” (2009, p. 6) This lesson, along with a few other similar ones, would suggest that the combination of a Social and Emotional Learning Environment and the use of discussions “where the math serves the conversation” (Meyer, D. 2010) could produce better amounts of engagement and desire for achievement for my students. While this was not true for all of my students by looking at their formative assessments, it would suggest a positive correlation.

One other thing that can be taken from the formative assessments is that many of the students still expressed their lack of confidence in the subject materials. This kind of classroom environment would take a while for my students to start feeling a little better about their abilities. This makes sense in this environment. Even Dan Meyer stated that it took his students a whole semester before students got really involved in the lessons.

In conclusion, we can suggest that a weak mathematical history from prior classes strongly correlates to the lack of engagement that we see from many of these same students. Students at a younger age need to be in an environment that contains Social and Emotional Learning so that they can be more included in the math that they should receive at a much

younger age. This requires that teachers consider how to develop such a classroom and that these same teachers attempt to maintain the same rigor for all so as to not allow students to feel left behind. I can also say that it is very important for teachers to collaborate so that the classrooms are part of an inclusive system.

Students also need to be a part of this community in order to develop a better respect for themselves, their colleagues and the teachers in the classroom. This is affirmed by Jennifer Jones, Karrie Jones, and Dr. Paul Vermette as they also suggest that “supportive classrooms are generally better managed classrooms where students get along better with each other and with adults. They complete more assignments, focus longer, and achieve better grades.” (2009, p.6)

There were many limitations in putting together this research. The first thing is related to the sample size and culture. I focused on just my students with the idea that they represent the community very well. Another concern that I have was related to the number of interviews that were performed. Unfortunately, my duties as a teacher got in the way and I was not able to interview enough students to get a better idea of what they think. Along with the lack of interviews on my part, Daniel Chazan suggested that “it would be difficult for teachers to collect information useful for understanding and tackling student disengagement.” (2000, p. 43) I would say that a teacher doing the research is in itself also a complication.

Another limitation is that this research looked at the engagement of students over the course of one unit. While the research can be sufficient looking at the math histories of my students, this limited amount of time looking at engagement is not sufficient. Much of my references look at populations over a much longer period of time. Since I only tracked my

students through just one unit, I also have to consider the materials as a reason for the level of engagements that I witnessed.

The final limitation that I want to address is on the amount of sources for research I utilized. I wanted to get a comprehensive view of this issue of engagement but I am willing to consent that I might have overdone it. This research takes on two parts: “why are they disengaged?” And “how do we engage these students?” I would argue that both are not mutually exclusive but either one is a big enough task. Because of the many avenues that I attempted to acquire information, I was unable to spend enough time at very specific modes of inquiry. The survey was good but there were probably too many questions. Due to the amount of questions, I limited my item analysis research on how each group responded to each statement. I think a lot more information could have been gathered just by analyzing the surveys.

Overall, the research shows a strong connection on what teachers can do in producing student engagement. This may not work for all students but there is a strong reason to believe that the overall classroom environment can be improved with a Social and Emotional Learning environment as well as instruction that can cause students to consider math solutions to what we witness in our world. At least this is what teachers can do on their part to help with student engagement.

### **Next Steps**

A lot can be said of how a teacher puts together the learning environment in the classroom. The next step would be how to better develop such a classroom and how to develop lessons that can produce better reasoning. Teachers need to strongly consider how to develop better math curriculum with an emphasis on “patient problem solving”.

If there was another follow-up from just what I researched, I would recommend spending more time figuring how students respond to the variety of ways they did and figure how each group of students respond. In other words, a more comprehensive item analysis is one thing that could be explored. While the environment that my students grew up in was considered, I would think that a more thorough analysis on what goes on at home and how that impacts students in the school would be highly recommended.

A lot of what I researched here is going to be put into use as I teach. Much of it already was as I use the formative assessments that are given at the start of class anyways. Much of how students respond ends up helping me consider the direction a unit needs to go. I also evaluate the assessments to see what needs to be done for certain students. I will continue to use these methods of inquiry but I also see the limitations of what I have concluded since I was still unable to get certain populations to engage at all. Like what was stated before, a closer examination on particular groups of students comes highly recommended.

## References

- Chazan, D. (2000). *Beyond formulas in mathematics and teaching: Dynamics of the high school algebra classroom (the series on school reform)*. New York, NY: Teachers College Press.
- Horn, L. (2004). Why do Students Drop Advanced Mathematics? *Education Leadership*, 62 (3), 61-64.
- Jones, J., Jones, K. and Vermette, P. (2009). Using Social and Emotional Learning to Foster Academic Achievement in Secondary Mathematics. *American Secondary Education*, 37(3), 4-9.
- Dan Meyer: *Math Class Needs a Makeover*. (Video File) Retrieved November 9, 2010 from [http://www.ted.com/talks/lang/eng/dan\\_meyer\\_math\\_curriculum\\_makeover.html](http://www.ted.com/talks/lang/eng/dan_meyer_math_curriculum_makeover.html)
- Schornick, P. (2010). Looking at High School Mathematics Education From the Inside Out. *NASSP Bulletin* 94 (1) 17-39.