Collaboration and Participation in Digital Learning
by

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I recommend that this paper be accepted as a seminar paper
(or research paper) required for the Master of Education
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Professor Directing Seminar Paper Signature   Date

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Advisor Signature   Date

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I pledge on my honor that I have not given or received any unauthorized assistance on this assignment.

5/16/2021

_____   _____
Student Signature   Date

Abstract

Researchers and teachers always say students who engage more in class are more likely to succeed academically. It reigns true during virtual learning and in my action research which asked, how would student small group collaboration and discourse impact student learning in math? The students who participated actively in discourse developed critical thinking skills and gained confidence in their understanding of math when they were able to collaborate and debate with their peers. This year has taken a toll on many of the students, especially in communities like my school where they are Hispanic/Latinx/Black and on the lower SES community who have been highly affected by the pandemic. However, some of my students have risen to the occasion they really got engaged into their own learning. Students who engaged in collaborative groups strengthened their academic performance and learned how to work in student groups without consistent teacher guidance. The students who took part in the discourse either verbally or through chat challenged each other and according to their performance in observations, district, and classroom assessments, displayed significant growth in their learning and critical thinking.

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Introduction

2020 had been an interesting year for teachers everywhere, we started the school year meeting students for the first time ever online. Neither of us were comfortable in the situation, we stumbled into somewhat of a routine to best support our students. However, as many teachers have noticed students had even more difficulties understanding concepts. Either because of technical difficulties, student misunderstandings, lack of practice, gaps in understanding from the past, students flat out walking away from their computer screens during class, or a slew of other reasons that make online learning a challenge that no one was truly prepared for. I am fortunate to be fluent with technology and general web development that has made the transition to online learning much easier but for many teachers who have been teaching for over 20 years but not fluent with technology online learning has been a monstrous endeavor. I also teach at a Title 1 school where a majority of the population at my school is in ESOL, so speaking and language development is a major component of my school's academic success.

Students learn better from someone they like and respect. Thankfully I have achieved those two goals, however I am still having students who do not always engage in the learning, because they walk away, lack practice, or zone out during class. As an educator who is required to attend professional development after work or as a grad student who attends class online Wednesday evenings, I fully empathize with students who zone out or walk away during periods of what we believe to be boring or unimportant parts of the lesson. I am also in a position where I teach students advanced math which also translates to them understanding most concepts relatively quickly. However, they are still 5th graders who need to be taught how to engage in productive and respectful discourse when learning new concepts and defending their understanding. The research question I am choosing to focus on is, "how would student learning and performance vary if the students were to learn how to collaborate and support each other without specific teacher guidance?" I wonder what would happen if I specifically modeled and had the students practice small group discussions without the teacher. Will student engagement improve, and assessment scores improve as a result of more students participating and engaging in the content through small group discussions with peers?

The first math assessment we took this year, I was shocked to see that these students did a lot worse than I expected. These are students who are supposed to be in advanced math, why are they scoring so low? I reflected and thought, most likely this is because normally in the classroom I can make sure students are focusing during lessons throughout the week, but in this online situation hardly any of my 5th graders take part in actual discourse, resorting to typing short responses in the chat. Therefore, my research question is a possible solution to this issue. If the students can explain and defend their answers by using what I taught in class through conversation with their peers they will understand and absorb the concept. My school is also participating in the two-way dual language program that focuses on bilingualism and biliteracy, academic achievement, and social cultural competence, so a focus on communication and development of a student's communication and language skills will back up the goals of my school. I plan on doing some research on the effects of discourse supporting content development and some research from MCPS's expert in two-way immersion, Dr. Jose Medina.

Theoretical Framework for the Research

According to research done by Forslund and Hammar (2018) students often fall back on relying on teachers for answers and explanations rather than relying on their peers for support. This also coincides with what I have seen in my own classroom when students have questions about their work. Another study done in 2015 by Ing, M. et al. on student participation and student achievement pointed out that the major factor that impacted student achievement is the more a student participated the better they did on post assessments compared to their pre assessment scores. They also noted that students who participated more also tended to be more supported by the teachers. This could be a result of students participating which allowed teachers to ask follow up questions. Boyd and Rubin (2002) focused on identifying types of SCT's which were student critical turns which demonstrated students practicing and engaging in literacy through communication. Types of communicative functions of SCT's include extending or elaborating their ideas, response, explaining, extending, or elaborating on other's ideas, evaluating, and asking authentic questions. The article also talks about how to best facilitate SCT's such as having students explain, respond, extend, and edit. These are strategies that I have tried to facilitate through modeling and having the students respond to me but coupled with students engaging in this type of conversation with each other rather than me as the teacher.

I modeled to students how to respond to each other based on an article on teacher invitation and support moves for student discourse by Frank M.L. et al. (2015) on how students participated in collaborative groups, where the authors noted that there are three levels of engagement students display which are either low, medium, or high. Low levels of engagements include simply agreeing or disagreeing with their peers, medium being repeating what their peer's say and explaining what their peers did, high levels of engagement would be correcting or elaborating on their peers' answers. They also noted that teachers use a variety of invitation moves and three types of support moves to further student answers which are probing, scaffolding, and positioning. Probing is where teachers push "students to engage further by questioning or revoicing in a way related to mathematics." Scaffolding has the teacher linking simple ideas together and clarifying the information to a point where students can agree. Finally, positioning is when teachers "acknowledge the student or student's connection to the" math and shares it with the class.

My hope is for the students to move towards more cooperative learning classes from an article in 2002 where students can use the five Elements of Cooperative learning to support each other in their learning. The five elements are positive interdependence, individual accountability, face to face interaction, development of social skills, and group processing where groups evaluate what went well and what did not. According to the study all of the elements of cooperative learning positively benefited academic achievement. My research will be focused on how collaboration and discourse will impact student achievement in an online classroom. None of the prior research has been done in an online classroom so I am curious of the results. However, I am already noticing in my class, the students that participate in class more have obvious positive results in assessments compared to students who do not participate as much in class.

Methods

I will be conducting an action research study to test if I specifically modeled and had the students practice small group discussions without the teacher, and if it would improve student achievement and critical thinking in academic subjects such as math. My first step would be to model and train my students in how to take part in productive discourse. I would accomplish this by modeling for the class with help from student volunteers along with giving the students sentence frames to discuss their answers. For example, a student can say "I believe my answer is correct because …" and another student would respond by saying "I disagree because ..." Then I would have students practice this by using this technique with the whole class. I would also continue to model this structure throughout all the subjects. Then I would have the students split apart into small groups and complete assignments together by using the sentence frames to structure their discourse.

My class consists of students who are all identified for accelerated math, and in order to join this class the students must have scored highly in school, district, and state tests in math. The class consists of 9/21 students who were previously in ESOL but have all exited. It is also a diverse group of students who are either of Mixed race (Asian/White), Hispanic/Latinx, White, and African American.

In my current teaching, I notice that I am doing most of the talking and I want to switch that around to be more student driven. In the past when we taught in person, I did have a more student driven approach to teaching, but now that we are all online and some students do not have the materials, I relied on modeling and talking to the students and less having the students create their own ideas. As a result, I feel like many students are not engaged in their learning as they would have been had they been the ones driving their own learning through my facilitated questions. By modeling and practicing respectful debates I hope the students will push each other in understanding new concepts by building upon concepts they have learned before. As a facilitator of the learning, I will see if the students are retaining concepts better through daily exit tickets and formative assessments. I will take note of how the students' scores have changed because of switching from a more teacher driven lesson into student driven lessons. Based on the research by encouraging the students to participate in discourse with each other, theoretically they should have an increase in student achievement as a result of more participation which is prompted through collaboration.

General research question:

How would student to student collaborative discourse without teacher guidance affect student achievement and critical thinking?

Data matrix:

Research question	Data source #1	Data Source #2	Data source #3
What are my students' attitudes towards discourse math, and will they change throughout this process?	Pre-research survey	Informal interviews	
What are my students' attitudes towards virtual math instruction?	Anecdotal observations during whole group and small group lessons/discussions	Informal interviews	
Will productive student discourse increase student performance and understanding of math concepts?	Analysis of Fall/winter (1st semester) assessment data District assessments Teacher made assessments. Exit tickets		Analysis of Spring (2nd semester) math assessment data District assessments Teacher made assessments. Exit tickets

Data Sources and Evidence

Data set 1:

I analyzed unit assessments from the county after every unit and exit tickets given daily after lessons to have students both practice concepts taught day by day and measure their comprehension after every unit. Daily exit tickets are formative that guide me to understand what students need to review and the summative assessments help me understand what the students have learned throughout the unit. Each unit lasts between 3 - 5 weeks and I give daily exit tickets and one unit assessment after the whole unit is completed, for example we just completed our unit assessment on rational numbers where students learned about the relationship between positive and negative numbers.

The purpose of examining these documents in Appendix A and B is to see which students are still struggling with concepts and determine the relationship between student participation in class discussions and student performance on these measurement tasks. Especially during virtual learning this year, I have noticed that some students tend to zone out or leave their computers during lessons. Therefore, the emphasis on student participation is essential, if they are not constantly participating in the lessons audibly participating or in the chat, I do not know if they are present in the lesson.

This is a snapshot of the month of March worth of exit tickets as shown in appendixes A details which students have either been consistently completing and practicing their work. Relating exit ticket completion to class participation. Christopher (15/15), Svetlana (13/15), Beimnet (12/15), Darwin (13/15), Euyel (15/15) and Tensae (14/15) participate in our class discussions daily, which shows in this data as they complete either all or almost all of the daily exit tickets. Students who occasionally participate are Ruth, Justin, Ava, Chloe, Naimah, and Faith complete their exit tickets also occasionally. I am very concerned for students like Allison, Jason, and Steward who almost never participate and do not complete their exit tickets, even after several phone calls home and attempts and parent contact.

When we look at the unit assessment data, it is clear that Euyel, Svetlana, Chris, and Tensae clearly demonstrated a strong understanding of Rational numbers taught in this unit because they got between 90-100% on their assessments. I am pleasantly surprised by how Andrew and Colm performed despite not participating in class discussions. On the other hand, based on the data from the Exit tickets, they are indeed practicing the skills taught, whether it is with me, with their family or alone at home. I also provide review videos for students who are absent or want to self-review. However, I was also surprised by Beimnet and Darwin's lower performances on the assessment. I wonder if the types of questions that Beimnet and Darwin answer in class are surface level questions and not deeper level questions that really show conceptual understanding on the topics being taught? Then when we look at the data for Steward, Vivian, Alisson, and Jason, we clearly see that their data is either missing or scored very low. I wonder what I can do to further support their learning. I have had many one-on-one conversations with all four students, and I have attempted to resolve as many of the obstacles preventing them from being successful as I could.

I am using this data as pre-study evidence to determine the difference between teacher-led class discussions versus student and student driven discourse on topics, whereas as the teacher, I facilitate student questions but the students drive the discussions. My next step would be to start student led lessons in the next unit on Expressions. I will also be taking informal notes on the types of questions being asked, where I am facilitating deeper level understanding questions, such as why and how, rather than simply what questions. I will also be focusing on groups that include my students who do not participate as much such as Jason, Allison, Steward and Vivian. I wonder if they would be more willing to participate in small group discussions.

Data Set 2

In my previous data source, I determined that I had approximately four to five students who did not perform well on the assessments that measured how much content they understood. This next data source is Likert Scales where I asked students to rate how they feel about math talk and my general math instruction. I like to use Likert scales to help me gauge my own instructional methods because I believe that every year, we get a different group of students, and we need to make adjustments that fit the needs of the class. As teachers we need to be constantly monitoring our own methods and adjusting for what works best with our current students. What worked well a previous year might not work for the next year. Just as trends change, so do the ways students learn best.

December, I sent out my first Likert Scale to have my students just give me quick informal feedback on their opinions on my math instruction as seen in Appendix C and D. 11/21 students who thought my instruction was very good, 2/21 who thought my instruction was good, 3/21 students who think I am doing "meh" which means in the middle, and 6 students who did not answer. The six students who did not answer are also following the trend of students who typically do not participate in class. 4/6 of those students have a combination of not participating in class and do not perform well on assignments. I have called home, sent emails, talked to counselors, had one-on-one conversations with all these students and sometimes conferenced with the student and parent at the same time with a translator. However, for the four students, none of the issues were resolved or only got resolved for a week. I make sure to focus on talking to the students from an understanding perspective. I wished these four students would have volunteered to return to the building to ensure that at least their technology and Wi-Fi would have been secure. Unfortunately, my four students who really needed it opted out. The area around my school was heavily impacted by the pandemic and I am one out of the four students who had lost close family because of the pandemic. Steward, Vivian, Jason, and Allison are the four students who need support and according to the data below, only Vivian responded to the survey. Fortunately, after many phone calls and small group conversations with Vivian, she is slowly starting to participate in class, but she is still not doing any work. Her older sister was one of my previous students and their parents have told me to let the sister know if Vivian was keeping up with her work. As someone who was also responsible for younger siblings' education when I was in school, I do not like to put the pressure on older siblings, but it has been the most effective strategy for Vivian. For Jason, Allison, and Steward, I do not know if they are even in front of their computers during class or if they are having internet problems. Therefore, for every math lesson, I also record a review lesson that stays available for whenever they are ready to go

back and do the work. I do not plan on deleting the videos and will allow my students to use them throughout the summer.

Following the Likert scale in Appendixes C and D to determine how the students felt about my math instruction, I also asked the students what type of suggestions they would give me such as having students use math talk to teach and build on each other's understanding of math. I also gave my students a survey on how they felt collaborative math talk would impact their understanding of math. According to the research done by multiple sources like McVittie, Krol, and Fuentes many students are not initially drawn or know how to collaborate with their peers in a productive way. Therefore, they need to be taught how to collaborate with each and have productive discourse. As seen in my data only 2 of my students wanted to work with their peers on math work. In previous years, I had always allowed my students to work in groups when we finished whole group or small group instruction. I cannot wait for the day when we can be in the building again and I could listen to my students work together. Vivian was the one student who wanted me to explain topics more. However, I have also noticed that she works well in small groups. She does well with talking to her friends and even though they can go off task, she enjoys not needing to do all the work on her own along with bouncing ideas off of her friends. This is a common trend for two other students in my class Gisette and Beimnet who do not test very well. However, students like Andrew, Chris and Colm have been testing fairly well and do not like speaking out loud. I wonder how Gisette, Beimnet and Vivian's data will compare to their previous assessments when I did not use math talk.

Students surveyed	Explain more	Explain less	No need to change	Collaborating with peers	Quiet indp. work	No Answer
18/21	1/21	2/21	5/21	2/21	3/21	4/18 of students surveyed

Data Set 3

According to the data as shown in Appendix E, the students who actively participate in collaborative discourse generally showed an increase performance from the Mid Module assessment to the End of Module assessment. Even though some students do not always complete the practice throughout the week, students like Gisette, Jason, Andrew, Ava, and Naimah displayed an increase in their scores. Svetlana, Darwin, Justin, Chloe, and Chris also displayed a dramatic increase in scores from the Mid-Module assessment and End of Module assessment and tended to trend highly in overall score on the assessment. During the time between the Mid-Module and End of Module assessments, I found a well fitting and productive combination of students who supported one another and pushed each other to debate topics covered in the unit. The Mid-Module and End of Module covered Pre-Algebra topics such as Properties of Operations, Exponents, Variables, and Order of Operations. During their collaborative conversations' groups worked together on assignments from the curriculum and the group consisting of Svetlana, Justin, Ava, Chloe, and Naimah would only occasionally ask me to settle a debate, for example in the case of multiplication and division, what came first in an

equation when there is no parenthesis. For a while, I was very confused about Darwin's performance on previous assessments and how he did not perform well, despite always participating in whole group activities and discussions. It seems like the collaborative group of Chris, Darwin, and Andrew really pushed them to discuss and improve on their general understanding of the concepts. After the previous data set, I also challenged myself to probe the students in discussing deeper level questions such as why and how, rather than surface level questions. I believe this also supported many students in thinking more critically about each concept.

Unfortunately, there are still students who struggled on the assessment. I am not quite sure why Beimnet tends to perform poorly on assessments, however it could be a result of a slew of reasons. However, during class she actively participates and can explain and support her answers by describing the concepts correctly. Most likely she needs to work on test taking skills to ensure that she answers accurately. On the other hand, Alisson, Steward, Jason, Faith, and Vivian still struggled on both active participation in the discussions which does not surprise me when they either did not finish the assessments or performed poorly. As I stated in my previous data set, I continued to call home, pull them in to small group discussions, write emails, give pep talks, to no avail. In the case of Vivian and Faith, they would occasionally participate a little more the week I have a conversation with them, but after the weekend they go back to their usual trends. The pandemic, the lack of social interaction, and virtual learning has taken a toll on majority of the students' moral and mental health. When I talk to the group of students in this group, they always share their feelings of hopelessness, boredom, and despite wanting to succeed and do well, they do not see a point in putting in the effort to participate in the discourse or complete assignments.

Findings

There is a strong correlation between an increase in student performance on assessments with students who actively participated in discourse in small groups. 14/21 students actively took part in discourse and 9/14 of those students had either a minor or dramatic increase from their Mid-Module assessment to their End of Module assessment after two months of consistent student run small group participation and collaborative discourse. 9/10 of the students who performed better on the Mid-Module as compared to End of Module also supports the benefit student discourse improving student understanding of concepts. The students who were not consistently participating had several reasons, either because of mental health or technology issues such as poor Wi-Fi. Therefore, virtual settings are not equitable for all students, Sadly in the case of the pandemic, but it is one the few options available for the continuity of learning or any type of social interaction for some of my students. It is also the only option many of the families in my school community are comfortable with after seeing the toll, the pandemic has taken on lower SES communities or color. Outside of strictly math discourse, the students who actively participated in discourse tended to also participate in social discourse which may have benefited their mental health. In a year where the students were at home and hardly got to see any friends or people their age, still having a way to communicate with their peers on a daily basis most likely improved their mood and academic motivation.

Conclusion

In the end it is evident as stated by Boyd and Rubin (2002) and Krol, K., Veenman, S., & Voeten, M. (2002) effective cooperative learning allows students to better extend and elaborate on concepts they have a basic grasp on. The students who actively participated in discourse conveyed positive interdependence, kept each other accountable, developed social skills and worked together as a group to grow. The only aspect of the Elements of Cooperative learning they did not engage in was face to face interaction, which was not only possible in the virtual setting if the students were comfortable turning on their cameras. Considering this research was done in 2002, it did not consider the option of learning through video calls. Despite that, through this action research and research done by many groups throughout the years between 2002 and 2020, all sources claim that effective student discourse will improve student achievement.

In years prior and in research done by groups in 2004 by Mcvittie, 2015 by Ing, M. et al, and Fuentes in 2018, students oftentimes rely on teachers for answers or to explain everything to them. Therefore, I used teachers support moves to redirect student discourse into having the students debate whether or not their ideas make sense to the situation based on research from the article on the role of teachers to engage students done in 2015. I wanted students to really challenge each other's ideas to not only build on the concepts but to practice critical thinking and supporting their own ideas with evidence. Of course, not all students were engaged in the discourse as only 14/21 students participated actively every day. Considering we were teaching during a pandemic there were a lot of limitations with what I could do to support the students who were going through a hard time or who had technical difficulties. The number of times I wished I could jump through the screen and just help them through a technical glitch or tell them face to face that I cared about them is uncountable. Honestly, if it were not for the pandemic, I think the students who were in my class could have flourished in virtual learning. Much of their low morale was a result of anxiety caused by either their close family or the students themselves contracting Covid-19. The social unrest with the Hispanic, Black and Asian populations throughout this year has not only affected the students morale but also my own being an Asian American woman. Throughout this year, I emphasized to the students that their safety was my number one concern and that if they ever needed someone to talk to, I was only an email away. Sometimes the students were not comfortable talking to adults like myself, but throughout this action research, it also provided opportunities for students to simply interact with each other like they did in the classroom or during recess at school.

My biggest surprise was the enormous differences on how the dynamics changed when the same students interacted with another group of students. I found the sweet spot in group work with my last combination of students who I kept for the last two months of school. In Forslund Frykedal and Hammar's study in 2018 they discussed the difficulties of student collaboration and group work. Oftentimes, there will be one student who always does the bulk of the work and the rest of the students simply copy and follow along without challenging the student who is deemed the "smartest" in the group. Fortunately, that was not the case for the groups I observed, the students were debating with each other and supporting their ideas with claims then coming to a consensus. When they could not come to a consensus they asked for help, and I used clarifying, and guiding questions to drive them to form their own ideas. Oftentimes, I would repeat student ideas knowing there was a misconception in their idea and throwing their ideas back to them to think about whether or not it made sense. This usually led to the student realizing their own mistakes or another student countering my clarification with reasoning. I am curious about how it would be different when we are not in a virtual setting, if the students had better connection, or if they were not going through a traumatic experience. I will expand on this action research in the summer when I return to the school building to teach summer school. In conclusion, I plan on testing if engaging students through discourse and pushing them to challenge or build each other's ideas will engage even more students along with improving their performance on mathematical concepts.

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Appendices

Appendix A: Snapshot of Exit ticket completion:

Student Name	G6 Exit ticket M3... Out of 1	G6 Exit ticket M3... Out of 1	G6 Exit ticket M3... Out of 1	G6 Exit ticket M3... Out of 1	G6 Exit ticket M3... Out of 1	G6 Exit ticket M3... Out of 1
Alemu, Ruth L (Student)	–	–	📑	📑	–	📑
Alvarez Valiente, Aliss...	–	–	–	–	–	–
Cedillos Bonilla, Jason...	–	–	–	–	–	–
Dao, Beimnet V (Stud...	📑	📑	–	📑	📑	📑
Diaz Elias, David R (St...	–	📑	–	–	📑	📑
Gooden, Justin P (Stu...	📑	📑	📑	📑	📑	📑
Hernandez Sagastum...	–	–	–	–	–	–
Konyndyk, Colm M (S...	📑	📑	📑	📑	–	📑
Konyndyk, Eoin C (St...	📑	📑	📑	📑	📑	📑
Lee, Christopher B (St...	📑	📑	📑	📑	📑	📑
Loayes Romero, Gise...	–	–	–	–	–	–
Mamo, Tensae Y (Stud...	📑	–	📑	📑	📑	📑
Mondragon, Andrew ...	📑	📑	–	📑	📑	–
Ordonez Moreno, Vivi...	–	–	–	–	–	–
Romero Vicente, Dar...	📑	📑	–	📑	📑	📑
Simpson, Ava M (Stud...	📑	–	–	–	–	–
Stone, Chloe E (Stude...	📑	📑	📑	📑	📑	📑
Tadewos Feyera, Euye...	📑	📑	–	📑	📑	📑
Thumbu Joshua, Svetl...	📑	📑	–	📑	📑	📑
Ward, Naimah A (Stud...	📑	–	📑	–	–	–
Zack-Funes, Faith A (S...	–	–	📑	–	–	–

Appendix B: Rational Number Unit Assessment and County Mid-Unit assessment

Student Name	Positive and nega... Out of 1
Alemu, Ruth L (Student)	0.81
Alvarez Valiente, Aliss...	–
Cedillos Bonilla, Jason...	–
Dao, Beimnet V (Stud...	0.78
Diaz Elias, David R (St...	0.72
Gooden, Justin P (Stu...	0.89
Hernandez Sagastum...	0.39
Konyndyk, Colm M (S...	0.83
Konyndyk, Eoin C (St...	0.78
Lee, Christopher B (St...	0.94
Loayes Romero, Gise...	–
Mamo, Tensae Y (Stud...	0.97
Mondragon, Andrew ...	1
Ordonez Moreno, Vivi...	–
Romero Vicente, Dar...	0.5
Simpson, Ava M (Stud...	0.17
Stone, Chloe E (Stude...	0.78
Tadewos Feyera, Euye...	1
Thumbu Joshua, Svetl...	1
Ward, Naimah A (Stud...	0.83
Zack-Funes, Faith A (S...	0.22

Student Name	Test Score %	PE/PP
Alemu, Ruth	▶ 51.2%	5.5 / 10.75
Dao, Beimnet	▶ 45.0%	4.84 / 10.75
Diaz Elias, David	▶ 53.5%	5.75 / 10.75
Gooden, Justin	▶ 58.1%	6.25 / 10.75
Hernandez Sagastume, Steward	▶ 53.5%	5.75 / 10.75
Konyndyk, Colm	▶ 74.4%	8 / 10.75
Konyndyk, Eoin	▶ 93.0%	10 / 10.75
Lee, Christopher	▶ 90.7%	9.75 / 10.75
Loayes Romero, Gisette	▶ 55.8%	6 / 10.75
Mamo, Tensae	▶ 69.0%	7.42 / 10.75
Mondragon, Andrew	▶ 76.7%	8.25 / 10.75
Romero Vicente, Darwin	▶ 62.8%	6.75 / 10.75
Simpson, Ava	▶ 51.2%	5.5 / 10.75
Stone, Chloe	▶ 52.7%	5.66 / 10.75
Tadewos Feyera, Euyel	▶ 81.4%	8.75 / 10.75
Thumbu Joshua, Svetlana	▶ 100.0%	10.75 / 10.75
Ward, Naimah	▶ 67.4%	7.25 / 10.75
Zack-Funes, Faith	▶ 67.4%	7.25 / 10.75

Appendix C: Informal Student Survey on Teacher performance

How do you feel about how Ms. Wu teaches math?

	Response
Andrew	Meh
Ava!!!	Very Good
Chloe	Good
colm	No Answer
darwin	Good
depressed cow	Very Good, Good
Eoin is awesome	Meh
Euyel	Very Good
Faith	Meh
Gisette	Very Good
Jason	No Answer
justin	Very Good
Naimah	Very Good
rensae	Very Good
Ruth A	Very Good, Good
Svetlana	Very Good, Good
the little kitty cat (beimnet)	Very Good, Good
Vivian✌️	Very Good

Appendix D: Informal Student survey on about their own performance
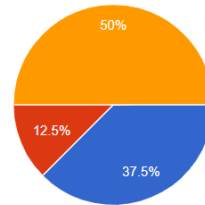
I participate in math conversations during class.

16 responses

- Yes
- A little bit
- No

25%
37.5%
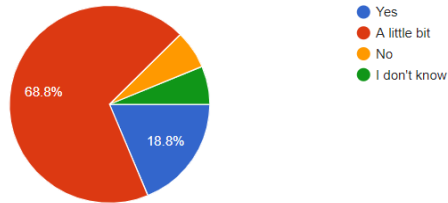37.5%
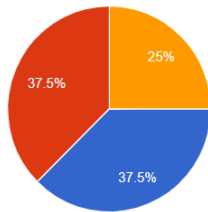
I should participate more in math in class.

16 responses

- Yes
- No
- I don't know

50%
12.5%
37.5%

I talk about school or math at home with my family.

16 responses

- Yes
- A little bit
- No
- I don't know

68.8%   18.8%

I think that talking/working with my classmates will help me understand math better.

16 responses

- Yes
- A little bit
- No
- I don't know

37.5%   18.8%   12.5%   31.3%
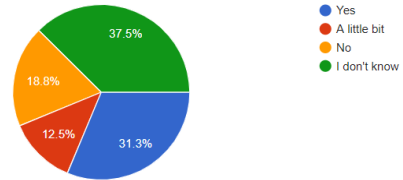
Appendix E: Student performance on Assessments

	Mid Module	End of Module
Alemu, Ruth	85.4%	79.2%
Alvarez Valiente, Alisson	12.8%	0.0%
Cedillos Bonilla, Jason	6.1%	18.0%
Dao, Beimnet	52.8%	40.7%
Diaz Elias, David	22.4%	21.8%
Gooden, Justin	35.5%	57.3%
Hernandez Sagastume, Steward	0.0%	0.0%
Konyndyk, Colm	63.4%	30.1%
Konyndyk, Eoin	85.4%	60.8%
Lee, Christopher	69.6%	84.8%
Loayes Romero, Gisette	47.6%	49.0%
Mamo, Tensae	86.1%	58.3%
Mondragon, Andrew	30.1%	51.0%
Ordonez Moreno, Vivian	7.3%	8.3%
Romero Vicente, Darwin	32.6%	80.6%
Simpson, Ava	40.7%	47.9%
Stone, Chloe	28.5%	43.7%
Tadewos Feyera, Euyel	59.7%	56.3%
Thumbu Joshua, Svetlana	78.0%	87.6%
Ward, Naimah	43.9%	59.7%
Zack-Funes, Faith	43.6%	4.2%