

Spring 2014

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Effects of Altering Student Seating Position on Student Learning in an 8th Grade Mathematics Classroom

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EDTL 4160

Abstract

There is a general lack of research on how altering student seating positions in middle and high school classrooms can affect students' performance in learning the classroom content. In this study I aimed to create a seating position chart to optimize student learning through cooperative learning groups. Student seating positions in two classes were altered with two different methods to compare the effects on students learning and belief in learning.

Introduction

The classroom environment is comprised of several different elements the teacher can and cannot control. This environment can be called the setting events for a lesson which can include the temperature of the room, lighting, physical space, seating arrangement (the physical arrangement of desks or tables), student seating position (where the students sit within the classroom seating arrangement), noise level, and presence or absence of peers or adults among other elements which help shape the classroom environment in which students are expected to learn (Wannarka & Ruhl, 2008). Many factors are out of the teacher's control lending more importance to the factors which teachers can alter to ultimately accommodate student learning, especially if the factor is proven to have significant impact on student behavior and performance.

There are several factors which help determine an appropriate seating arrangement for a classroom to optimize student learning. For a seating arrangement to be successful the arrangement should facilitate interaction among students and teacher, suite the instructional objectives and activities, and ease access to the instructional material (Çinar, 2010). Each different seating arrangement has advantages and disadvantages which can be utilized by teachers to accommodate individual lessons. While seating arrangement may not always be alterable in a classroom, the individual students seating in the classroom can be easily changed. This study will observe the effects of specifically altering the students seating positions in a class to strategically pair students for cooperative learning has an impact on students classroom performance. This investigation aims to identify some implications of how intentionally altering student seating position can be a useful tool for classroom teachers.

Literature Review

Physical Classroom Seating Arrangement

Altering student seating arrangement can have several beneficial effects in a classroom including class participation, behavior, and academic performance. Altering classroom seating positions and arrangements is an easy way to effectively minimize or eliminate student misconduct and behavior without the use of consequence intervention or other differential reinforcement or punishment (Bicard et al., 2012). By identifying problem behaviors and arranging both desks and students, altering seating arrangement can become an effective classroom management tool. Hood-Smith and Leffingwell (1983) found students behaviors improved significantly after altering the classroom desk arrangement which included less noise, longer attention spans, more positive student interaction, more comfort, and the elimination of paper airplanes. Through spending less time on classroom management, a teacher can invest more time covering classroom content.

There are three main categories of seating arrangements which include the traditional rows and columns seating, semi-circle formations, and group seating arrangements that each have different benefits to student learning. Seating students in rows has been found to double on-task behavior of students and reduce inappropriate behavior (Wannarka & Ruhl, 2008); (Bicard et al., 2012). On individual tasks the row and column seating arrangement can help maintain student productivity on the task (Wannarka & Ruhl, 2008). In a semi-circle formation students develop a greater sense of community, ask more questions, and interact with other students more often (Wannarka & Ruhl, 2008); (Patterson et al., 1979); (Kaya & Burgess, 2007). These benefits could significantly enhance student discussion based lessons. Finally group seating arrangements help facilitate student interaction (Kregenow et al., 2011). Each seating arrangement has several benefits, which teachers can utilize to accommodate lessons. To improve efficiency teachers should let the nature of the task dictate student seating arrangement

(Wannarka & Ruhl, 2008). Maximizing the teacher's efficiency could include changing seating arrangements on a weekly or even daily basis to accommodate individual lessons.

Student Seating Position

Besides behavioral implications, student seating position within a classroom can potentially significantly impact student academic success. Several factors could account for potential academic differences between students seated in the front versus students seated in the back of a classroom. Typically teachers spend seventy percent of the classroom time in the front of the classroom in a traditional classroom seating arrangement (Hood-Smith & Leffingwell, 1983). The concentration of the teacher at the front of the room could partially contribute to findings that students seated in the front of the classroom have higher participation, ask and receive more questions from the teacher, and have improved belief of their abilities through several different grade levels (Kaya & Burgess, 2007; Wannarka & Ruhl, 2008; Perkins & Wieman, 2005). On the other hand in larger university classrooms, students seated in the back of the classroom show lower attendance, larger dropout rates in university classes, and higher interaction with peers (Zomorodian et al., 2012; Perkins & Wieman, 2005; Wannarka & Ruhl, 2008). These effects are documented in studies with the rows and columns seating arrangement. Table 1 documents the differences in classroom size and seating arrangements between studies.

How seating position is initially established can also significantly affect student academic performance. Students can choose their own seats or teachers can assign students seats in a classroom. Students can have several factors impacting their choice of seating position within a classroom including proximity to friends or acquaintances, motivation toward the course subject, and personality (Kaya & Burgess, 2007; Çinar, 2010). When student get to select their own seats students who prefer to sit in the front center of the class generally gets higher grades than those

who prefer to sit in the back of the class (Kregenow et al., 2011). This suggests a relationship between student self-chosen seats and motivation to learn the content. In addition Parker, Hoopes, and Eggett (2011) found that there was a positive correlation between seating preference and students overall grade point average further distinguishing that motivated students prefer to be seated at the front of the class.

However the connection between student seating position and academic performance is largely inconsistent. For example, Armstrong and Chang (2007) did not find a significant difference of seating location on student achievement and student chosen seating location determined less than seven percent of variation in student achievement. Out of the 20 different classes studied, 6 classes which had correlations between student seating arrangement and academic performance were taught by the same instructor suggesting that a teachers teaching style could largely influence student achievement in relation to seating positions (Armstrong & Chang, 2007). Every student learns differently, which is difficult for a teacher to try to best accommodate. Even subtle difference in teaching style can significantly impact classroom instruction and student motivation.

Further highlighting the importance of student seating position are several classroom studies. Hood-Smith and Leffingwell (1983) found immediate behavioral implications from switching the classroom arrangement. However a correlation between changing seating arrangements direct effect upon students' academic performances has not been studied in a high school or elementary classroom. In a university lecture hall of 200 chairs Perkins & Wieman (2005) found no significant increase in academic performance when the students randomly assigned to the back of class were switched to the front of the class halfway through the semester. Students originally assigned to the back of the classroom were six times more likely to

fail the course then those originally assigned to the front of the classroom which implies a permanence of the “back of class” effects Kregenow et al (2011) additionally observed in a smaller lecture hall class with 99 students. However a correlation between student academic performance and seating position must be established for a smaller class size for the results to be applicable to a high school classroom.

There are major differences in the classroom structure and student learning between middle school, high school, and higher education. Not only are the students at a different developmental stage, the classroom structures, layout, and format are completely different. Kregenow, Rogers, and Price (2011) observed by placing the teacher in middle of the classroom eliminated the “front of class” effect, yet did not conclusively eliminate the “back of class” effect. The difference in class size and classroom setting in high schools alone could possibly eliminate the front of class back of class effects found in studies predominantly focusing on university lecture halls. In addition other factors such as teacher familiarity with individual students and classroom arrangement flexibility can distinguish most high school and middle school classroom settings from most large college lecture halls, which further alter any application of conclusions from previous research specifically addressing student seating position and academic performance. Additional factors which can significantly alter the relationship between seating arrangement and academic performance include the design of the classroom, student demographics, the content area taught, and instructional methods (Armstrong & Chang, 2007). More research is necessary to apply the conclusions as well as inconsistencies in the research to seating arrangement and academic performances in middle school classrooms.

In addition to several research gaps between the effect of seating arrangement on student achievement, motivation, behavior, and academic performance, there is a glaring omission of

research on seating positions effects on academic achievement in high school or middle school classrooms. Table 1 illustrates that out of the eleven studies found only three of the studies were observed for student below grade 13 or higher. There is a serious gap in action research on the effects of altering student seating positions in a middle or high school classroom. If a positive correlation is found between student seating position and academic achievement in a middle school classroom, future research on the subject will be beneficial to examine the relationship and the potential implications for teachers.

Group Structuring of Classroom Learning

In a classroom environment, more important than the physical layout of the student desks is the teacher's class structure. Grouping students into cooperative learning pairs of no more than two or three students can maximize positive cooperative learning throughout a class. However the willingness to participate within the cooperative learning groups is essential for a group (Gilles, 2003). If a member of a group is unwilling to participate then the group will fail to support the students learning needs, even with a small establish group size. Siegel (2005) suggests a way to keep all students involved in active throughout small group work is to establish specific task-roles in a cooperative learning environment. These task roles should be designed and given to group members to keep students actively participating throughout the learning process in a cooperative learning environment.

The establishment of strategic cooperative learning groups can significantly enhance student motivation and participation. However on the other hand, a negative attitude or mathematical disposition can also have a direct effect on small cooperative learning groups. Low achieving students in particular are likely to have negative self-efficacy feelings that are likely to be transferred in a small cooperative learning mathematics group (Mulryan, 1992). This negative

attitude can affect the participation of the student resulting in letting higher achieving students dominate the group. In fact Mulryan discourages having high and low achieving students working together because it will likely lead to a lack of interaction which will prevent the students from fully benefiting from the cooperative learning experience (1992). There are several differences between students learning beneficial for cooperative learning, however differences in student achieving levels can be detrimental which will be taken into account in the design of the student seating positions in the classroom.

Table 1: Comparison of classroom characteristics

Article	Case Study	Students		Classroom Characteristics
		Grade	Class Size	
Armstrong and Chang, 2007	No	13+	350	Tiered row and column
Bicard D. F., Ervin, Bicard S. C. and Baylot-Casey, 2012	Yes	6	21	Row and column: Student versus teacher selected seats
Çinar, 2010	No	13+	Varried	Row and column
Hood-Smith and Leffingwell, 1983	Yes	4-6	34	Row and column arrangement changed to semi-circle
Kaya and Burgess, 2007	No	13+	30	Row and column, group clusters, and semi-circle classrooms
Kregenow, Rogers, and Price, 2011	Yes	13+	99	Small group setting (9 students per grouping)
Parker, Hoopes and Eggett, 2011	Yes	13+	55	Row and column
Patterson, Kelly, Kondracki and Wulf, 1979	No	-	4	Observation room
Perkins and Wieman, 2005	Yes	13+	201	Row and column
Wannarka and Ruhl, 2008	No	4-8	-	-
Zomorodian, Parva, Ahrari, Tavana, Hemyari, Pakshir and Sahraian, 2012	Yes	17+	190	Tiered row and columns

Methodology

A student seating methodology was created in order to see if ability grouping through student seating arrangement would have an effect on target students' performance. Student performance was observed from three different sources including test scores, video recordings, and student surveys. The study occurred over the course of a geometry unit in two 8th grade pre-

algebra classes in an urban school district. The classes chosen met every day for 84 minutes for the entire duration of the gathering research data. The classroom was arranged in a traditional rows and column layout with the teacher's desk located in the front right hand side of the classroom. Appendix A illustrates the layout of the classroom.

A seating methodology was created and used to alter the seating position of the students in the classroom based off of the students test score. Using the student test scores initially from the end of unit test in the previous unit, students in the class were then each given a rank based on the grade that they received on the test. The student who scored the highest on the exam was given number 1. The student with the second highest score was given the number 2. This ranking system was continued for the entire class of 20 students. If two or more students received the same score on the assessment then the students were ranked alphabetically.

The number given to each student determined their seating position in the classroom through the following seating method to create student groups in the classroom. Starting in the first row closest to the door students placed in the second quartile of the class (numbers 6-10) were alternatively sat with students who place in the bottom (number 16-20) of the class based on the ranking system described above. After the first row and part of the second row was filled, students with the top scores in the class (numbers 1-5) were seated alternated with students whose scores were in the third quartile of the class (numbers 11-15) until the entire classroom was filled. With 26 available seats in the class and a total of 20 students, a desk in each of the first three rows was left empty in order to accommodate for students to work in groups of two. The seating positions are illustrated in Appendix B in the seating position diagram. The alternated seating placement helped organize student groupings to facilitate interaction. While the students were split up into groups with varying student performance, highest performing

students were specifically not paired with the lowest performing students to avoid the failure of interaction in low and high achieving student pairs that Mulryan cautions about (1992). In addition the lowest academically achieving students were placed with the closest proximity to the front of the classroom and teachers desk to hopefully further encourage participation and active involvement in class.

In order to compare if the seating methodology helped improve the overall class a second class was also utilized in the study. The seating positions of all of the students in the class were determined through randomizing with a computer software program. The second class of 23 students was given the same instruction as well as assessments the focus class, including the same concentration on having students work with their seating partners and small groups throughout the unit. This method aligns with the previous method of assigning the students seating positions in the classroom. Data collected from the two different classes will be compared to see if strategically placing students in the classroom has any impact on the academic performance.

At no time throughout the data collection time were students in either class were notified or aware of the intentions of the research study or the seating methodology used for each of the two classes. Over the course of the study students were instructed to work in either groups of two or four students depending on the task. The groups were determined by the students seating position. Students sitting next to each other were called the students seating partner (three groups of two in the first three rows). When working with groups of four students groups was also decided by the students seating positions. The first four students in each row formed the first four groups. The final group of four was comprised by the last two students seated on the right in the second and third row of desks.

Results

The seating position chart was used three times throughout a seven week geometry unit. The original seating positions were altered at the beginning of week four through reapplying the established seating positions in Appendix B after taking a quiz at the end of the third and the fifth week of class. The cumulative quiz and test scores from the geometry unit was used to re-rank the students after each quiz, altering their original seating position. The second class with the random seating position was also altered at the end of the two quizzes as well.

Student Academic Performance

The student scores on the quizzes and exam were collected throughout the duration of the unit. While the first two quiz scores were used to determine the seating position of one class, the scores were also collected for further analysis. The average test score for the entire class, the top quartile, and the bottom quartile of student scores on each assessment is documented in Table 2.

Table 2: Student assessment scores

	Random Seating			Academic Based Seating		
	Quiz 1	Quiz 2	Test	Quiz 1	Quiz 2	Test
Top 25% of Students	95.6%	94.8%	98.7%	94%	92.8%	97.6%
Lowest 25% of Students	72.4%	65.2%	65.9%	49.6%	43.4%	45%
Class Average	89.4%	79.7%	83.1%	78.8%	68.3%	72.8%

Over the course of the three given assessments students placed in the random seating positions consistently scored an average of 10.8% better compared with the class with the test scored based seating positions. This is consistent with the average class scores from previous units which indicate the seating positions of the students had no significant effect on the test scores of the class average. In addition the range between the top quartile and the lowest quartile of the students remained rather consistent on each assessment in both classes. The seating position

changes between the classes had no noticeable effect on the overall class average on classroom assessments.

Student performance on classroom assessments can vary significantly. Factors such as the time of day, if the students eat breakfast, the amount of sleep the students got the night before, and the student mood are all different factors that are out of a teachers' control which can affect a students' score on any particular day. In addition classroom instruction such as the content being taught, the way the content is taught, the pacing of the class, and days absent will have a significant effect as well. For that reason the student assessment scores are expected to fluctuate on every assessment. Overall the class with the random seating positions had three students remain in the top 25% of the class for all three of the assessments, two students remain in the top on two of the assessments, and 2 people score in the top on only one of the assessments of the unit. There were also three students who remained in the bottom 25% of the class for all three assessments, one student who remained in the bottom for two assessments, and four students who have remained in the bottom for only one assessment. For the class with the seating position determined by test scores there was also three students who were in the top 25% of the class scores on all three assessments, no students who scored in the top two assessments, and 6 students who scored in the top on only one of the three total assessments. There were no students who remained in the bottom 25% of the class scores for all three assessments, seven students who scored in the bottom on two assessments, and one student who scored in the bottom on one assessment.

Despite having a similar range of between student scores in the top and bottom of the class, more students scored in the top quartile in the class than students in the strategic seating placement had more variation in student test scores. No students consistently scored in the lowest

quartile of the class for all three assessments. There was more mobility in students test scores in the class with the altered seating positions. As previously stated student performance on assessments are expected to vary, so the mobility of the students in the class with a seating methodology cannot be directly attributed to the student seating position. This relationship was further evaluated through student responses to the survey given after each assessment.

Students' Perceptions of Cooperative Learning

In addition to the students' performance on the unit quizzes and tests, data was also collected through a student survey and video recordings of the class. Students were given the survey in Appendix C after each of the unit quizzes and unit test to observe the students perceived value of their cooperative learning group throughout the course of the unit as well as their overall opinion on cooperative learning.

The survey was given after each alteration of the classroom seating arrangement and the average score the students gave each question are illustrated in Tables 3 and 4. The first question asked students to rank on a scale of 1 to five how well the student felt they worked with their seat partner. The average of the 39 students' response to the first survey question is listed in table 3.

Table 3: Average student responses to survey question 1 for all three assessments. The description of the five point scale utilized to evaluate students is included on the survey in Appendix C.

Table 3: Average student responses to survey question 1 for all three assessments

	Random Seating	Academic Based Seating
Top 25% of Students	3.6	4.11
Lowest 25% of Students	4.17	3.5
Class Average	4	3.6

Students in the top quartile of the random seating position liked working with their seat partner more than students in the lowest quartile of the class. However this was the opposite for the class

with the ranking based seating positions. In this class the top five students on each assessment liked working with their seat partners more than the students who test score was in the lowest quartile of the class.

The second question on the survey asked students to rate if cooperative learning, working in pairs and groups has impacted their learning. Once again the students rated their opinion on a scale from 1 to 5 and the students average rating was calculated for the student responses after all three major classroom assessments in Table 4.

Table 4: Average student responses to survey question 2 for all three assessments

	Random Seating	Academic Based Seating
Top 25% of Students	4.4	4
Lowest 25% of Students	4.17	3.33
Class Average	4.31	3.7

Students in the randomly determined seat classroom despite a lower belief in the effectiveness of their groups, rated cooperative learning in groups as partially helpful in helping them learn mathematics. Interestingly in both classes students had a higher average belief that working in pairs helped them learn mathematics even when they rated working with their seat partner as not effective.

There were several different trends in students' answers to the final survey question. Students were asked to generalize their results for the entire unit. Overall there were 39 student responses, 20 students in controlled seating positions and 19 students in the randomized student seating position class. While students responded to the question after every unit assessment the final survey results was used to analyze the students developed perspective on cooperative learning at the end of the unit. Overall the student responses were categorized into one of the four categories. The responses from students in both classes are included in the following examples of the four categories established.

The first category is comprised of students who felt that working with their seating partner was not beneficial throughout the duration of the unit. Six students in the randomly assigned seat class and five students in the ranking based seating positions maintained the belief that working with seating partners did not help them learn throughout unit. Responses include:

- *“No, I work better with people of my own choice. When we are aloud to work with seat partners, I normally don’t.”*
- *“No, because they don’t help much”*
- *“No because some just use others around you cheat”*
- *“Not really, made me hate people more”*
- *“No, he dosent do anything. But I help him”*

The second category includes students who recognized both positive and negative aspects of working with their seat partner. Two students in the randomly assigned seat class and three students in the ranking based seating class had responses that fell into this category.

- *“I think it really depends on who you are sitting by if it is someone you normally talk to in or out of school you will have a better working experience with them.”*
- *“Yes and no because sometimes they can help and sometimes [he] only makes me confused”*

The third category include student responses that working in pairs was beneficial. Ten students in the randomly assigned seat class and ten students in the ranking based seating class had responses that fell into this category.

- *“Yes. Because we have different opinion/answer in a question and we got to discuss it and it all made sence”*

- *“Yes, because you can see their perspective on something and share ideas if you missed a piece of data or step they can catch you and tell you what you did wrong and help you.”*
- *“Yes because I sometimes ask questions about the subject if I don’t understand.”*
- *“Yes because if I don’t understand something instead of raising my hand and waiting I can just ask”*
- *“Yes because you have someone to check your answers and you can work together with them on thing to make it go faster.”*
- *“Yeah because sometimes say you didn’t know something how to do something and they can help explain to you how to.”*
- *“Yes cause I can actually talk to the person I sit by”*

The fourth category of student responses include students who did not answer the question or put an off topic remark down instead. One student in the randomly assigned seat class and two students in the ranking based seating class had responses that fell into this category.

The students who replied no to the last survey question was further examined and compared with their seat partners answers. These students were typically paired with other students who scored the first question very low because they did not work well together or a higher scoring student who liked to work independently.

The seating methodology based on student grades prevented the highest scoring students from being paired with other highest scoring students and the lowest scoring students being paired with other lowest scoring students, which was observed in the class with the random seating arrangement. In these pairings the students had mixed responses to the first two survey

questions. One pair of students scoring in the top quartile of the class both rated working together high, 4 on question 1) but did not like working in groups because “[he] *slowed me down.*” However a second pairing of high scoring students was formed in the randomized class and both of the students answered with 4 or 5 for questions one and two of the survey.

Similarly there was one random seating chart the paired together two of the lowest scoring students together. This group struggled to finish any of their work on time and needed a lot of guiding and assistance from the teacher throughout the process. One of these students gave a 3 on question 1 and a 2 on question 2 while the other student rated both questions with 3, neutral. These particular students were unmotivated and rarely finished any of their work.

While the seating methodology chart class did not have any of the highest or lowest scoring students grouped together, there were still several concerns in groups. For example the student who answered that the groups were not beneficial because “*he dosent do anything. But I help him*” answered 1 on question 1 but 5 on question 2. That student paired with a student in the lowest quartile of the class actually significantly helped the student improve his grade on the next assessment out of the bottom quartile of the class and into the 50-75th percentage of the class scores. That student rated both questions as a 5. Despite the higher scoring students opinion of working with the seating partner in the class, the group was still highly effective in increasing both group members scores significantly on the next unit quiz. In each class there were several different individual cases in which the established groups were ineffective or effective.

Additional Classroom Observation

Overall by the final survey of the units most students were able to identify at least one beneficial aspect to working with their seat partner. This was noted as a change throughout the three random days chosen for video recording. In the first video from the second week of the

unit after introducing the activity to the class a student asked if they could choose their own partner before I gave the instructions to work with their seating group. Three students sighed or gave a nonverbal cue to their disappointment in my answer as well. In addition two students commonly left their group (turned around in their seat) in the middle of the cooperative learning activity to talk to students not in their group. As students became more familiar with working in their assigned groups there was no complaining about the groupings in both the second and the third lessons recorded.

Discussion

Students became more accustomed to working in their assigned cooperative learning pair throughout the unit and in the end majority of the class perceived some value in working in cooperative learning pairs. Statistically there was no difference in range or average student test scores between my two seating methodologies. However the controlled seating to create specific learning groups prevented the grouping of two top achieving or two lowest achieving students. These groupings did not maximize the students learning potential. The highest achieving students typically worked independently on all of the work, finished faster than majority of the groups, and then distracted other groups (observed in the second randomly recorded class). On the other hand the groups of the lowest achieving students paired together really struggled with the content and almost always were not able to figure out the problems independently as a group. While a majority of the randomly chosen groups worked well together the seating methodology helped form groups where all students could be challenged by the content. While a direct academic impact of the student seating arrangement was not observed, there is further potential for seating arrangement to be explored. While this particular seating methodology did not have a

major impact on the class, modifications and specific grouping with specific learner needs in mind should be further explored.

It is important to note that a grade on a particular assignment does not accurately describe a student's ability level but is only a snapshot of the students' knowledge on that particular day. This resulted in a constant fluctuation of student grades on each of the unit quizzes and test. Therefore after each test the student seating partners did change for the class the seating chart was applied to in addition the other class receiving new random seats. Despite the different methodologies in student seating placement overall there were both ineffective and effective groups formed. The motivation and participation in class is ultimately the decision of each student. In both classes there were equivalent pairings of both ineffective and effective groups. If furthering this research, I would like to expand to try to see if any other seating methodology could create a greater difference in the students' performance.

It is important to note that throughout the course of the unit students did not have the opportunity to work with their seating partners every day. Cooperative learning strategies were used throughout the lessons when appropriate to potentially enhance student learning. Majority of the opportunities for cooperative learning utilized the student seating partners, however there were a few time which students had to work in groups of three to four, which was also based on student seating position.

Throughout administering this study, I encountered several different limitations to the process which could potentially have significantly influenced my results. In the study over 7 weeks of a unit, student seating positions were altered a total of three times according to the established methodology. Perhaps more of an impact would be observed when students have more time to establish more of a working relationship with their seat partner. If the duration of

the experiment was extended or if a third class. In addition the week before the final unit exam was the schools spring break. Overall class focus and behavior after break corresponded with less active participation in class for the last week before the final unit test impacting several individual student grades. In the fourth week of the study a new student joined the class with a random seating placement but was not counted in any of the data.

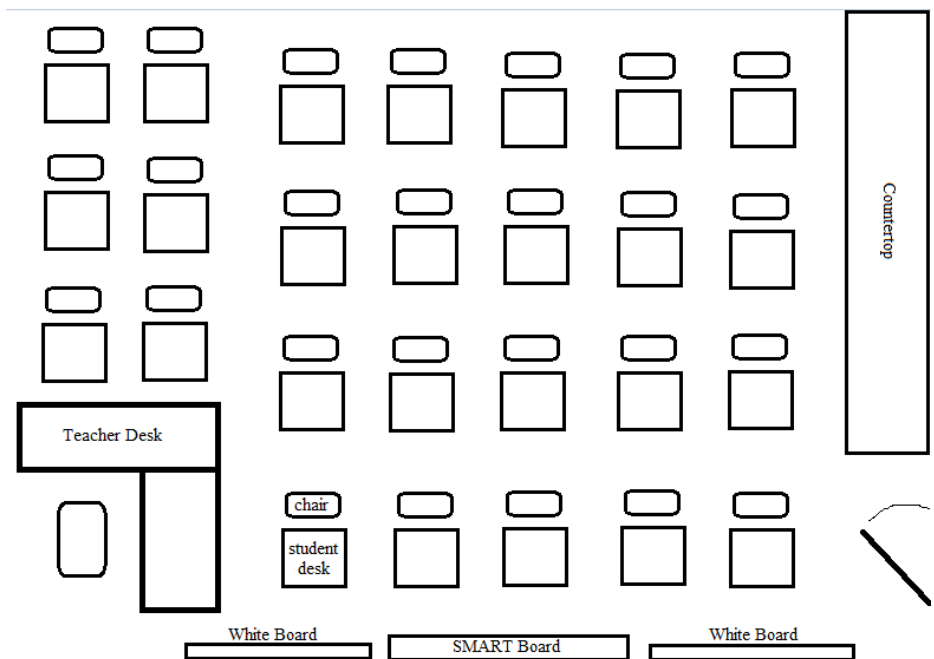
As a potential future educator and a lifelong learner following the process of performing action research has influenced my perspective. When approaching my research question, I attempted to design my study to collect as much quantitative data as possible for analysis. I did not take into account the vast array of factors that can significantly influence a class making quantitative data difficult to collect and draw valid conclusions from. I discovered instead that the qualitative data collect in the survey of the class as well as the class video recordings gave me the most insight into answering my original research question. These valuable lessons will help me design and implement research questions in the future. If given the opportunity, I would love to continually expand upon performing action research in my classes.

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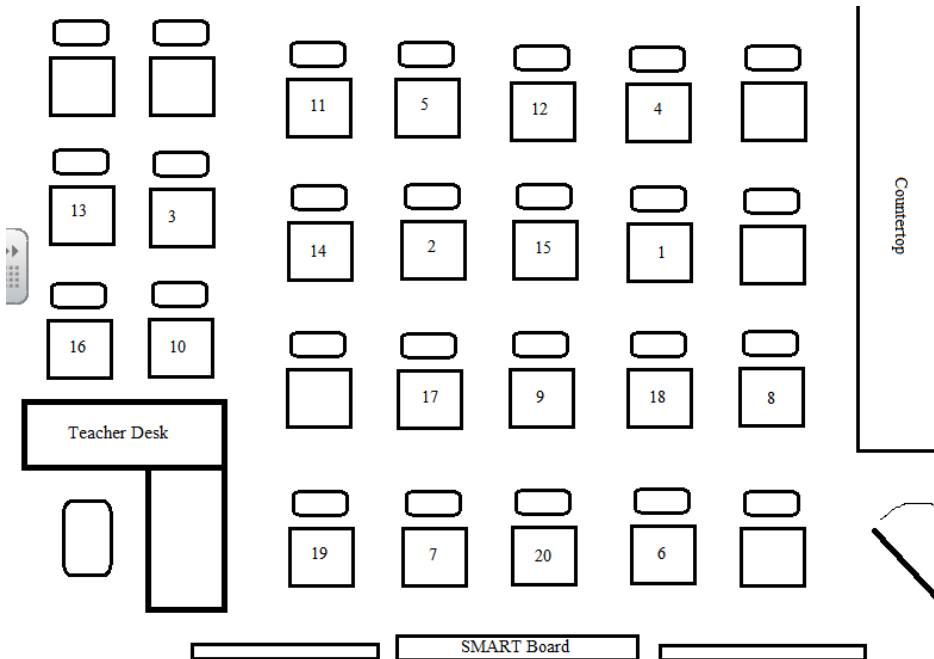
Appendix A

Classroom Layout Figure



Appendix B

Student Seating Position Figure



Appendix C

Student Survey Questions:

For the following questions please rate on a scale of 1 to 5 on how the following has helped you throughout the past lessons on a daily basis.

- 1 = Not helpful at all
- 2 = Mostly not helpful
- 3 = Neutral
- 4 = Partially helpful
- 5 = Very helpful

How well do you think you collaborate and work with your seat partner?

1 2 3 4 5

Does working in pairs or groups help you learn mathematics?

1 2 3 4 5

Was working with your seat partner beneficial? Why or why not.