CLASSROOM SEATING LAYOUT CONNECTIONS TO STUDENT ACTIVE LEARNING ENEGAGEMENT

by

Michael Philip Barbaccia

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DEDICATION

This work is dedicated to my parents and grandparents who encouraged me to pursue this degree. Through your examples, I have formed a passion for becoming a lifelong learner. It is with your love and support that I have been able to accomplish my goals and dreams.

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ABSTRACT

Does the furniture layout in the science classroom contribute to student active learning? This question was investigated by strategically implementing three lesson-specific seating layouts for students in the science classroom. The first seating layout was traditional, placing students in rows closely bound together in the classroom. This layout allowed students the opportunity to talk with those around them; however, it limited the amount of space they could move. The second seating layout was designed to be more open, utilizing a lab-style theme which spaced students around the perimeter of the classroom while leaving the middle open for student activity use. The third seating layout was designed to be more communicative, using a circle fishbowl-style design that encouraged students to collaborate with others around them. Through qualitative surveys, student focus groups, and quantitative observational tally sheets, differences in student behavior were observed to determine if there were any changes in active learning behavior. Active learning behavior was categorized into three categories which included student-to-student interactions, student-to-teacher interactions, and the usage of educational zones. The data collected from the study showed an increase in student willingness to engage in active learning behavior while implementing these lesson-specific seating layouts. The conclusion reached from this study was that developing thoughtful, lesson-specific seating layouts is a powerful method educators may consider for increasing student active learning behavior in the science classroom.

INTRODUCTION & BACKGROUND

Context of the Study

Yuba City is a small, Northern California city, about an hour north of Sacramento, with a population of about 70,000 residents (U.S. Census, 2021). Yuba City Unified School District (YCUSD) manages 17 schools throughout the Yuba Sutter region and is responsible for the education provided to roughly 13,000 students ranging from kindergarten through 12th grade (YCUSD, n.d.). My school site, Riverbend Elementary, is a relatively new school, now in its 16th year, and currently has 1,004 students enrolled in its kindergarten through eighth-grade offerings (Public School Review, n.d.). I have been teaching middle school science at Riverbend for the last four years and was part of the decision-making processes for adopting the Next Generation Science Standards (NGSS) certified curriculum. This year, I have a total of 119 students spread over five periods of 7th & 8th-grade general sciences, which meet every day. In these classes, 65 students identify as male and 54 identify as female. There are a total of 11 students with active Individualized Education Programs (IEP), a total of five students with active 504 plans, and a total of 17 students who are English Learners (EL) (Aeries Classroom Gradebook, 2023). Many of the English learning students at Riverbend speak a first language of either Spanish or Punjabi. Due to the largely Hispanic and Indian population found in the Yuba Sutter area, many EL students from Riverbend regularly travel to their home countries throughout the school year to visit family. This poses as a learning challenge to their teachers to maintain a consistent structure that allows students to achieve all grade-level standards.

California imposed some of the strictest school shutdown regulations in the United States during the 2019-2020 COVID-19 pandemic. As a result, students at Riverbend were isolated from their peers for a total of 13 months. The only educational engagement offered to students was served through Google Meets and Zoom calls. Throughout my five years as an educator, I have witnessed a lack of student motivation and a strong unwillingness for students to work effectively with one another. As a strong proponent of NGSS, this has led to another challenge, as many of my NGSS-inspired lessons focus on a student's ability to collaborate and participate to show mastery of standards, and more importantly, take advantage of the learning space given to each student in science class.

As a part of my action research, I am examining ways that allow students to reengage in their education, build upon collaborative efforts, and become effective scientists who are willing to work hard to achieve their goals. By assessing thoughtful classroom layouts tied to specific science lessons, I believe this could be one way to positively encourage an increase in student active learning.

Focus Question

My focus question was, What are the effects of implementing thoughtful furniture layouts in the science classroom and their contribution towards an increase in students' willingness to engage in active learning?

CONCEPTUAL FRAMEWORK

Time for an Update

Science education has experienced many changes over the last decade. Through these changes, students have been asked to engage in new ways of learning which has forever shifted how science is taught. Science education at the K-12 level is now taught with an emphasis on science, technology, engineering, and mathematics (STEM). This new approach encourages students to engage in processes that promote desperately needed STEM-related careers and provides practice using a critical thinking mindset. As a method for teaching STEM-related content, the inquiry-based teaching model was developed and implemented as a part of the Next Generation Science Standards (NGSS). NGSS encourages students to focus on the process of learning science, observing phenomena, and correctly explaining the processes being observed. This new way of teaching science quickly replaced the outdated model of passive learning which includes lengthy lectures, memorization, and multiple-choice testing of various scientific information (Abdi, 2014; NGSS Lead States, 2013).

The inquiry-based teaching model has caused science educators to shift their emphasis to incorporate collaborative, inquiry-based, active learning lessons, which challenge students to take responsibility for their learning. There are seven segments to fully complete the engagement aspect of scientific inquiry starting with the phenomenon. For a student to be fully committed to the concepts they are learning, there must be a high level of motivation. Kids are curious and want to know why things behave the way they do. Carefully crafted phenomena provide students with the buy-in needed to become fully invested in the inquiry process. Next, a focus question needs to be asked. This allows the student to take the phenomenon, as stated in segment one, and begin developing the parameters of what specifically they are trying to accomplish. The question asked allows the student to fully connect to the phenomenon they observed, and the question they are trying to answer. The third piece to this list is the planning segment, more importantly, planning the formal investigation. Students must spend time thinking about what practical ways must be considered to fully answer the question they are asking. The fourth segment is then to conduct their investigation. Here, the student follows the plan that was carefully developed, which data and evidence are then recorded. This data and evidence are then analyzed in segment five. Once this has been accomplished, students are ready for segment six, which focuses on constructing new knowledge. Students must have the ability to make sense of their data and find ways to provide reasoning to connect their evidence to their initial claim. Finally, in the seventh segment, students must find ways to communicate their newly found knowledge to others. It is within these seven segments that students are fully invested in the scientific inquiry process (Llewellyn, 2010).

Active learning is a teaching method used to engage students in activities that contribute to their overall learning experiences. Many different methods apply active learning in science lessons, some of which include think-pair-share information, hands-on activities, and small-group exercises; all of these are encouraged through the integration of NGSS. Lessons that focus on implementing active learning teaching strategies yield better learning outcomes than traditional lecturing-styled teaching. To properly implement such active learning strategies in the classroom, educators must be comfortable with the physical space they are given. Active learning is both facilitated and enhanced when the physical space provided allows students to make the most of the active learning opportunities. It is unrealistic for all students to be fully engaged in active learning if they begin lessons disadvantaged due to a lack of thoughtful classroom physical layouts. It was suggested that assessing planned lessons before teaching, which ensures the physical layout of the classroom, creates a least restrictive learning environment for all students (Brent & Felder, 2016; Chang-Tik et al., 2022).

It is important to remember that all decisions made by an educator signal a message to students. Nonverbal communication is interpreted differently by each student. From the signs posted in a classroom, to the additions of graphics on lab papers, to the physical layout of desks, all physical components of a classroom are noticed by the students who occupy the space. One of the many jobs of the educator is to create a physical classroom environment that is appropriate for the lessons and ideas they wish to implement. Teacher movement, student movement, student flow, student workspaces, student desks, teacher desks, and storage units are just some of the many aspects an educator must consider when designing the physical layout of their classroom (Sommer, 1977).

The Physical Classroom Layout

There are many components of a science classroom that contribute to its physical layout. Throughout years of study, researchers have observed the many connections between the classroom, physical layout, and students' success in school. Student success has been measured in the form of test scores, active participation, and overall classroom management. While determining which classroom layouts are best, it is important to remember that classroom design, seating arrangement, and wall decorations are all part of a fluid spectrum that teachers change over time. Simply put, there is no best classroom layout, one must plan accordingly to best address the learning needs of all students. In one example, desk layouts were investigated to identify which layouts best lend aid to student assessment and contributed to an overall increase in active participation. This concluded that in the fourth-grade classroom, to increase class collaboration and motivation, desks should be oriented in ways that allow students to see one another (Rogers, 2020).

Specifically, the experiences of students in a traditional classroom setup were observed. Data collected after teaching the first few lessons of a new school year, students showed extreme boredom. Some students would only look at their hands, and some students would only look at the clock. There were very few students who looked interested in what was being taught at the front of the room. It was considered that maybe the lesson style and layout of the classroom were to blame, not the content being taught. It was at this point a change occurred. Desks were rearranged to face one another, which provided students additional opportunities to get up and move to other areas of the room during lessons and created more learning spaces in the classroom with meaningful purposes. These changes provided students with an alternative to the traditional sit-and-listen style of learning they knew too well. With a critical mind assessing the physical layout, there was a reported shift in overall behavior and participation among students (Almer, 2022).

In another study, overall classroom design implemented by educators and their impact on student learning, student motivation, student collaboration, and classroom management were observed with eighteen unique seating arrangement options. Each of the seating layouts includes a brief description of the subject and lesson type that best represents each desk layout. Additionally, one needs to consider the physical size and shape of the classroom. For example, some desk arrangements simply cannot work in smaller-sized classrooms. As with many aspects of teaching, there are pros and cons to the seating layouts available and the contributions made by the arrangement of the physical layout of the classroom. One conclusion that was drawn included that many aspects, or tone, of a classroom can be attributed to the overall design, layout, seating arrangement, décor, and lighting positions. It is the combination of these factors that leads to a successful, meaningful classroom layout (Dahlgren et al., 2022).

This tone generated by the physical layout of the classroom is connected to students' collaboration and active participation. Griffith University in Australia (2013) studied the effectiveness of linking the classroom layout to student collaboration during self-led accounting-based lessons. To change students' apprehension and encourage collaboration related to accounting-based information in an accounting-level college course, the classroom layout for students was changed dramatically. The rearrangement of the classroom, including the desks and chairs, encouraged student face-to-face interactions, desks were pushed together to form table groups, and students were invited to move to areas in the room where they felt most comfortable. Implementing these physical classroom changes lowered the anxiety levels of students, who originally felt uncomfortable speaking in a room full of strangers. As a result, the changes made to the physical layout of the classroom, which heavily consisted of the movement of desks and chairs, contributed to the overall increase in student collaboration, student motivation, and active learning (Rae & Sands, 2013).

Next Generation Science Standards

The Next Generation Science Standards (NGSS) was developed in 2010 by the National Academy of Science, the American Association for the Advancement of Science, and the National Science Teachers Association (NSTA). Throughout its creation, attention was given to a two-step process to create instructional flexibility for all involved in science education. The first step included a framework report. This report, which was developed using the most current information at the time regarding science education, helped identify the content for students in the K-12 grade classroom. The second step focused on specific research involving the pedagogy of the methods used to deliver instruction. This was a collaborative effort made by the National Research Council (NRC) Framework for K-12 Science Education. This included input from 26 states and 41 writers. Information was gathered, organized, and analyzed in further review once more by NSTA. Once finalized, NGSS was available for states to adopt as a science curriculum in 2013 (NGSS Lead States, 2013).

The focus for implementing NGSS in the science classroom was to help prepare K-12 students to be college and career-ready, with an emphasis on critical thinking by the time they graduate high school. In science education before NGSS, students were graduating from high school ill-prepared to enter college or careers with a critical-thinking mindset. NGSS provides students with the opportunities to practice their critical thinking skills, problem-solve real-world scenarios, and accept or reject claims based on evidence and reasoning. In turn, students become well-equipped to enter all areas of life with the knowledge of specific scientific phenomena, critical thinking skills, and the ability to use inquiry-based problem-solving. To best address the claims and goals NGSS offers, each standard is divided into a three-dimensional approach, (a)

Engineering Practices, (b) Crosscutting Concepts, and (c) Disciplinary Core Ideas. It is through these interwoven components that students practice using their scientific abilities to ask and solve problems that lead to meaningful science education (NGSS Lead States, 2013).

Collaboration plays a vital role in implementing NGSS in the science classroom. As students are building their library of knowledge through active learning strategies, they must be engaged with others to support their learning. It is through this collaboration that students can present information, argue for or against claims, and receive feedback from their peers (Chang-Tik et al., 2022).

Active Learning

Many different types of students occupy educators' classrooms. Some students come to school each day with a pencil and a notebook in hand, ready to engage in the day's lesson. These students are highly engaged in their learning needs and consistently amaze their teachers with their detailed work. Of course, there are less motivated students who come to class ready to do whatever is asked of them, but not much else. These students are responsible; however, they lack the full commitment necessary to take charge of their learning. Next, some students occasionally show engagement with their education, but not often. These students will sometimes complete their work, but it can be rare and a challenge for the teacher. These students need constant reminders to engage in the learning process. Finally, some students actively try to avoid all tasks related to their education. These students are difficult to motivate and usually contribute to some of the classroom management challenges faced by their teacher. Considering this large array of student perspectives, teachers must work diligently to find ways to encourage all students to be highly engaged in the day's lessons, even those who do not want to be. To best address all students' unique needs, teachers must incorporate active learning strategies that allow students to become responsible for their learning which leads to higher motivation. It is only then that all students become fully responsible for their learning and take back control of their education (Harmin & Toth, 2006).

There are four parts to consider when applying active learning strategies to lesson plans. Part one is to identify a realistic target to implement that allows students to engage in the classroom environment more fully. This can be something as simple as asking open-ended questions or asking for feedback on how things are going in the classroom. By doing this, educators are providing opportunities for students to engage in active learning in a low-stress environment. Part two is adjusting one's current teaching approach to incorporate research-based, active learning strategies. Some active learning strategies may be more appropriate than others based on the various lessons being taught. One might start by researching active learning strategies to address specific types of issues in the classroom and ways to resolve such events. Part three focuses on striking a balance for the implementation of selected active learning strategies. It is important to remember that teachers are humans who deal with multiple factors fighting for their attention. Knowing when and how to appropriately implement active learning strategies is important both for the teacher and students. Finally, step four suggests that educators share their active learning strategies and experiences with others for honest feedback. (Harmin & Toth, 2006).

METHODOLOGY

Treatment

When considering which students to use for this treatment, it was important to capitalize on student experiences and time spent in a traditional classroom with traditional seating layout experiences. I chose my three 8th grade class periods, as they are the oldest of all students at Riverbend Elementary and have the most experience in the classroom (*N*=75) (Table 1). Each day, I met with my fourth, fifth, and sixth-period students in 52-minute-long class periods in my science classroom.

Table 1. Classroom demographic data.

Science Period	Number of Students (*N*=75)	Male	Female	English Learners (EL)	Special Education (SPED)
4	29	17	12	1	6
5	17	5	12	2	3
6	29	17	12	5	4

The focus of the treatment was to intentionally place students in various seating layouts in the science classroom and challenge their ability to become more responsible for their learning. The goal was to allow students to take advantage of the physical space provided to them in the science classroom to engage in active learning strategies. There were a total number of eight desks used to create the various seating layouts for this study. Although the desks were at different heights, this was not an important variable to consider while arranging the desk layouts. Participation in this study was voluntary and did not affect a student's overall grade. Students began the nontreatment portion of this study using a traditional seating layout. This arrangement initiated and created a baseline for the research as the desks were arranged in rows, relatively close to one another, and did not provide students with any specified area for supplies or activity-related information. This layout was chosen as the baseline, as most students are familiar with this layout and have had the opportunity to engage in their learning in this style of desk arrangement (Figure 1).

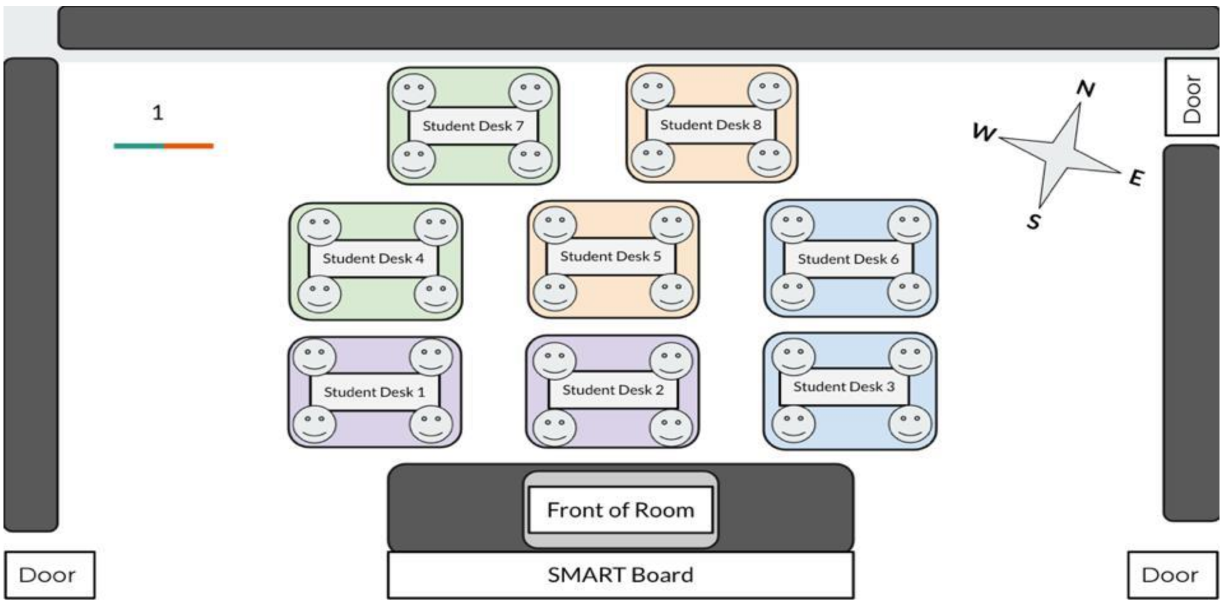

Figure 1. Traditional nontreatment seating layout map of classroom, Seating Layout #1.

Two separate treatment seating layouts were then implemented to observe the differences in student effort, collaboration, and active learning engagement based on the physical layout of the classroom. The first of the two treatments implemented were desks arranged in a lab-style layout; desks arranged around the perimeter of the classroom, leaving the middle of the room open for a materials station. This seating layout focused more on allowing students the physical space needed to engage in science lessons and to find practical spaces to complete their science assignments (Figure 2).

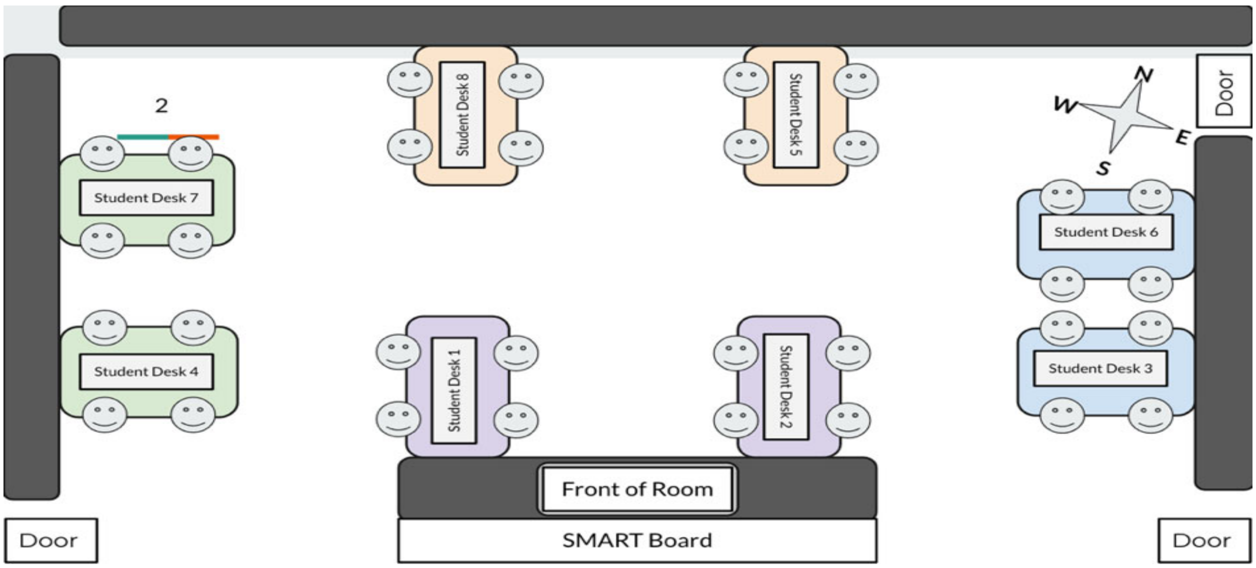

Figure 2. Lab-style treatment seating layout map of classroom, Seating Layout #2.

The second treatment used desks arranged in a square formation around the center of the classroom. This allowed students space in front and behind to work on projects and an open middle area to view demonstrations. This seating layout focused more on communication, allowing students the opportunity to engage more easily with communication from a variety of peers surrounding them (Figure 3).

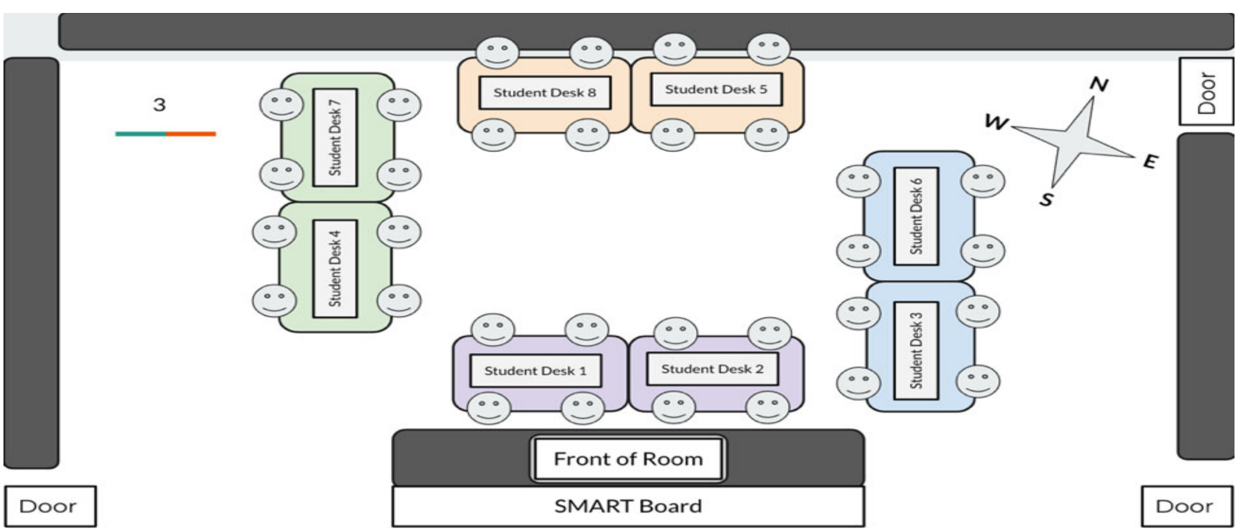

Figure 3. Fishbowl-style treatment seating layout map of classroom, Seating Layout #3.

At the beginning of this research, students were partnered in groups of four to sit randomly with three other peers. It should be noted that if the class size of students did not allow for full groups of four students, a group of three students would be created instead. The randomness of student seating charts was created utilizing the Aeries seating chart organizer. Aeries is Riverbend Elementary School's online grade and attendance data program, which integrates seating charts to assist teachers with taking attendance each class period. Once the initial student groupings were created, I made slight modifications to assign students more strategically to their groupings of four as needed. These groupings of four students stayed together throughout all seating layouts to maintain consistency throughout research. In each different classroom layout, students were asked to engage in a week-long science lesson that each concluded with their own summative, performance-based assessments.

A data collection instrument list was created based on the nature of my focus statement and the demographic information among my student population. This list allowed students multiple opportunities to express their reasoning and feelings based on their classroom experiences. Based on research into data collection methods and tools (Mertler, 2020), Surveys inspired using Likert scales, classroom observations, and student-focused groups were identified as the most appropriate instruments for data collection in this study. These data collection tools were approved by the Montana State University Intuitional Review Board (Appendix A).

Data Collection and Analysis Strategies

To record a student's shift in attitude towards different seating layouts, the Pre- and Post-Survey for Seating Layout were given at three different times (Appendix B). Both surveys implemented Likert-based survey questions using a four-point scale. The four-point scale eliminated a neutral answer response, forcing students to choose either a positive or negative response to the questions asked. The Pre-Survey was administered anonymously before a new week-long classroom layout, and students had the opportunity to individually record their initial thoughts and opinions on how the classroom layout was arranged. Student responses were recorded using paper forms, which were then collected as a method to track and organize student data. The results of the survey were then organized into one of two categories: student opinions on the seating layout itself and the student's belief in how the seating layout would lead them to see, move, and communicate with others. These two categories of data were used when comparing similar post-survey questions and provided the baseline responses needed to determine if an increase in active learning was achieved.

The Post-Survey for Seating Layout was administered at the end of a week-long seating layout period, and students had the opportunity to individually record their final thoughts and opinions on how the classroom was arranged (Appendix C). Much like the pre-survey, student responses were recorded anonymously using paper forms, which were again collected for organization. The Post-Survey questions differed slightly from the pre-survey, as students were challenged to reflect upon their initial ideas of the seating layout. This helped determine if their preconceptions about seeing, moving, and communicating with others during the selected layout became a reality. The answers from the post-survey were then divided into the same two categories as the pre-survey, and the results were compared after converting student responses into percentage values. The differences in percentages compared the measurements made from the pre- and post-surveys to answer the research question, “Was there an increase in active learning based on the seating layout of the classroom?” The comparison also showed changes in students' outlooks for each seating layout, how their opinions changed after participating in the seating layout, and provided the opportunity for students to reflect upon their learning.

The Classroom Layout Attitude Survey was designed to measure student feelings towards seating layouts in the classroom and to identify any common themes or patterns in student feelings involving seating layout topics (Appendix D). The Classroom Layout Attitude Survey was introduced to students at the very beginning of the treatment, and once more after all seating layout treatments had been implemented. This provided data that allowed me to measure changes in student mindsets regarding seating layouts as a whole. This data set was possible due to implementing the attitudes survey before any treatment and after conducting all research, encompassing the research timeline. Much like the Pre- and Post-Survey for Seating Layouts as written above, a four-point scale was used. This Classroom Layout Attitude Survey focused on statements written about seating layouts in the general education classroom and had students evaluate their own beliefs on how seating layouts affect their learning ability in school. The questions written in this survey were derived using the Test of Science-Related Attitudes (TOSRA) Handbook and adapted to best meet the data collection needs of this research (Fraser, 1982). The items in the Classroom Layout Attitude Survey required students to express the degree to which they agreed with each statement given. Using a four-point scale, student responses could include Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). Students were encouraged to answer each question thoughtfully and honestly, as having the most accurate data would help ensure a more suitable seating layout for all. The survey started by asking students to reflect on the amount of time seating layouts change in their school schedules. It then asked students to reflect on how they felt about changing classroom layouts in general, then finally to share any connection they felt between how desks are organized in a classroom and their overall learning experiences. Scores were converted into percentages which was used to analyze the pre- and post-treatment attitude data. This data provided a more realistic understanding of how students regard seating layout designs in their daily school schedules and how that perception changed over the course of this research.

The Observational Layout Tally Sheet was a teacher-only organizational sheet used to keep a record of active learning behaviors demonstrated by students during summative assessment activities (Appendix E). During the week-long span of different seating layouts, Observational Layout Tally Sheets were used to identify student-to-student collaboration, student-to-teacher collaboration, and student utilization of educational zones. Examples of student-to-student interactions included asking a question, responding to a question, or any form of collaborative attempt made by two or more students. Student-to-teacher interactions included questions asked from student to teacher, a response to a question made by the student from a teacher, or any other form of behavior students exhibited taking responsibility for their learning. Educational zones were designated areas in the classroom that required students to utilize resources related to the assessment activity, either on their own or within a collaborative partnership. Educational zone examples included supply retrieval for activities, a demonstration zone to test phenomena, or a station related to a lab activity. Each type of encounter was recorded with a single tally mark on the Layout Tally Sheet for the given lesson. These tallies were then organized using a Microsoft Excel datasheet, accompanied by utilizing mean, median, mode, and standard deviation. The collection of this data aimed to document the rate at which students engaged in active learning strategies related to collaboration based on the current classroom layout at that time.

For the final data collection method, a series of focus groups were formed and a group discussion, consisting of all focus groups, was held. Eight volunteers per class period were asked to join three separate focus group sessions. These sessions were held at lunch on the last day a given seating arrangement was implemented in the classroom. During these sessions, five to six groups of four students were asked to reflect upon the classroom layout they all had just experienced using the Seating Layout Focus Group Sheet (Appendix F). Student groups were mixed and consisted of students from fourth period, fifth period, and sixth period science. The first question asked focus groups to write down three things they remembered about the seating layout. The purpose of this question was to create a baseline of what the students from various classes remembered about the seating layout. Any reasonable response was accepted, and groups had a chance to share the most memorable aspect of the seating layout in question. The second question asked the focus groups to list two ideas about the seating arrangement that they believed helped them learn science more effectively. This question asked student groups to reflect and record what they liked about the seating layout. Finally, the third question asked focus groups to state one thing they believed about the seating arrangement that made learning science more difficult. This question asked students to reflect on what changes or improvements could be made to the seating arrangement that allowed them to learn in a less restrictive environment. The focus group sessions ended by allowing anyone who wished to stay and provide additional information regarding their feelings on the classroom seating layout. This information was recorded in a specific individual comments section on the form. Both written group responses and individual student responses were recorded and analyzed for common themes. Themes were identified by common words and phrases used in student responses as either positive, negative, or neutral.

Triangulation Matrix

The triangulation methods of these data collection instruments allowed for all data to be gathered in a clear, organized way that directly indicated an answer to the proposed research question. Throughout this process, it was important to collect students' opinions and thoughts on a wide variety of seating layout aspects. This provided a clear understanding of which seating layouts provided students with more opportunities to engage in active learning strategies.

Multiple points of data were used in this research to triangulate both qualitative and quantitative data. By using a mixed-data collection approach, information was organized in ways that were able to indicate if the seating layout of a classroom contributed to a student's willingness to engage in active learning. Since there were many different techniques used to collect data, the nature of this action research study was observational, therefore, it was important to gather enough qualitative data that could additionally be used as quantitative data to make accurate comparisons.

The pre-survey offered students the ability to share beliefs and ideals during the nontreatment portion of each new seating layout. This data was then compared to the post-survey result percentages where students could reflect upon their initial beliefs and challenge them to determine if they were still accurate. Additionally, the seating layout attitudes survey was analyzed comparing percentages to measure a change in student perception and attitude over the time dedicated to the research. The compared results were used to create bar graphs which show the distinction between pretreatment and posttreatment of various seating layouts. The Observation Tally Sheet provided raw quantitative data of active learning behaviors taking place in real-time and comparing that data specifically to different seating layouts. Mean, median, and mode were three data collection techniques used to identify the number of times each active learning behavior was shown. To collect data on mixed student perceptions of overall experience, Seating Layout Focus Group results were analyzed for themes and used to make comparisons with survey results. These mixtures of perspectives allowed students to share their classroom experiences and provided vital feedback to show which seating layouts contributed to an increase in active learning behavior among students (Table 2).

Table 2. Data Triangulation Matrix.

Data Collection Methods				
Research Question	Source 1	Source 2	Source 3	Source 4
What are the effects of implementing thoughtful furniture layouts in the science classroom and their contribution towards an increase in students' willingness to engage in active learning?	Student Pre-/Post Survey Seating Layout (Including Likert Scales)	Observational Layout Tally Sheets	Classroom Layout-Related Attitudes Survey (Including Likert Scales)	Seating Layout Focus Groups (Including Individual Student Interviews)

DATA ANALYSIS

Qualitative Seating Layout Survey Data

Results from the Pre- and Post-Survey for Seating Layout Surveys showed positive changes in student active learning behavior based on the different seating layouts throughout this study. At the beginning of the Traditional Seating Layout, the Pre-Seating Layout Survey showed that five percent of students strongly disagreed, and nine percent disagreed with the statement that the current seating layout would allow them to see everything they needed to be successful in class. Forty-Seven percent of students agreed, and 39% of students strongly agreed with the statement that the current seating layout would allow them to see everything the needed to be successful in class. Five percent of students strongly disagreed, and 11% of students disagreed with the statement that they would be able to move easily around the classroom during this seating layout. Forty-Seven percent of students agreed, and 37% of students strongly agreed with the statement that they would be able to move easily around the classroom during this seating layout. Finally, Nine percent of students strongly disagreed, and 14% disagreed with the statement that they believe they would communicate easily with others while in this seating layout. Thirty-Five percent of students agreed, and 42% of students strongly agreed with the statement that they believe they would communicate easily with others while in this seating layout. One student said, “I think this is boring. I can see the board where I am sitting. I will always stay in my seat during class. I think it will be easy to talk with those around me, but I want a change.”

By the end of the Traditional Seating Layout, the Post-Seating Layout Survey showed that one percent of students at strongly disagreed, and 11% disagreed with the statement that they could see everything they needed to be successful in class. Thirty-Six percent of students agreed, and 52% of students strongly agreed with the statement that they could see everything they needed to be successful in class. Zero percent of students strongly disagreed, and Nine percent of student disagreed with the statement that they could move easily around the classroom during this seating layout. Forty-Three percent of students agreed, and 48% of students strongly agreed with the statement that they could move easily around the classroom during this seating layout. Finally, Four percent of students at strongly disagreed, and 14% disagreed with the statement that they could communicate easily with others while in this seating layout. Forty-Four percent of students agreed, and 38% of students strongly agreed with the statement that they could communicate easily with others while in this seating layout. One student said, "I can see the board and it is very simple so there is nothing wrong with it. Sometimes people's heads get in the way. It was also easy to get around." (Figure 4).

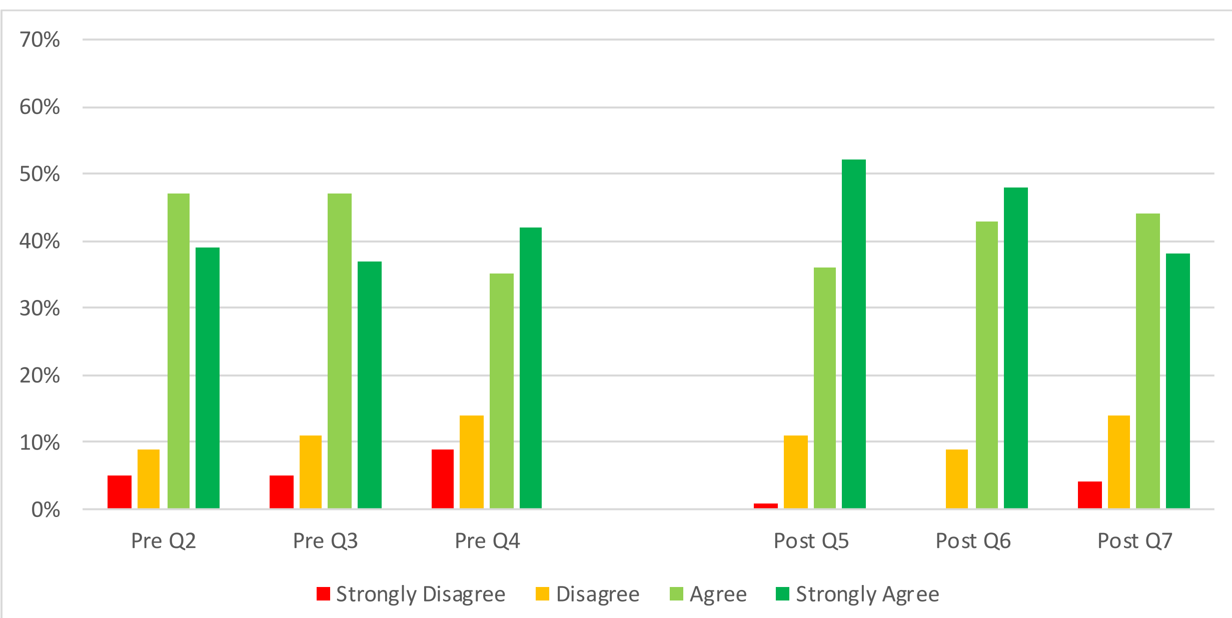

Figure 4. Change in Pre-Survey Data, (*n*=69) and Post-Survey Data, (*n*=56) from the Traditional Seating Layout. *Note*. Q2 & Q5=I would/could see to be successful; Q3 & Q6=I would/could move to be successful; Q4 & Q7=I would/could communicate to be successful.

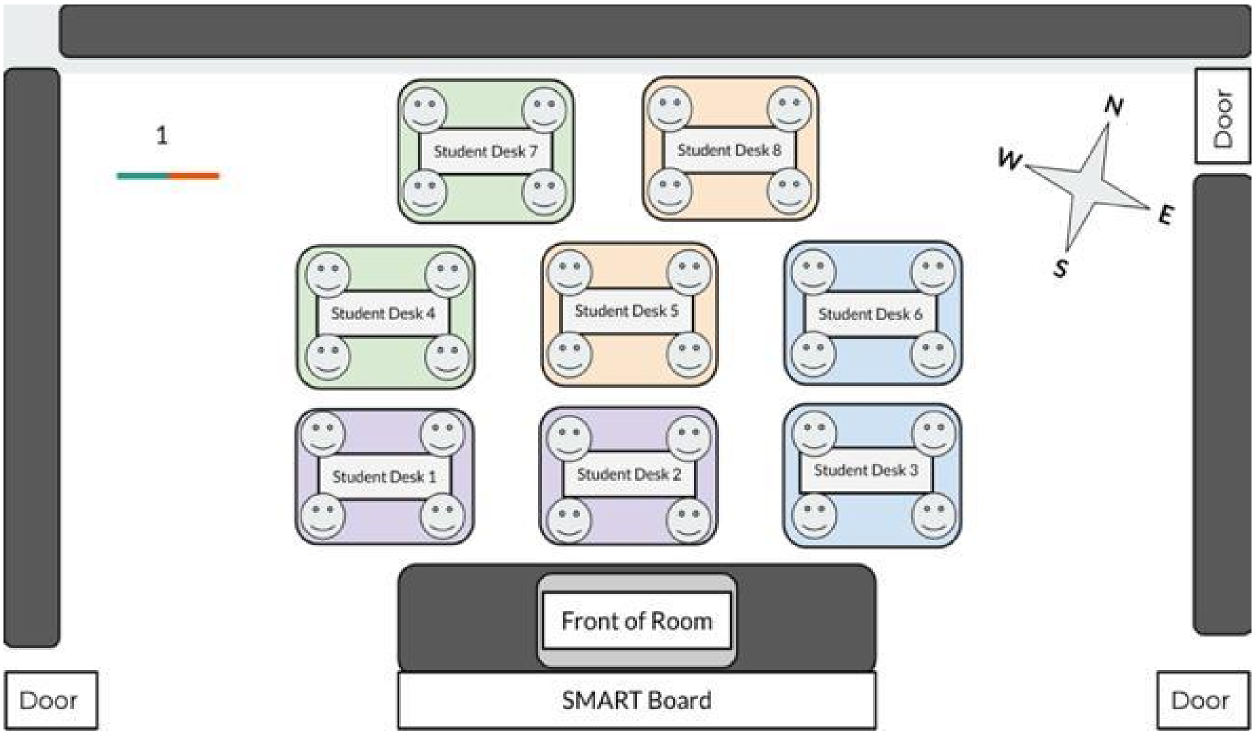

Figure 1 from page 12. Traditional nontreatment seating layout map of classroom, Seating Layout #1.

In the first treatment group of students, who were arranged in the Lab-Style Seating Layout, a larger reported shift in answers to the Pre- and Post-Survey Questions, indicated a notable shift in personal student active learning behavior. At the beginning of the Lab-Style Seating Layout, the Pre-Seating Layout Survey showed that Eight percent of students at strongly disagreed, and Nine percent disagreed with the statement that the current seating layout would allow them to see everything they needed to be successful in class. Thirty percent of students agreed, and 53% of students strongly agreed with the statement that the current seating layout would allow them to see everything they needed to be successful in class. Two percent of students strongly disagreed, and 13% of students disagreed with the statement that they would be able to move easily around the classroom during this seating layout. Forty-Four percent of students agreed, and 45% of students strongly agreed with the statement that they would be able to move easily around the classroom during this seating layout. Finally, three percent of students strongly disagreed, and 14% disagreed with the statement that they believe they would communicate easily with others while in this seating layout. Forty percent of students agreed, and 52% of students strongly agreed with the statement that they believed they would communicate easily with others while in this seating layout. One student reported, “For me, I’m close to where I was sitting, but I think this will be good.” Also, “I believe that I will be successful, but other people may have trouble if their backs are facing the board.” Another student stated, “I should be able to move and talk to other groups and I liked the other layout before because it was more familiar to me.”

By the end of the Lab-Style Seating Layout, the Post-Seating Layout Survey showed that Two percent of students strongly disagreed, and Eight percent of students disagreed with the statement that they could see everything they needed to be successful in class. Twenty-Seven percent of students agreed, and 63% of students strongly agreed with the statement that they could see everything they needed to be successful in class. Zero percent of students strongly disagreed or disagreed with the statement that they could move easily around the classroom during this seating layout. Thirty-Seven percent of students agreed, and 63% of students strongly agreed with the statement that they could move easily around the classroom during this seating layout. Finally, Zero percent of students strongly disagreed, and Eight percent of students disagreed with the statement that they could communicate easily with others while in this seating layout. Forty percent of students agreed, and 52% of students strongly agreed with the statement that they could communicate easily with others while in this seating layout. One student reported, "I liked how much room is in the classroom! People are not as in the way as I thought they would be." Another student stated, "I could move and get things easily and there is a lot of space in the center." Also, "The desks are easy to get to and I have a lot of space." (Figure 5).

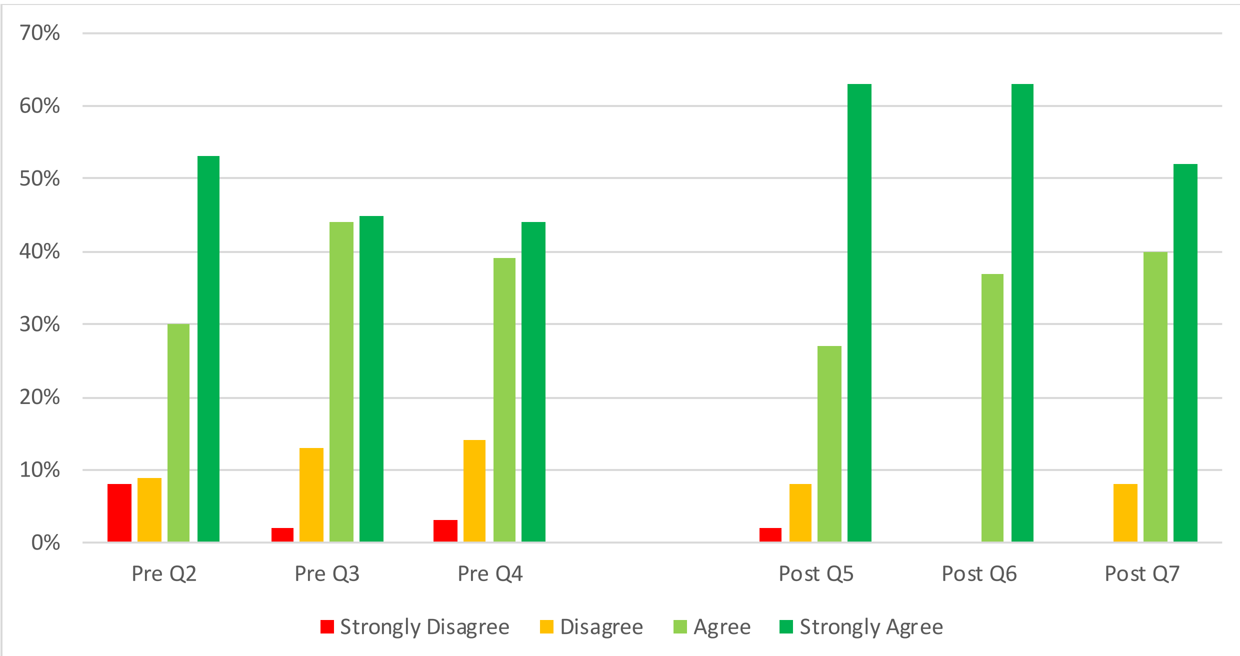

Figure 5. Change in Pre-Survey Data, (*n*=64) and Post-Survey Data, (*n*=49) from the Lab-Style Seating Layout. *Note*. Q2 & Q5=I would/could see to be successful; Q3 & Q6=I would/could move to be successful; Q4 & Q7=I would/could communicate to be successful.

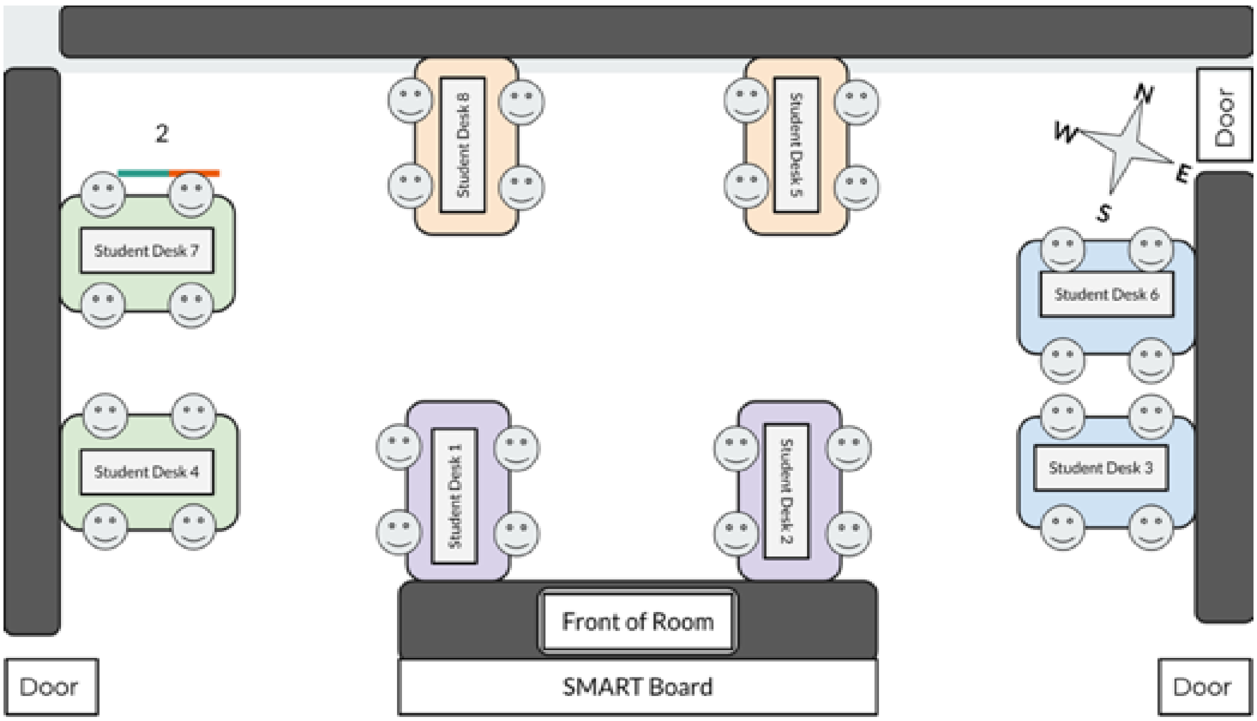

Figure 2 from page 13. Lab-style treatment seating layout map of classroom, Seating Layout #2.

There were other shifts in student active learning behavior in the second treatment group of students, who were arranged in the Fishbowl-Style Seating Layout. At the beginning of the Fishbowl-Style Seating Layout, the Pre Seating Layout Survey showed that Four percent of students at strongly disagreed, and 10% disagreed with the statement that the current seating layout would allow them to see everything they needed to be successful in class. Thirty-Five percent of students agreed, and 50% of students strongly agreed with the statement that the current seating layout would allow them to see everything they needed to be successful in class. One percent of students strongly disagreed, and 12% disagreed with the statement that they would be able to move easily around the classroom during this seating layout. Thirty-Five percent of students agreed, and 51% of students strongly agreed with the statement that they would be able to move easily around the classroom during this seating layout. Finally, Three percent of students at strongly disagreed, and Nine percent disagreed with the statement that they believe they would communicate easily with others while in this seating layout. Thirty-Four percent of students agreed, and 54% of students strongly agreed with the statement that they believe they would communicate easily with others while in this seating layout. One student reported, “This layout is very organized. I am facing backwards in the class, but it is very spacious. This is very nice, and I like it.”

By the end of the Fishbowl-Style Seating Layout, the Post Seating Layout Survey showed that Two percent of students strongly disagreed, and 10% disagreed with the statement that they could see everything they needed to be successful in class. Twenty-Nine percent of students agreed, and 59% of students strongly agreed with the statement that they could see everything they needed to be successful while in class. Two percent of students strongly disagreed, and Eight percent disagreed with the statement that they could move easily around the classroom during this seating layout. Forty percent of students agreed, and 50% of students strongly agreed with the statement that they could move easily around the classroom during this seating layout. Finally, Two percent of students strongly disagreed, and 10% of students disagreed with the statement that they could communicate easily with others while in this seating layout. Twenty-Five percent of students agreed, and 63% of students strongly agreed with the statement that they could communicate easily with others while in this seating layout. One student reported, “I like this layout is not too crowded and that there is space for me to work.” Also, “This layout is very open, and I can get around, but I liked the other layout the best.” (Figure 6).

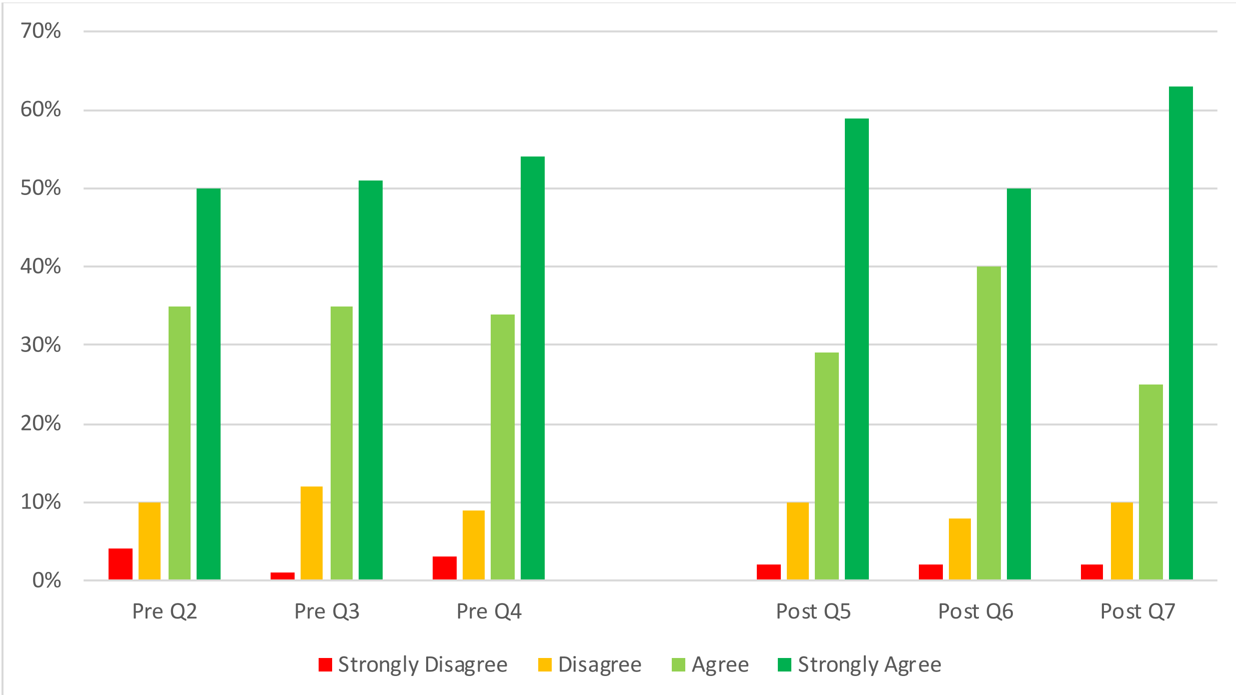

Figure 6. Change in Pre-Survey Data, (*n*=68) and Post-Survey Data, (*n*=60) from the Fishbowl-Style Seating Layout. *Note*. Q2 & Q5=I would/could see to be successful; Q3 & Q6=I would/could move to be successful; Q4 & Q7=I would/could communicate to be successful.

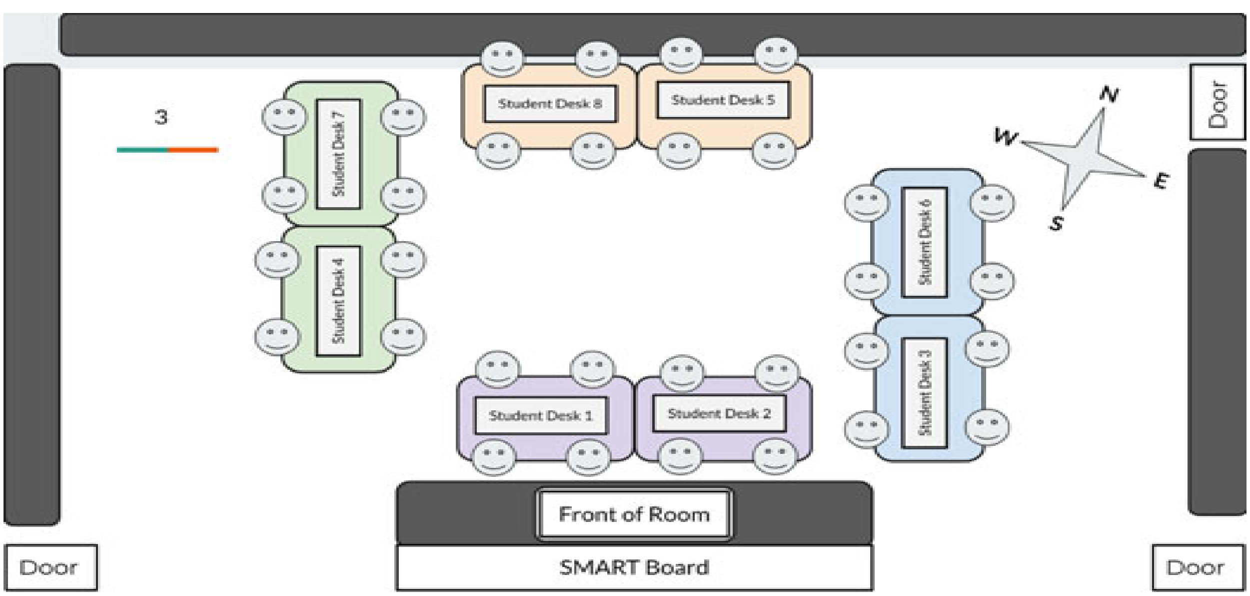

Figure 3 from page 13. Fishbowl-style treatment seating layout map of classroom, Seating Layout #3.

Data from the Traditional Post-Survey Data was then compared to the Lab-Style and Fishbowl-Style Post-Survey Data, to show the major shifts in student opinion and perception after each seat layout configurations had been tested. By the end of the Traditional Layout Post-Survey, one percent of students strongly disagreed and 11% disagreed with the statement that the current seating layout allowed them to see everything they needed to be successful in class, while 36% agreed and 52% strongly agreed. By the end of the Lab-Style Layout Post-Survey, Two percent of students strongly disagreed, and Eight percent disagreed with the statement that the current seating layout allowed them to see everything they needed to be successful in class, while 27% agreed and 63% strongly agreed. By the end of the Fishbowl-Style Layout Post-Survey, two percent of students strongly disagreed and 10% disagreed with the statement that the current seating layout allowed them to see everything they needed to be successful in class, while 29% agreed and 59% strongly agreed.

By the end of the Traditional Layout Post-Survey, Zero percent of students strongly disagreed and 9% disagreed with the statement that the current seating layout allowed them to move everywhere they needed to be successful in class, while 43% agreed and 48% strongly agreed. By the end of the Lab-Style Layout Post-Survey, Zero percent of students strongly disagreed or disagreed with the statement that the current seating layout allowed them to move everywhere they needed to be successful in class, while 37% agreed and 63% strongly agreed. By the end of the Fishbowl-Style Layout Post-Survey, Two percent of students strongly disagreed, and Eight percent disagreed with the statement that the current seating layout allowed them to everywhere they needed to be successful in class, while 40% agreed and 50% strongly agreed.

Finally, by the end of the Traditional Layout Post-Survey, Four percent of students strongly disagreed and 14% disagreed with the statement that the current seating layout allowed them to move everywhere they needed to be successful in class, while 45% agreed and 38% strongly agreed. By the end of the Lab-Style Layout Post-Survey, Zero percent of students strongly disagreed, and eight percent disagreed with the statement that the current seating layout allowed them to move everywhere they needed to be successful in class, while 40% agreed and 52% strongly agreed. By the end of the Fishbowl-Style Layout Post-Survey, Two percent of students strongly disagreed and 10% disagreed with the statement that the current seating layout allowed them to move everywhere they needed to be successful in class, while 25% agreed and 63% strongly agreed (Figure 7).

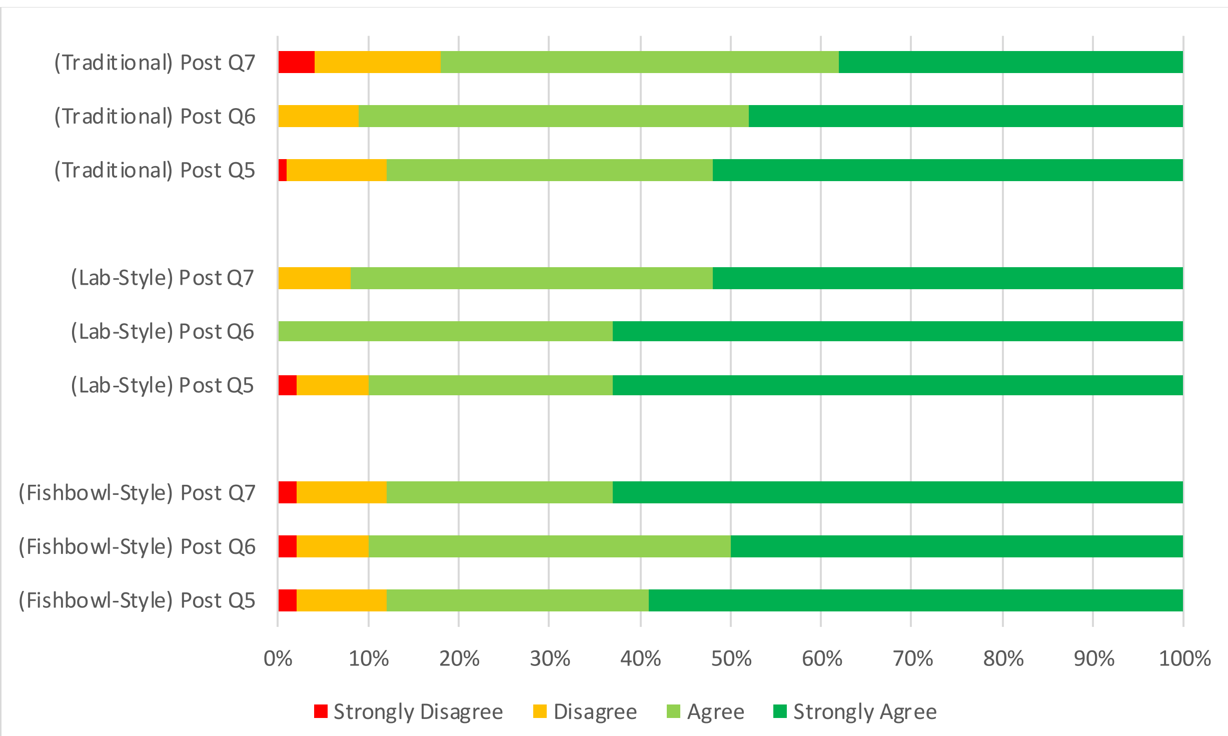

Figure 7. Changes in Post-Survey Data from the Traditional Layout, (*n*=56) Lab-Style Layout, (*n*=49) & Fishbowl-Style Seating Layout, (*n*=60). *Note*. Q5=I could see to be successful; Q6=I could move to be successful; Q7=I could communicate to be successful.

Qualitative Classroom Layout-Related Attitudes Surveys

The results from the pre- and post- treatment of the Classroom Layout-Related Attitudes Survey suggested that students initially did not think much about classroom layout designs, except when they influence who they sit with. The Classroom Layout-Related Attitudes Pre-Survey showed that Four percent of students strongly disagreed, and Four percent disagreed with the statement that there is more for a teacher to think about than just the subject they teach. Forty-Five percent of students agreed, and 47% of students strongly agreed with the same statement. One percent of students strongly disagreed, and 19% disagreed with the statement that the seating layout in a classroom is important. Fifty-Nine percent of students agreed, and 21% of students strongly agreed with the same statement. Twelve percent of students strongly disagreed, and 38% of students disagreed with the statement that the layout of a classroom should change often. Thirty-Four percent of students agreed, and 16% of students strongly agreed with the same statement. Finally, 23% of students strongly disagreed, and 49% disagreed with the statement that the seating layout in a classroom plays no role in how I learn. Twenty-Two percent of students agreed, and 7% of students strongly agreed with the same statement.

By the end of the Classroom Layout-Related Attitudes Post-Survey showed that Three percent of students strongly disagreed, and Seven percent of students disagreed with the statement that there is more for a teacher to think about than just the subject they teach. Forty-Two percent of students agreed, and 48% of students strongly agreed with the same statement. Five percent of students strongly disagreed, and 12% of students disagreed with the statement that the seating layout in a classroom is important. Fifty percent of students agreed, and 33% of students strongly agreed with the same statement. Ten percent of students strongly disagreed, and 37% of students disagreed with the statement that the layout of a classroom should change often. Thirty percent of students agreed, and 23% of students strongly agreed with the same statement. Finally, 24% of students strongly disagreed, and 39% of students disagreed with the statement that the seating layout in a classroom plays no role in how I learn. Seventeen percent of students agreed, and 20% of students strongly agreed with the same statement (Figure 8).

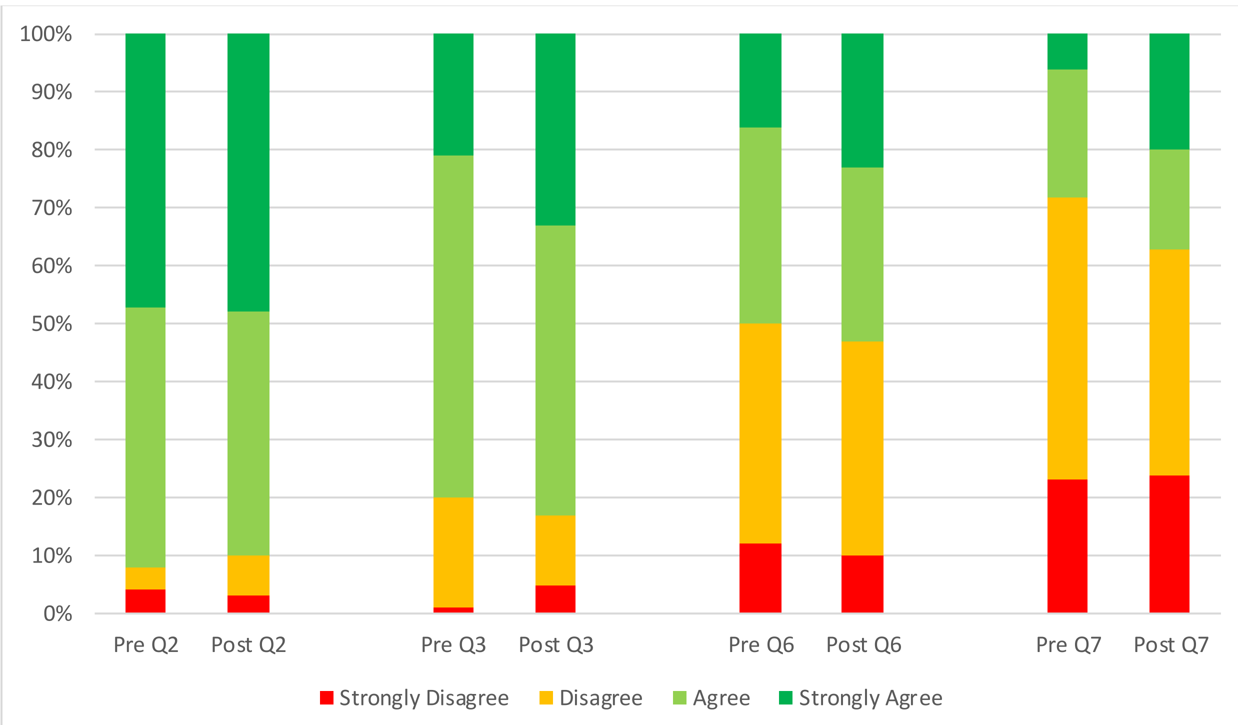

Figure 8. Change in Student Opinion Before, (*n*=68) and After, (*n*=60) the Seating Layout Configurations Had Taken Place. *Note*. Q2=There is more for a teacher to think about than just the subject they teach; Q3=The seating layout in a classroom is important; Q6=The layout of a classroom should change often; Q7=The seating layout in a classroom plays no role in how I learn.

Quantitative Observational Tally Sheet Data

Using mean to calculate the averages of active learning behavior, the nontreatment group of students in the Traditional Seating Layout showed 33 instances of student-to-student interactions, 17 instances showed student-to-teacher interactions, and eight educational zone usages were observed. Next, the first treatment group of students who were arranged in the Lab-Style Seating Layout showed 52 instances of student-to-student interactions, showed 20 instances of student-to-teacher interactions, and 21 educational zone usages were observed. Finally, in the second treatment group of students, who were arranged in the Fishbowl-Style Seating Layout showed 49 instances of student-to-student interactions, showed 12 instances student-to-teacher interactions, and 15 educational zone usages were observed. These changes in observed show a 31% increase in active learning behavior observed from the Traditional Layout to Fishbowl-Style Layout and a 60% increase in active learning behavior observed from the Traditional Layout to Lab-Style Layout (Figure 9).

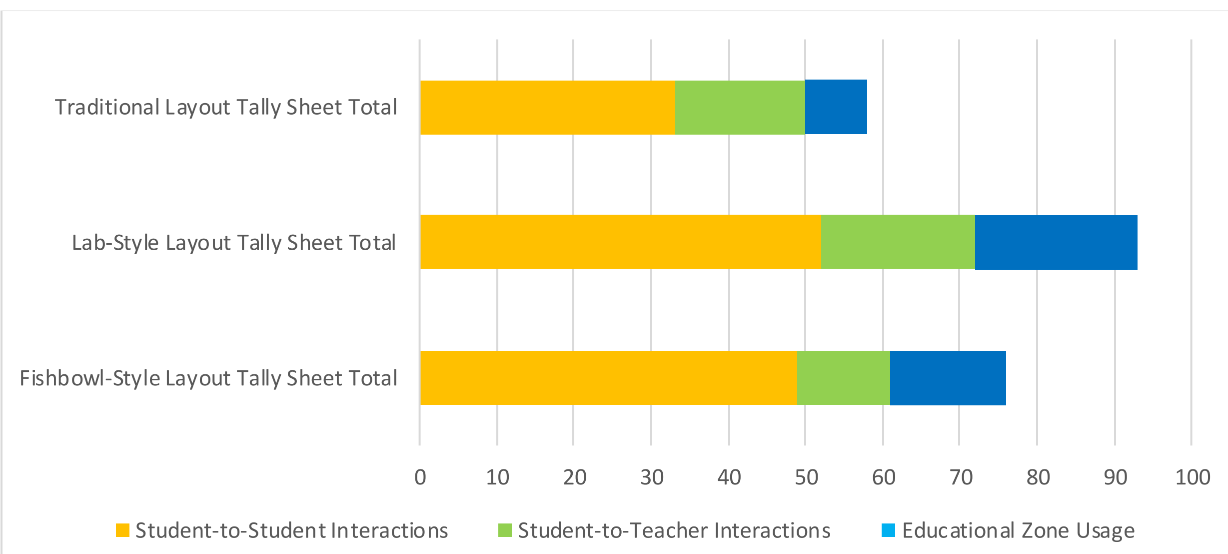

Figure 9. The Number of Active Learning Behaviors Observed Based on Seating Layout, (*n*=66).

Qualitative Student Focus Group Data

There was some notable data collected by the Student Focus Group Forms that was unique to this part of the study. Even though all class periods were experiencing the same classroom layout designs, this provided students an opportunity among other peers to collaborate and share similar experiences with one another. After reviewing student responses for positive, negative, and neutral comments, seven identifiable themes were recognized. These themes included student's ability to see, student's ability to communicate, student's ability to obtain materials, furniture observations, student's perception of workable space, and overall volume levels while working in class.

Of the five focus groups that were formed to discuss Traditional Seating Layout One, there were a total of seven positive comments, five neutral observations, and one negative comment. Most positive comments made by these student focus groups included student's ability to see the board during class and to communicate well with those around them. One focus group commented, "We like how close we are and how we can all see the board." Neutral observations made by these student focus groups recorded the number of desks in the classroom and mentioned that this was a seating layout they were used to in school. The one negative comment reported by this focus group session stated that it was difficult for them to see in Traditional Seating Layout One because other student's heads were blocking their view (*n*=20). Of the six focus groups that were formed to discuss Lab-Style Layout 2, there were a total of 20 positive comments, five neutral observations, and seven negative comments. Positive comments made by these student focus groups included the student's ability to see the board during class, ability to have enough space to work during class, the ability to communicate with others during class, and the ability to easily find materials for activities. One focus group from this arrangement commented, “Everywhere in the room, I could see the board, which helped with focus.” Another positive comment stated, “We could move around the classroom easier, we could see the board clearly, and we could talk to other groups.” Neutral observations made by these student focus groups stated that desks were arranged in a circle and that the materials were in the middle of the classroom. Negative comments reported by focus groups were location specific, meaning students whose experiences were located more in the back of the classroom reported difficulties being able to see the board during a lecture or not having enough space in their designated area during activities. An example student focus group response stated, “Some tables are a little close together, especially the corner tables.” (n=24). Of the five focus groups that were formed to discuss Fishbowl-Style Layout 3, there were a total of 15 positive comments, three neutral observations, and six negative comments. Positive comments made by these student focus groups included student’s ability to see the board during class, communicate effectively with one another, retrieve materials easily, and have enough space to work efficiently. One focus group from this arrangement commented, “It was easy to work on projects and to work in general. It is easy to see the board too.” Another positive comment stated, “We were next to supplies, we could see the board and our groups worked well together.” Neutral observations made by these student focus groups stated that desks were arranged in a circle that is closely connected to one another. Negative comments focused on the overall volume of varying student work areas and non-ideal seating position. An example of a negative student focus group response stated, “Some of us were positioned in the back of the class which made it hard to see." Another example stated, "Two groups were close together, so it was kind of loud." (Figure 10).

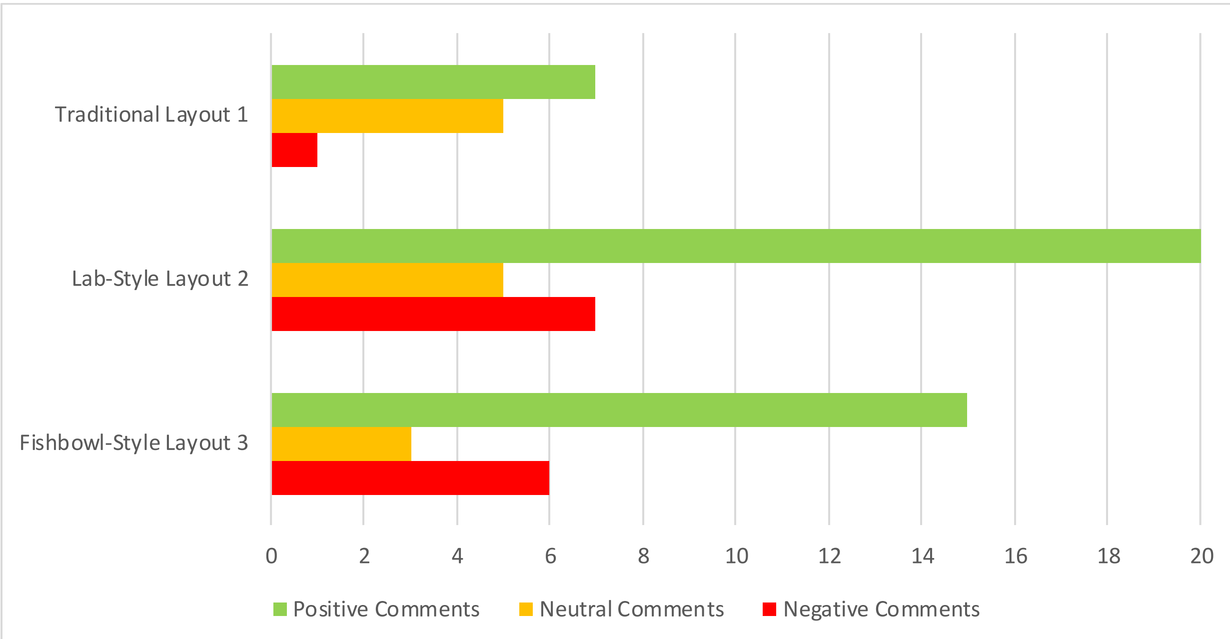

Figure 10. The Number of Positive, Neutral, and Negative Comments Reported by Student Focus Groups. *Note*. Traditional Layout 1 & Fishbowl-Style Layout 3 Consist of Five Student Focus Groups, (*n*=20). Lab-Style Layout 2 Consist of Six Student Focus Groups, (*n*=24).

CLAIM, EVIDENCE, AND REASONING

Claims From the Study

Results from this study showed three major findings. The first was that different seating layouts had a noticeable effect on student willingness to engage in active learning behavior. A second finding was that students had far more opinions about seating layouts in a classroom than I had previously expected. A third finding was that students clearly can use critical thinking skills learned in science lessons and apply that mindset to a wide variety of school related topics.

Looking closely at the Pre- and Post-Layout Surveys showed greater student perception of how the seating layout affected student learning. The Lab-Style treatment group reported the highest opinion of the three seating layouts, followed by the Fishbowl-Style treatment group, then, finally, the Traditional nontreatment group was the least positive. After the research from this project had been concluded, I had several students ask when we were going to go back to the "cool" seating layout, which was the Lab-Style seating layout. Students explained they preferred that layout the best. Another finding from this study showed that the biggest change in student opinion throughout one seating layout was the Fishbowl-Style treatment group. Many students had initially stated their dislike of the classroom for the Fishbowl-Style Layout, not shying away from their honest feelings. One student even stated that they, "Hated how the room looked." By the end of the Fishbowl-Style Layout, most students who had initially informed me of their disapproval of the classroom layout, reported a more positive opinion by the end of the week stating, "It actually wasn't that bad." It was observed that these different seating layouts were implemented to meet the specific needs of each lesson and given with a purpose, which shifted the tone for students, and encouraged more meaningful student-to-student interactions. As Rae and Sands (2013) observed, this allowed for a less restrictive learning environment which encouraged student-to-student collaboration and student-active learning. The behavior was seen in both the Lab-Style and Fishbowl-Style seating layouts. The Lab-Style layout encouraged students to utilize the physical space around them while performing academic tasks and the Fishbowl-Style layout provided students more opportunities for student-to-student collaboration.

Additionally, observational data collected revealed a positive shift in student active learning behavior throughout this study. The nontreatment group arranged in the traditional seating layout had far fewer observed active learning behaviors performed by students than the two treatment seating layouts, which focused on workable space and student communication. There was a notable increase in student active learning behavior observed while implementing the Fishbowl-Style Layout and an even larger increase in student active learning behavior while implementing the Lab-Style Layout. Evidence of this increase is shown in the number of times students chose to engage in active learning strategies, which were influenced by the current seating layouts in the classroom. The Lab-Style Layout, which encouraged students to utilize more of the physical space in the classroom, showed the highest active learning behavior of educational zone usage. This makes sense, as the layout of the classroom allowed for easy student movement, and clear pathways for students to engage in acquiring materials, supplies, and demonstration engagement. The Fishbowl-Style Layout encouraged student communication, as the desks were pushed together, allowing for more face-to-face interactions. Active learning observations showed a high number of student-to-student interactions along with the lowest student-to-teacher interactions. This point was interesting as it indicates that given the opportunity, students will choose to first ask and collaborate with their peers rather than immediately ask their teacher. This aligns with research done by Harmin and Toth (2006) as teachers find multiple ways to address students' unique needs these decisions ultimately lead to students becoming more fully responsible for their education.

Finally, as Chang-Tik et al. (2022) states, collaborations have a critical role in the implementation of NGSS in the science classroom. Throughout the course of this action research project, I instructed students to consistently be engaged in the NGSS-inspired lessons as active participants. Based on all data collected as surveys, focus groups, and observations, I made students think critically about what they were being asked to do. By allowing students the opportunity to think critically and share their positive, negative, and neutral thoughts and opinions, they were becoming more critically minded through a wide variety of collaboration-based opportunities that were created by changing seating layouts.

Value of the Study and Consideration for Future Research

In the last few years, pulling students out of the complacency of distance learning has been challenging. The teaching practices that were bread from the COVID-19 pandemic, which were meant to be temporary, still influence how students are learning today. I believe that as life continues to move out of the post-pandemic isolationist learning, students will continue to relearn what it is like to be fully engaged in NGSS-inspired science lessons. Students are curious by nature and given the opportunity, will develop ideas to answer the questions that truly interest them. Providing thoughtful seating layouts that help encourage students to drive towards that interest is a small action that can be taken by teachers to aid in student success. During the treatment stages of seating layouts, students were eager to see how the classroom changed each week. It was clear to students that the new seating layout of their science classroom played a role in their success. As a teacher who encourages students to ask questions, engage in lessons, and take charge of individual learning, I found it rewarding to have seen such a strong support for this research project among my students. Observing this as a part of the action research process provided me with the validation needed to recognize seating layout importance as another component of being a critically minded science educator. It is with this critical mindset that teachers provide students with the tools needed to be successful.

Impact of Action Research on the Author

Changing the seating layout of my science classroom has always been something I have found interesting. Since my first year of student teaching, I have always made a conscious effort to find practical, meaningful ways to organize the science classroom. Throughout my experiences engaged with this action research project, I am surprised to have learned that students are just as interested in this topic as I am. By the end of this research, I had students come speak with me about their ideas for different seating layouts and why their ideas would work well for upcoming lessons. From the initial panic of students knowing they are getting a new seating chart to the ease and flow of a mindful seating layout, there is something to be said about the practice of finding ways to reorganize the layout of a classroom. By constantly providing students with opportunities to bring new perspectives to the same classroom, I believe this brings a freshness that is needed for students to fully engage in the physical classrooms they are provided. Based on the research collected in this study, all teachers should reflect on classroom layouts to allow students to be more fully involved in their active learning behaviors and help provide each student the opportunities they need to be successful.

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APPENDICES

APPENDIX A

IRB APPROVAL

External Sender

Hello Barbaccia, Michael,

Your protocol was reviewed by the IRB and has been approved.

PI: Barbaccia, Michael
Approval Date: 1/23/2024
Title: Classroom Layout Effects on Active Learning

Protocol #: 2024-1062-EXEMPT
Review Type: Exemption
Expiration Date: 1/23/2029

APPENDIX B

PRE-SURVEY FOR SEATING LAYOUT

1. I like the way the desks are arranged in the classroom.

   YES / NO

   Explain your reasoning.

2. I believe I will be able to see everything I need to be successful in class based on where I am sitting. (1 I do not believe this at all; 4 I very strongly believe this.)

   1 2 3 4

   Explain your reasoning.

3. I believe I will be able to move to where I need to be during class, based on how the seating is currently arranged (1 I do not believe this at all; 4 I very strongly believe this.).

   1 2 3 4

   Explain your reasoning.

4. I believe I will be able to communicate with others during class easily, when needed, based on how the seating is currently arranged (1 I do not believe this at all; 4 I very strongly believe this.).

   1 2 3 4

   Explain your reasoning.

5. I believe this seating layout will allow me to more easily show my teacher I am learning science (1 I do not believe this at all; 4 I very strongly believe this.).

   1 2 3 4

Explain your reasoning.

6. Is there anything you would like to let your science teacher know about the current seating layout?

APPENDIX C

POST-SURVEY FOR SEATING LAYOUT

1. I liked the way the desks were arranged in the classroom for this last week.

   YES / NO

   Explain your reasoning.

2. What is one thing you really liked about the seating layout?

3. What is one thing you really disliked about the seating layout?

4. I would like to use this seating chart again in the future.

   YES / NO

   Explain your reasoning.

5. I could see everything I needed to be successful in class based on how the classroom was set up (1 I strongly disagree; 4 I strongly agree).

   1 2 3 4

   Explain your reasoning.

6. I could move to where I needed to go during class based on how the classroom was set up (1 I strongly disagree; 4 I strongly agree).

   1 2 3 4

   Explain your reasoning.

7. I could communicate with others during class easily, when needed to, based on how the classroom was set up (1 I strongly disagree; 4 I strongly agree).

   1 2 3 4

   Explain your reasoning.

8. Reflect: I felt responsible for my learning this past week.

   YES / NO

   Explain your reasoning.

9. Is there anything else you would like to let your science teacher know about the seating layout?

APPENDIX D

TEST OF CLASSROOM LAYOUT ATTITUDES SURVEY

Directions: Using the scale below, rate the following statements based on your current beliefs.

1=Strongly Disagree (SD); 2=Disagree (D); 3=Agree (A); 4=Strongly Agree (SA)

1. My teachers change the layout of their classrooms often.

1	2	3	4
(SD)	(D)	(A)	(SA)

2. There is more for a teacher to think about than just the subject they teach.

1	2	3	4
(SD)	(D)	(A)	(SA)

3. The seating layout in a classroom is important.

1	2	3	4
(SD)	(D)	(A)	(SA)

4. I would like to arrange the desks in the classroom.

1	2	3	4
(SD)	(D)	(A)	(SA)

5. I like to move around the classroom while learning.

1	2	3	4
(SD)	(D)	(A)	(SA)

6. The layout of a classroom should change often.

1	2	3	4
(SD)	(D)	(A)	(SA)

7. The seating layout in a classroom plays no role in how I learn.

1	2	3	4
(SD)	(D)	(A)	(SA)

8. When I like where I am sitting, I feel better about my learning.

1	2	3	4
(SD)	(D)	(A)	(SA)

APPENDIX E

OBSERVATIONAL LAYOUT TALLY SHEET

Date: ____________________

Lesson Name: _____________________

Classroom Layout Number: _____

Student-to-student interactions	
Student-to-teacher interactions	
Educational Zone Usage	

My Notes:

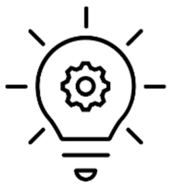
APPENDIX F

SEATING LAYOUT FOCUS GROUP RESPONSES

Date: ____________________

Unit Theme/Subject: _____________________

Classroom Layout Number: _____



What are three things we remember from the discussed classroom layout?

- ____
- ____
- ____

What are two things about the seating layout that helped us learn science?

- ____
- ____

What is one thing about the seating layout that did not help us learn science?

- ____

Specific Individual Comments: