

The Effects of Classroom Seating Layouts on Participation and Assessment Performance in a Fourth Grade Classroom

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The focus of this study was to look at how the seating layout effects participation and assessment performance overall as a class. The participants were 23 fourth grade students at a Louisiana elementary school. Three layouts were tested: small groups, horseshoe, and pairs. This study included three, two-week rounds of research. The collection process consisted of a series of mixed methods. According to three of the four data sources, the most significant finding from this study indicated that out of the three layouts, the horseshoe formation was the most effective arrangement for student learning in the fourth-grade classroom.

When considering the importance of classroom environment, one might imagine how the student feels in the classroom and how the classroom physically looks. There is abundant research that shows there are a number of additional factors that are also included when referencing the term “classroom environment”. While looking at the different components of the classroom environment, research by Weinstein (1979) focused on aspects such as “seating position, classroom design, density, privacy, noise, and windows” and classroom ecology (p. 578). Even decades ago, Weinstein was able to determine a correlation between a student’s seating position in the classroom and their academic performance. In a study conducted 17 years later, a sense of belonging positively correlated to student achievement and efficacy because of positive student-teacher relationships and their ability to promote school enjoyment without fear of failure (Roeser, Midgley, & Urdan, 1996). As discussed in more recent research by Fernandes, Huang, and Rinaldo (2011), results showed that the actual layout of the seating area in the classroom affects students’ participation, sense of control, and academic or non-academic activity.

Determining and evaluating what classroom layout will be used commonly poses a challenge for teachers. More specifically, the arrangement of desks leaves teachers struggling to decide which layout would work best for their students. There are numerous ways to arrange desks, and as expected, each of these arrangements benefit specific learning circumstances in the classroom. Like arranging seating for any type of event, the place in which a person is assigned to sit can affect their whole experience. This is also

true for students in the classroom learning environment. Teachers must consider the goal of the lesson or unit to determine what layout is going to produce the best learning environment for the class. It is important to consider the arrangement of the classroom so that it best supports the goal of promoting participation and learning achievement (Hastings & Schwieso, 1995).

The purpose of this study was to determine which layout(s) is the most advantageous to student participation and assessment performance in a fourth-grade classroom. Three desk layouts were analyzed: small groups (Appendix A), horseshoe (Appendix B), and pairs (Appendix C). The study examined the effects that each of these layouts had on the students’ participation and assessment performance. Research by Marx, Fuhrer, and Hartig (2000) showed that different layouts have a “T zone” where students in this area participate and perform better than those who sit in the back or side of the class. While this study was not specifically researching the seating zones of participation, the participation data gathered were analyzed to see if it concurred with the findings of Marx and colleagues.

Professional Connection

Over my time spent student teaching and previous classroom observations, nearly every classroom I visited or took part in had students sitting in groups of four to five. Knowing that there is a visible connection between students’ participation and performance and their seating location (Montello, 1988), I began to wonder how students in a layout other than small groups would perform in class. As a result of this, I chose to study the effects of the classroom seating layout on participation and assessment performance in a selected fourth grade English Language Arts (ELA) class.

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Review of Related Literature

This section will briefly describe previous research on the various ways in which desks can be arranged in the classroom, what influences these arrangements could have on student participation, and benefits of future research on this topic.

Classroom Layouts

Elementary students spend the majority of their class time assigned to one seat for the entire day. Therefore, the seating assignment and layout becomes a vital part of their learning environment, so it is important that each format is chosen based on the task assigned and the expectations of the students (Wannarka & Ruhl, 2008). A few of the most common ways to arrange student desks are in rows, small groups, pairs of two, U-shape/horseshoe, and semicircle/circle. Research by Gremmen, Van den Berg, Segers, and Cillessen, (2016) showed that 40% of teachers in their study selected that they use rows, 48% (according to the article, to add up to 100%) selected small groups, and 12% selected other layouts.

The traditional layout of rows that has been used since educational classes began has shown to produce increased levels of on-task behavior and completion of independent activities (Hastings & Schweiso, 1995; McCorskey & McVetta, 1978). However, in 2001, this common seating layout shifted, moving from rows to small groups/clusters (Paton, Snel, Knight, & Gerken, 2001). Today, small groups are used to promote social interaction and peer talk. Instead of the focus being completely on the teacher like in the row layout, students are given more responsibility and opportunities to learn with and from their peers. Although small groups allow for more peer interaction, Gremmen and colleagues (2016) found that many teachers opted not to use this format because of the many distractions that come with being seated so closely to others.

Pairs of two is another layout that promotes peer communication and shares a few similarities with the small group layout. However, by only working with one peer, the opportunity for distraction decreases. The U-shape/horseshoe layout still allows the teacher to have the lead role in the classroom but provides a sense of community and allows for peer collaboration because desks are facing inwards instead of solely on the teacher (Kaya & Burgess, 2007). Finally, semicircles or circles of desks are typically used when striving for whole class discussion. Comparing this layout to the traditional rows, students developed and asked more questions in a semicircle layout in the study by Marx et al. (2000) thus being more engaged in the learning process. Engagement and involvement in the learning process can be altered depending on the seating layout.

Participation

The term “participation” can be defined in many different ways depending on the researcher and the task being evaluated. According to Turner & Patrick (2004), classroom participation can be any of the following behaviors: “offering ideas and thoughts spontaneously, volunteering to answer questions, answering questions when called on, demonstrating at the chalkboard, talking to peers or the teacher about tasks, completing written work” and “watching, listening, and thinking” (p. 1760). Willms (2003) found that participation is bringing materials to class, bring prepared, class attendance, etc. While all of these components certainly do make up participation, this study viewed participation as how often students raised their hand to answer the teacher’s questions during a whole group lesson as they are sitting in a specific arrangement. As previously described, the research of Marx et al. (2000) found that there is a “t-zone” and “triangle shaped action zone” residing inside the seating layout where students participate more than those that are not in the two zones. Furthermore, Fernandes and colleagues (2011) concluded that the placement of the students in the back or front of the class can also affect student participation due to the increase or decrease of student control during learning. Fernandes et al. also found participation to be influenced by the “teachers’ impression of the student” (p. 73). Going back to Montello (1988), correlation was found between high participation rates and student’s feelings of belongingness and importance in the classroom.

Benefits of Future Research

The most recent applicable research conducted on this topic was published in 2011 and one study published in 2016 that focused on the teacher’s role. However, a large sum of the research was conducted in the period between the 1970’s and 2000’s. I believe this topic is very important because it would benefit the student by being placed in a seating arrangement that is best for specific tasks and encourages classroom participation. The majority of the research in the last 20 years studied these components in a college level academic setting. As time progresses, the implications of results from research can change drastically, which is why it is extremely important to have up to date and accurate results for teachers and students alike.

Questions Guiding the Study

- 1) What is the effect of the classroom seating layout on participation?
- 2) What is the effect of the classroom seating layout on assessment performance?

Method of the Study

In this section, the method of the study will be discussed. This section begins with the approach to the study, followed by the setting and background, researcher's information, participants and materials, and ends with an analysis of the data.

Approach to the Study

This study is a Teacher Action Research assignment in which I actively gathered data on the effects of the classroom seating layout on participation and assessment performance in a fourth-grade classroom. Teacher Action Research allows the researcher to actively participate in the data collection process all while continuing to maintain the classroom and its learning environment. Since the research is conducted while learning takes place, the teacher studies a topic that improves learning that is already happening and will happen in the future in the classroom. The teacher is also able to modify the research process to fit the needs of the students who are participating in the study because it is taking place in his/her own classroom (Putman & Rock, 2018). With Teacher Action Research being done in a live classroom, the findings provide teachers and the educational community with valuable information that will improve learning and teaching in education.

The Research Setting

School information. The research for this study was conducted at an elementary school located in East Baton Rouge Parish, Louisiana. The total number of students that this school served was 517, pre-K through fifth grade. All students received free breakfast and lunch. Of the total students, 289 (56%) were male and 228 (44%) were female. The following statistics list the percentages of race/ethnicities found at the school: 43.7% African American, 31.3% Hispanic, 14.1% Caucasian, 9.3% Asian, 1.2% Hawaiian/ Pacific Islander, and 0.4% Native American/Alaskan Native. Enrolled in the fourth grade were 109 of 517 students at this school. Of the 4th grade students, 63 students were male, 46 students were female, 11 students received specific accommodations for testing and/or learning, and 39 students were English Language Learners (ELL).

Classroom information. The classroom where the research took place consisted of 24 fourth grade students. Since the fourth grade was departmentalized (*perhaps* explain this term) at the participating school, research was gathered every Monday and Wednesday or Tuesday and Thursday (depending on the week) from 9:45 am to 11:45 am as the participant class attended ELA. Prior to the study, students had assigned seats and were strategically placed

based on their academic performance of high, medium, or low. This type of pairing/grouping was done in order to easily allow more capable students to work with classmates who needed extra help or peer guidance. Prior to the study, the determining factor for identifying if student was high, medium or low was based on their Fountas and Pinnell (2008) instructional reading level.

Participants. Consent forms were collected from 23 students for the research process. The participants in this study were fourth graders who were 9-11 years old. The race/ethnicities of the group researched consisted of twelve African American students, six Hispanic students, and five Caucasian students. All six Hispanic students primarily spoke Spanish and received English Student Learner (ESL) services. Five of the six students receiving ESL accommodations were in the upper levels of the ESL program. One student was in the beginning stages of mastering the English language and relied on his peers who are bilingual to translate during class time. Six of the 23 students had an Individualized Education Program (IEP), received testing modifications, and Exceptional Student Services. All 23 students remained in the classroom during the research period. This class was selected based on its overall diverse range of race, behavior, and learning abilities.

Researchers

Primary Researcher. In 2018, I graduated with a Bachelor's Degree in Elementary Education from Louisiana State University. While this research project took place, I was a graduate student in the Elementary Holmes program at LSU completing a yearlong student teaching program, an action research project, and classwork for a reading specialist certification and ESL certification. During my research, I tallied student participation on the Participation Tally Chart as Ms. Wells instructed the class. I also analyzed student surveys, an interview, the participation tally chart, and pre- and post-tests at times when the live research is not taking place.

Mentor teacher. My mentor teacher, Jill Wells, assisted me in the data collection process. Jill graduated from Louisiana State University with a Bachelor's Degree in Elementary Education in 2016. She began her teaching career in early 2017 at the school where the research was conducted. At the end of the 2018-2019 school year, she had taught for two and a half years. She began by teaching a half of a year in fourth grade mathematics and then moved to teaching fourth grade ELA. Ms. Wells was in her second year of teaching ELA. Although she was a new teacher, she had already received several awards for her hard work and dedication to education. For the duration of this study, Ms. Wells taught the lesson each class period as I use the Participation Tally Chart to tally students who raise their hand to answer

questions during the lesson. Ms. Wells helped grade and analyze data from the pre- and post-tests.

Background of the Study

Prior to beginning the research, the researcher student taught in the departmentalized ELA classroom daily. Students’ desks were already in a small group layout that included four groups of five and one group of four desks. Students had assigned seats which had not changed since the beginning of the school year. The benefits of peer talk and group work were observed by the researcher along with peer distractions that were caused by the small group layout. A decrease in participation, behavior, and work ethic was observed from the beginning of the school year to the beginning of the study.

Intervention & Materials

This study included three, two-week rounds of research. Every two weeks, the layout of the desks was changed and the data collection process started over. The first arrangement of desks was small groups (three groups of five and one group of four; Appendix A). (The groups total 19, less than the class size mentioned earlier.) The second was the horseshoe layout (Appendix B), and the third round focused on desk in pairs of two (Appendix C). Data was gathered twice a week on student participation and biweekly on assessment performance. Students were randomly assigned seats in each new layout. Four to five specific students were strategically placed because of behavior needs or ESL accommodations.

Data Collection & Analysis

The following section describes the data collection process and how the data were analyzed. It begins with the collection process followed by the analysis of each data source for each round in the research process – participation tally chart, pre- and post-test scores, student questionnaires, and one student interview.

Collection Process

To collect data for this study, a series of mixed methods were used. For data collection on participation, a participation tally chart was used for each of the three different layouts: small groups, horseshoe, and pairs. The participation tally chart (data source one) included the layout of the desks labeled with the placement of each student. During the whole group lesson that was being taught, a tally was placed by the student’s name on the chart to indicate that the student raised his/her hand to answer a question asked by the teacher. Eleven questions were tallied

each lesson; approximately two from the introduction, seven from whole group, and two from the closure of the lesson.

To evaluate students’ assessment performance, data was gathered on percentage increase in scores from pre- to post-test given every two weeks (data source two). The pre- and post-test focused on the same Common Core Standards and had similar layouts but were not identical tests. These test results provided data on how each particular layout potentially increased or decreased learning. Pre- and post-test scores were analyzed by the percentage of increase shown on the test at the end of each round. Data from student questionnaires (data source three) and an interview (data source four) were gathered from yes/no questions, rate yourself using a Likert scale (Likert, 1932) ranging from one (negative effect) to 10 (positive effect), and short answer questions.

Participation Tally Charts. There were four participation tally charts per layout totaling 12 charts in all. Eleven questions were tallied from each day of data collection totaling in 12 days and 132 questions in all. The charts were analyzed using a Microsoft Excel spreadsheet and graph. For each individual layout, all tallies were added together to find the total number of tallies for all four observation periods. To find the total number of students per layout, attendance for each day was added. The average number of tallies per student was found by dividing the total number of tallies into the total number of students for all four observations. Each layout’s total number of tallies per student was then compared to the remaining two layouts.

Small group. The first layout analyzed was small groups. There were three groups of five students and two groups of four students. Chart 1 shows the breakdown of tallies for the small group layout. The number of tallies for each small group were added together. Then, the total number of tallies per day for the entire two-week cycle were added to get the total number of tallies for the small group layout totaling 357 tallies. This was then divided by the total number of students present during the four observation periods (87 students) equaling an average of 4.10 tallies per students in the small group layout.

Chart 1. Breakdown of number of tallies and students for the small group layout

Participation Tally Chart: Small Group		
Group:	Tallies:	Number of students:
Group 1	64	18
Group 2	58	15
Group 3	87	16
Group 4	70	19
Group 5	78	19
Total:	357	87
Average number of tallies per student		4.10

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Horseshoe. The second layout analyzed was the horseshoe. Since students were not sitting in a group or pair format, tallies were scored per student. Chart 2 shows the breakdown of tallies for the horseshoe layout. The number of tallies for each student for all four data collection periods were added together. Then, the total number of tallies for the entire two-week cycle were added to get the total number of tallies for the horseshoe layout totaling 557 tallies. This was then divided by the total number of students present during the four observation periods (81 students) equaling an average of 6.88 tallies per students in the horseshoe layout.

<i>Chart 2. Breakdown of number of tallies and students for the horseshoe layout</i>		
Participation Tally Chart: Horseshoe		
Student #:	Tallies:	Attendance (out of 4):
Student 1	11	3
Student 2	25	4
Student 3	37	4
Student 4	27	4
Student 5	25	3
Student 6	13	3
Student 7	20	3
Student 8	30	4
Student 9	30	4
Student 10	33	4
Student 11	21	4
Student 12	30	3
Student 13	41	4
Student 14	18	3
Student 15	15	4
Student 16	30	3
Student 17	24	4
Student 18	19	3
Student 19	27	4
Student 20	5	2
Student 21	31	4
Student 22	3	3
Student 23	32	4
Total:	557	81
Average number of tallies per student:		6.88

Pairs. The third layout analyzed was the pairs (chart 3). Tallies were scored by groups of 2 (pairs). Figure 3 shows the breakdown of tallies for the pair layout. The number of tallies for each pair for all four observation periods were added together. Then, the total number of tallies for the entire two-week cycle were added to get the total number of

tallies for the pair layout totaling 398 tallies. This was then divided by the total number of students present during the four observation periods (88 students) equaling an average of 4.52 tallies per students in the pair layout.

<i>Chart 3. Breakdown of number of tallies and students for the pair layout</i>		
Participation Tally Chart: Pairs		
Pair:	Tallies:	Attendance (out of 8):
Pair 1	34	8
Pair 2	42	7
Pair 3	35	8
Pair 4	20	8
Pair 5	13	6
Pair 6	59	8
Pair 7	31	7
Pair 8	33	8
Pair 9	31	8
Pair 10	10	4
Pair 11	43	8
Pair 12	47	8
Total:	398	88
Pairs		4.52

Pre- and Post-test. Pre- and post-test data were also analyzed using Microsoft Excel. At the beginning of each round, students took a pre-test focusing on subject specific Common Core State Standards. At the end of the two-week period, students took a post-test focusing on the same standards. While the pre- and post-test were not identical, the questions were in a similar format and tested the same standard(s). The data were analyzed using the increase of the average pre-test percentage between the average post-test percentage. Then, the overall percentage increase per layout was determined by the following formula: (post-test average – pre-test average)/pre-test average. The overall percentage increase was then compared between the three layouts.

Small groups. Data for the small group layout can be found in chart 4. The pre-test consisted of 12 points possible. Nine students scored zero to three points. An additional 12 students scored four to eight points, and two students scored nine to 12 points. The average pre-test score was 39%. The post-test consisted of six possible points. Four students scored zero to two points, 11 scored three to four points, and eight scored five to six points. The post-test average score was 70%. The overall percentage increase between the pre- and post-test average percentages were 81%. Out of the three layouts, small groups had the second highest percentage increase, beating the pair layout by only one percent.

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<i>Chart 4. Shows pre- and post-test data for the small group layout.</i>				
Pre and Post Test Data				
Layout:	Small Group			
	Pretest - Raw Score	Pretest - Percentage	Posttest - Raw Score	Posttest - Percentage
Possible Points	12		6	
Student 1	3	25%	2	33%
Student 2	5	42%	4	67%
Student 3	1	8%	4	67%
Student 4	7	58%	6	100%
Student 5	3	25%	2	33%
Student 6	3	25%	4	67%
Student 7	5	42%	4	67%
Student 8	3	25%	4	67%
Student 9	4	33%	6	50%
Student 10	0	0%	4	100%
Student 11	3	25%	4	67%
Student 12	0	0%	4	67%
Student 13	9	75%	6	100%
Student 14	8	67%	2	33%
Student 15	10	83%	6	100%
Student 16	4	33%	4	67%
Student 17	3	25%	5	83%
Student 18	6	50%	6	100%
Student 19	5	42%	4	67%
Student 20	8	67%	6	100%
Student 21	5	42%	2	33%
Student 22	5	42%	3	50%
Student 23	7	58%	6	100%
Overall Average:		39%		70%
Percentage Increase:				81%

<i>Chart 5. Shows pre- and post-test data for the horseshoe layout.</i>				
Pre and Post Test Data				
Layout:	Horseshoe			
	Pretest - Raw Score	Pretest - Percentage	Posttest - Raw Score	Posttest - Percentage
Possible Points	13		11	
Student 1	5	38%	7	64%
Student 2	4	31%	8	73%
Student 3	3	23%	11	100%
Student 4	0	0%	7	64%
Student 5	4	31%	6	55%
Student 6	5	38%	6	55%
Student 7	2	15%	10	91%
Student 8	5	38%	6	55%
Student 9	7	54%	9	82%
Student 10	4	31%	10	91%
Student 11	2	15%	6	55%
Student 12	5	38%	7	70%
Student 13	11	85%	10	91%
Student 14	4	31%	7	64%
Student 15	7	54%	10	91%
Student 16	5	38%	8	73%
Student 17	4	31%	9	82%
Student 18	11	85%	10	91%
Student 19	5	38%	8	73%
Student 20	0	0%	9	82%
Student 21	6	46%	6	55%
Student 22	5	38%	5	45%
Student 23	11	85%	8	73%
Overall Average:		38%		73%
Percentage Increase:				89%

Horseshoe. For the horseshoe layout (chart 5), the pre-test consisted of 13 points possible. Nine students scored zero to four points. Ten students also scored five to nine points, and three students scored 10 to 13 points. The average pre-test score was 38%. The post-test consisted of 11 possible points. No student scored zero to three points, 10 scored four to seven points, and 13 scored eight to 11 points. The post-test average score was 73%. The overall percentage increase between the pre- and post-test average percentages was 89% for the horseshoe layout. With 88% increase, the horseshoe layout had the highest percentage increase from pre- to post-test. (73% is 92% greater than the original 38%: $73/38=1.921$)

Pairs. The last layout tested was pairs (chart 6). The pairs layout pre-test was of 12 points possible. Nine students scored zero to three points, 11 scored four to eight points, and three students scored nine to 12 points. The average pre-test score was 39%. The post-test consisted of 11 possible points. No student scored zero to three points, eight scored four to seven points, and 15 scored eight to 11 points. The post-test average score was 71%. The overall percentage increase between the pre- and post-test average percentages was 80%.(82%) The pairs layout had the lowest percentage increase of the three layouts.

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Chart 6. Shows pre- and post-test data for the pair layout

Pre and Post Test Data				
Layout:	Pairs			
	Pretest - Raw Score	Pretest - Percentage	Posttest - Raw Score	Posttest - Percentage
Possible Points	12		11	
Student 1	2	17%	5	45%
Student 2	6	50%	6	55%
Student 3	0	0%	8	73%
Student 4	10	83%	8	73%
Student 5	7	58%	8	73%
Student 6	1	8%	7	64%
Student 7	9	75%	9	82%
Student 8	6	50%	8	73%
Student 9	6	50%	10	91%
Student 10	6	50%	6	55%
Student 11	0	0%	8	73%
Student 12	4	33%	9	82%
Student 13	2	17%	10	91%
Student 14	7	58%	6	55%
Student 15	8	67%	9	82%
Student 16	5	42%	9	82%
Student 17	0	0%	7	64%
Student 18	6	50%	9	82%
Student 19	5	42%	9	82%
Student 20	11	92%	11	100%
Student 21	2	17%	5	45%
Student 22	3	25%	4	36%
Student 23	3	25%	9	82%
Overall Average:		39%		71%
Percentage Increase:				80%

Student Questionnaires. The student questionnaire asked a range of questions that required the student to indicate their feelings about each layout. There was a total of six questions on the questionnaire. Four questions required a “yes” or “no” answer and two questions used a Likert-type scale for self-rating. The following questions were asked on the survey:

1. Do you like sitting with your desk in this format?
2. Do you think it helped you participate in class? Why?
3. Were you able to work with your classmates easily?
4. Did this layout effect your attitude about learning in class? Was it better or worse?

5. Rate how you feel this layout of the desks effected your participation and learning in the classroom.
6. Rate how you feel about having the desks in this layout.

There were also two places for students to include extra written information on their answer selection. The data were analyzed using a Microsoft Word graph. In figure 1, the results of questions one though four were broken down by the layout and the response of “yes” or “no” that was selected. The sum of all “yes” responses and all “no” responses was found.

Question one of the student questionnaire resulted in 16 yes and seven no responses for the small group layout, 13 yes and 10 no responses for the horseshoe layout, and 16 yes and seven no responses for the pairs layout. According to the questionnaire, the small groups and pairs layout tied for the most students liking their desk in that format. For question two, the small group layout scored 13 yes and 10 no responses, 15 yes and eight no responses for the horseshoe layout, and 14 yes and nine no answers for the pairs layout. Of the three layouts, the horseshoe layout had the most yes responses for helping students participate in class. Even though, there was only a one-point difference between the each of the responses for question two, this supports the data that the horseshoe layout generates the most participation as found from the participation tally charts. When asked why the student selected their response, student 1 wrote that the horseshoe layout helped their participation because she was able to see the board better and other students were not able to bother her (Student 1, Horseshoe Student Questionnaire, December 14, 2018).

On the questionnaire, question three asked about the easiness of working with classmates. For the small group layout, 15 answered yes and 8 answered no. Twelve students answered yes and 11 answered no for the horseshoe layout, and 14 answered yes and 9 answered no for the pairs layout. As expected, the small group layout resulted in providing the easiest layout to work with another classmate in. Finally, if the layout effected the student’s attitude asked in question four resulted in 12 yes and 11 no responses for the small group layout, eight yes and 15 no responses for the horseshoe layout, and 15 yes and 11 no responses for the pairs layout. The horseshoe layout had the least effect on students’ attitude. When asked if their attitude was better or worse, student 17 said her attitude was better in the small group layout because she could work with their peers (Student 17, Small Groups Student Questionnaire, February 5, 2019).

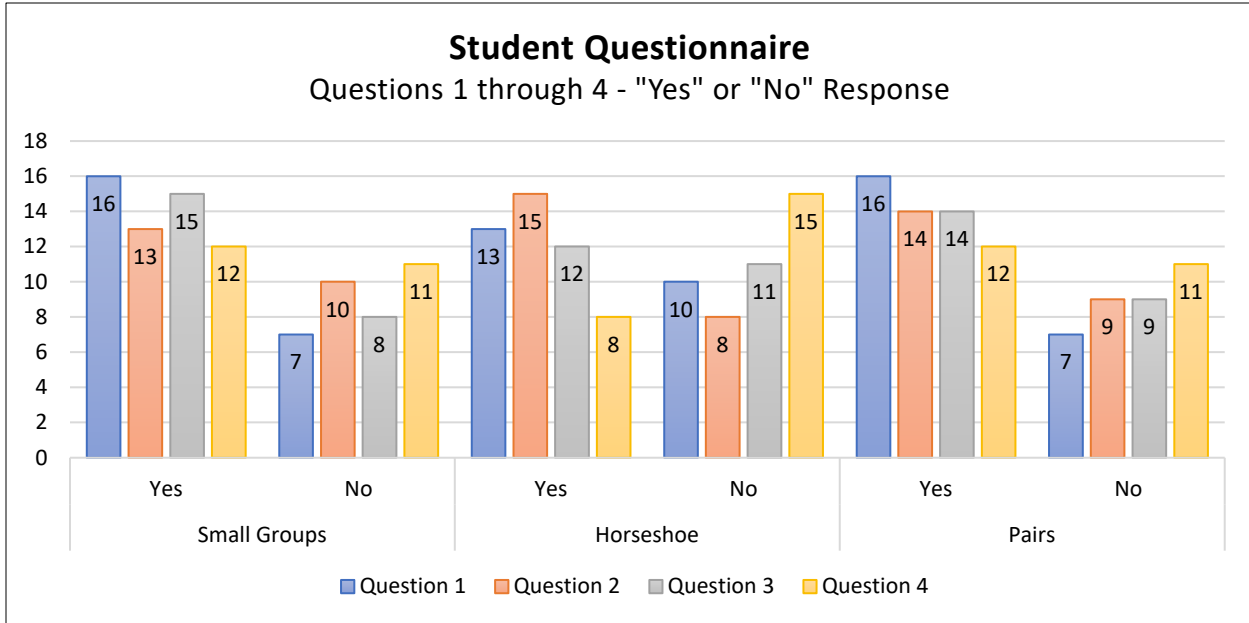


Figure 1. Shows the number of "yes" or "no" responses per layout for questions 1 through 4 of the student questionnaires

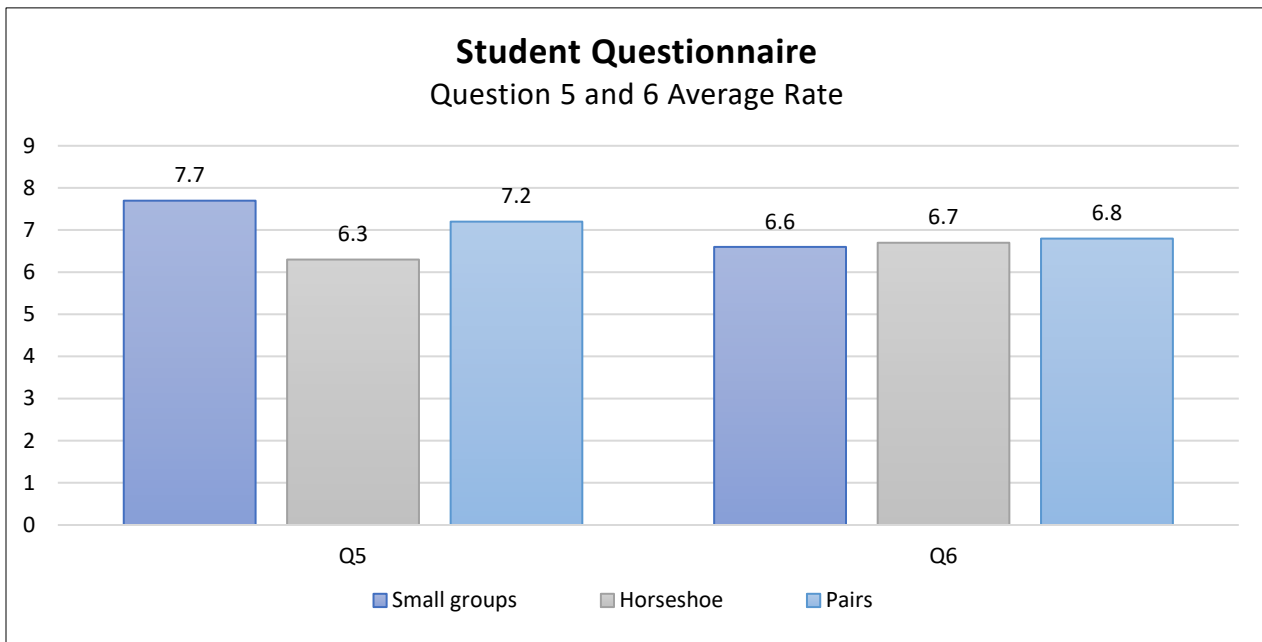


Figure 2. shows the average score selected for questions 5 and 6 of the student questionnaires

As stated above, on questions five and six the students were instructed to rate themselves on a scale of one to ten, one being a negative effect and 10 being a positive effect. Figure 2 shows the average response of each of these questions. When rating how the student felt the layout effected their participation and learning for question five, the highest positive average was small groups at 7.7. Contradicting question three above, the least positive average for participation and learning was the horseshoe layout at 6.3. The pairs layout average of 7.2 fell in the middle of the small groups and horseshoe layout scale average. Question six resulted in nearly identical results for all three layouts. For identifying how the student felt in the layout, the average was 6.6 for small groups, 6.7 for horseshoe, and 6.8 for pairs.

Student Interview. The last data source for this study was a student interview which was conducted at the end of the end of the research period. Only one question was asked in order to get a conclusive answer to what seating arrangement the students thought worked best for them. The concluding question was, "Which layout do you think you were able to learn and work best in?" Students could answer with one of the following types of layouts: small groups, horseshoe, or pairs. The data for the student interview were analyzed using a Wordle (www.wordle.net) that developed a "word cloud" by determining what was the most common response (Putman & Rock, 2018). Figure 3 shows the results for the interview question. Based on the student interview, the Wordle indicated that the horseshoe layout was chosen as the best layout for participation and learning. Of 23 students, 12 responded that the horseshoe layout worked best, six chose the pair layout, and five selected the small group layout.



Figure 3. Shows the frequency of the student interview question responses

Findings/Results of the Study

When comparing the participation tally charts and the average number of tallies per student per layout (figure 4), it is shown that students participated more during the

horseshoe layout. This could be due to layout focusing the majority of the attention on the teacher, but still providing the possibility of partner work when necessary as discussed by Kaya and Burgess (2007). The least amount of participation came from the small group layout. While small groups are known for promoting group talk and peer learning, the low participation rates could be due to the amount of distractions small groups can bring and coincides with why some teachers opted not to use this layout as discussed in research by Gremmen et al. (2016).

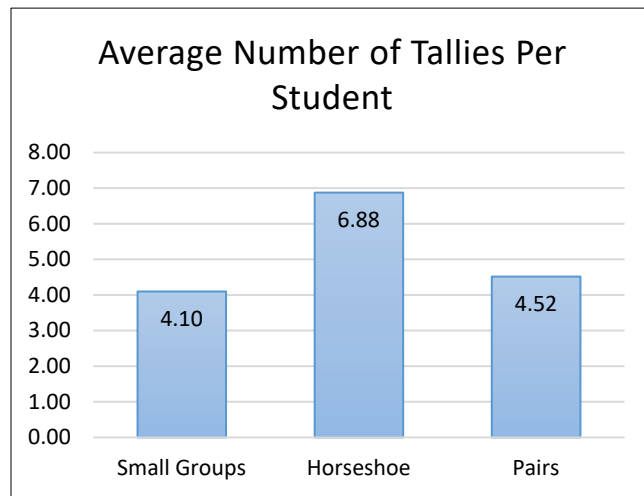


Figure 4. Participation tally chart averages per layout

Using the participation tally charts, I was also able to look at any T-zones and the specific seating of students in the front or back of the classroom. While I was not specifically focusing on these topics, I did not find similar results to either the research of Marx et al. (2000), which showed elevated participation rates in the T-zone of the layout, or with the research of Fernandes et al. (2011) that showed that the student's location in the front or back of the room effected their participation. Based on the data from the participation tally charts for this study, students that were normally very active in classroom participation, had about the same level of participation in all three layouts where they were placed at different points around the room. No "T-zones" were easily identified on the participation tally charts. For this specific research, the horseshoe layout was the most effective for participation. The location of students' seats in the classroom was not a factor in the frequentness of each student's participation level.

Using the data from pre- and post-test, the horseshoe layout showed to have the most percentage increase from pre- to post-test scores (figure 5). It led with an 8% higher increase than small groups and a 9% higher increase than pairs. This higher increase in the horseshoe layout's test scores could correlate with the results of the participation

portion of this study. The horseshoe layout did have the highest participation rates, which could show that participation and academic success are somewhat related. There was no prior research that could be found that neither supported nor denied my research findings on assessment performance in relation to the seating arrangement in the classroom. This could be a new and critical area of research for students and teachers.

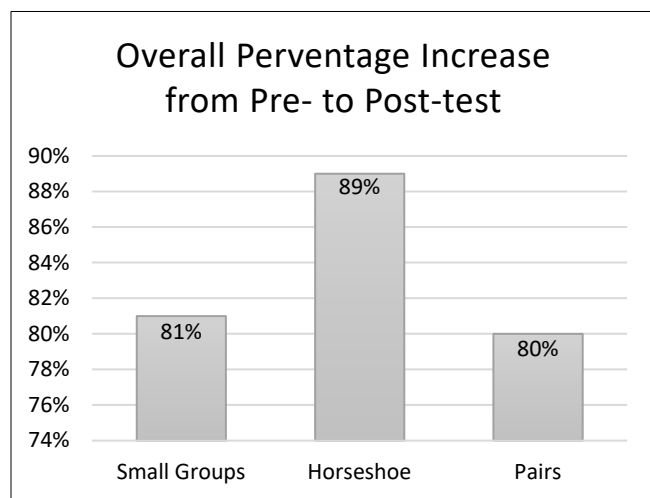


Figure 5. Pre- to post-test percentage score increase per layout

The data found from the student questionnaires were very similar across all three layouts. On question one and two, the majority of students indicated that they enjoyed sitting with their desks in each of the formats and also that each arrangement helped their participation. This could be due to each questionnaire being specifically about one of layouts. At the time, students might have genuinely felt these ways before having to compare all three arrangements. However, when asked during an interview at the end of the study what layout was best for participating and learning, a little over half of the class selected the horseshoe format. The small group layout was only chosen by five students which questions why it became one of the most commonly used formats in the classroom over the last 20 years (Paton et al., 2001). It is clear from the results of this study that students find other layouts, particularly the horseshoe layout, more effective for classroom learning.

Action Plan

When deciding what layout, I will use in my future classroom, this data will provide me with a starting point for determining what layout will be most effective. For me, active participation in a lesson, such as volunteering to answer teacher asked questions, plays a large part in

growing as a learner. I want students to participate in my lesson because it excites and motivates me as a teacher. Also, finding that students had about the same amount of participation no matter where they sat will help me in the future by being able to strategically place more involved students around those who are less likely to participate or who might simply need a little peer motivation to get involved.

Knowing that students selected a different format from the small groups layout that most teachers chose to use, I am able to see the importance of student choice and voice in the classroom. This highlights the key fact that although some things might be easiest for the teacher, it is not always what is best for the kids. While this study only used standard classroom desks and chairs, I would incorporate different types of seating options in my future classroom such as bean bags, stools, high/low-top tables, standing desks and exercise balls in order to allow more movement, comfort, and sense of community within the class. Perhaps the type of seat itself also effects students in the learning environment.

Further research on additional layouts, different types of participation, different types of seats, and even student behavior would be beneficial for the educational community for several reasons. It could be useful for helping teachers determine which layout is best for a particular unit or lesson depending on the desired type of participation or assignment. It would also spotlight the importance of how something as simple as the seating format can alter students' education.

Conclusion

This study was conducted to determine the effects of the seating arrangement on participation and assessment performance in a fourth-grade classroom. The layouts researched were small groups, horseshoe, and pairs. Each design was studied for two weeks and included tallying student's participation during whole group lessons, pre- and post-test, a student questionnaire, and one student interview following the end study. According to the data found using the participation tally charts and the pre- and post-test scores, the horseshoe layout resulted in the most participation during the whole group lessons and the highest percentage increase from pre- to post-test scores. After conducting all three student questionnaires, it was unclear which seating arrangement students preferred. The responses were similar by one or two points for all three layouts. Although, when students were asked directly during the student interview what the best layout was at the end of the study, the horseshoe layout was the most chosen formation. Overall, the horseshoe layout proved to be the layout with the best results. The horseshoe formation had

the highest participation rates, the highest percentage increase from pre- to post-test scores, was chosen as the most liked for participating and learning in class based on the student interview.

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