

THE EFFECT OF SEATING ASSIGNMENTS ON STUDENT
ACHIEVEMENT IN THE BIOLOGY CLASSROOM

by

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TABLE OF CONTENTS

INTRODUCTION AND BACKGROUND	1
CONCEPTUAL FRAMEWORK	5
METHODOLOGY	17
DATA AND ANALYSIS	33
INTERPRETATION AND CONCLUSION	45
VALUE	50
REFERENCES CITED	53
APPENDICES	56
APPENDIX A: Example of Daily Formative Assessments	57
APPENDIX B: Likert Survey	59
APPENDIX C: Explanation of Likert Survey	64
APPENDIX D: Likert Survey Findings	67
APPENDIX E: Individual Interview Questions	73
APPENDIX F: Colleague Interview Questions and Responses	75
APPENDIX G: Excerpt from Teacher Journal	79
APPENDIX H: Sample of Student First Round Interview Transcripts	86
APPENDIX I: Institutional Review Board Exemption	103

LIST OF TABLES

1. Classroom demographics	19
2. Data triangulation matrix	20
3. Treatment periods and curricula descriptions	26
4. Mean teaching comfort level for each treatment type	35
5. Student performance under alternative seating conditions	39

LIST OF FIGURES

1. Classroom seating preference map	7
2. High-level students' scores in three seating arrangements	41
3. Low-level students' assessments in three seating arrangements	43
4. Assessment scores by CRT Score for Seating Chart Assignments.....	45

ABSTRACT

This study investigated the relationship between classroom seating arrangements, student motivation and achievement in the science classroom. Data were collected over 16 weeks. Students were placed in three different seating arrangements for three weeks each: self-chosen seats, randomly assigned seats, and teacher assigned seats. Each was repeated to make a total of six treatment periods. Students' attitudes and motivation to learn were measured by their attitude survey and interview responses. Multiple choice formative assessments were administered each day to measure each student's level of engagement and understanding of the daily learning objectives. Curriculum unit difficulty levels were calculated to ensure that no one treatment was significantly different than the next.

The results showed that teacher chosen seating arrangements yielded better performances across the entire population. When investigating higher- and lower-performing students, the high performers accomplished significantly better results with the aid of teacher chosen seats, whereas the lower-performers showed no improvement with any seating method. The findings also revealed that, within my student interview group, there was significant improvement in all performance levels with the teacher chosen seats. These results indicate that well-developed communication between instructor and student helps to inform the teacher of necessary accommodations for each student. The results revealed that the most effective teaching days occurred during teacher chosen seating treatments where I was more able to control the classroom environment while experiencing the highest level of comfort.

INTRODUCTION AND BACKGROUND

Most of us have vivid memories of our childhood classrooms. For me, the events I remember most were meeting my best friend in third grade homeroom and being assigned a locker right next to the nicest boy in seventh grade. Another person might remember racing his peers to class on the first day to get his favorite seat in the second row by the window. He was convinced that sitting there would give him the best chance to earn a great grade and impress the teacher, and it could only be more perfect if his best friend got there in time to sit in the seat next to him.

In my junior year, I was confident choosing the front row, window seat especially with a new and dynamic anatomy teacher. Because of my comfort level, I remember loving to go to that class, and there was nothing that could stop me from succeeding. However, my back row seating in math class was not a happy place to be. In the back, I felt more discouraged, more ignored, less recognized as a positive classroom contributor, and less able to get that “A” I wanted so badly. My seat location in math not only affected my academic performance, but it influenced my motivation to succeed.

Do other students struggle with the same challenges to perform well? Is it possible that some teachers underestimate the power of an effective seating chart and are getting it all wrong? If it is true that seating location affects a student’s ability to perform in the classroom, then educators should spend more time organizing their learning environments to support achievement for all children. Most educators do not undergo formal seating chart training in their university educations, so perhaps they are not aware of the factors required to make a good seating chart. A novice teacher probably understands that placing special needs students in the front is usually acceptable. But are

these front-row seats the best option for the special needs subgroup? Also, it makes sense for the new teacher to seat the talkative kids away from one another in order to maintain a controlled environment. But what other concerns should teachers consider when assigning seats?

Students learn in different ways, just as their teachers develop customized skills to incorporate instructional methods that work best for them. There is no “one size fits all” solution to creating effective seating arrangements. My Action Research (AR) allowed me to investigate whether motivation and academic performance of my students changed as a result of three different seating assignment methods. The information gained through my AR has informed my instruction more than any other educational training I have experienced. I learned that certain student subgroups performed better and had more motivation to succeed given certain seating techniques. I became aware of classroom ecology organization methods that inspired less stress, more creativity, and a higher completion of learning objectives. This study provided a better awareness of how three different seating chart methods affected student achievement. This AR helped to guide my future instruction and will hopefully put other instructors at ease knowing their classroom environment promotes independent and collaborative learning and complex problem solving.

Teaching Experience and Classroom Environment

After teaching chemistry, physics and biology in a high school in suburban Seattle, my own high school biology teacher retired, and I moved into the open biology job teacher at my alma mater high school in Dillon, Montana. Dillon is a large agricultural center in western Montana and forms one of the largest hay and cattle

producing areas in the state. Outside of agriculture, many of my students' families have jobs in timber, tourism, recreation and mining. It has a predominantly white population of 3,700 residents. There are 330 students enrolled and 23.1 total full-time equivalent teachers at Beaverhead County High School (BCHS), where the student to teacher ratio is 14.5:1. The school is Title I eligible, and 11.3% of students are on free or reduced lunch programs. 94.6% of the students are white and non-Hispanic, 4.2% are Hispanic, 0.9% of students are Asian, and 0.3% of students are American Indian. The median family income in this district is \$32,400 per year.

Because of the myriad of social and economic stressors BCHS students face, the way teens perceive their roles as students is in stark contrast to a teacher's or administrator's expectations of their students. I have found that teaching high school biology can be challenging, but social distractions play more into the success or failure of students than any other factor. In my classroom, biology is collaborative where students experience laboratory or group activities 70% of the time. For the other 30% of the time, students are expected to work independently to solve problems, think critically, take careful notes and ask constructive questions. Seat location directly influences student behavior, attention and performance. My Action Research became a necessary tool to track student performance in different seating location.

In the past, I invested great energy creating seating charts where all students were considered. These seating charts worked well in the short-term, but the arrangements become useless after a few weeks. Even when I moved a few students around, it was only a few days before they became distracted by new neighbors. The social nature of cooperative biology learning is inquiry-based and very rewarding, but it introduces

challenges of excess noise and distraction. I hoped my AR would help me find a seating method that reduced social influence and increased student confidence to complete tasks independently. I wanted this method to inspire healthy working relationships between any two students in the classroom where teens could manage conflict effectively on their own with minimal teacher influence. I was inspired to find a mode of seating that would help students perform at or above expectations more frequently. If students experienced success more often, that feeling could motivate optimism about learning science. Statistically I wanted to determine whether my population and sub-groups had significantly different performances as a result of several seating methods, including student-chosen, random, and teacher-chosen seating.

Focus Questions

Concern about my students' abilities to perform well in specific arrangements in the biology classroom led me to my primary focus question: What are the effects of three seating chart methods on student performance in the science classroom?

My secondary questions are as follows:

1. Do various subgroups (e.g. boys vs. girls, "A-C+" vs. "C-F" students) have different performances depending on different seating charts?
2. What are the effects of various seating assignment methods on student motivation to perform well in the science classroom?
3. How do these different seating configurations affect my attitude, level of comfort, and teaching style?

Capstone Team

Fortunately, I did not have to complete my Action Research on my own. Mike Telling, my colleague at Beaverhead County High School is an innovative physics and chemistry teacher, graduated with his MSSE in 2007. He is a knowledgeable science educator, and his experience with the capstone process made him a brilliant coach. My husband, Ryan Hammang, helped me be critical of the questions I asked and the work I completed. He is a remarkable organizer and provides constructive criticism from the audience viewpoint. He has gained fabulous experience in his occupational, educational and lifetime situations, and he is an important asset to my team. Finally, Diane Allen is a veteran science teacher at Liberty High School near Seattle, WA. Diane was my mentor in my first teaching job and was a superb role model during my eight years of teaching in Washington. She is an amazingly creative educator, and she offered thoughtful advice to me throughout the capstone process.

CONCEPTUAL FRAMEWORK

Background

As I examined educational journals, it became obvious that there were many research projects that attempted to investigate potential connections between classroom seating and performance, attitude and personality. My desire to try varying seating assignment methods and to determine whether particular locations in a classroom affected student success led me to search the literature to see what types of studies have been completed that analyze student performance in different seating conditions.

Extensive research led me to a few articles that were continuously cited in most journals. Most of the studies occurred in either postsecondary or elementary classrooms. I found very few studies completed in the high school science classroom.

A Solid Foundation

The majority of the studies referenced two authors who researched seating assignments with college freshmen in the 1920's and 1930's. In 1921, a paper was published in the *Journal of Social Psychology* that chronicled the positions in the classroom where students obtained the best grades. According to his research, Griffith (1921) determined that the front and center seats of the room were the best places to perform well. In Griffith's study, several thousand grades were tabulated for 151 undergraduate classes meeting in 5 different classrooms (Griffith, 1921).

Although Griffith was the pioneer of seating assignment studies, there were many reasons successive scientists criticized his work. The basis for the student grades was not described in Griffith's paper, and his exact sample size was not specified. All seating was alphabetically assigned, and only a small subset of the data was presented where no significance tests were performed. Apparently, Griffith (1921) verbally encouraged students to sit near the front and center in order to "do the best in his classes." He reported the following pattern: grades were slightly higher (3-10%) in the second through fourth rows when compared to the front row. Grades declined gradually from row four toward the back of the classroom, and grades declined more drastically in the last row, row eight, by about 10-20% compared to the middle rows (Griffith, 1921). Griffith's study was groundbreaking in terms of seating chart effectiveness, but it lacked validity. Still, Griffith's findings were reported in most of the subsequent seating research.

A 1933 study asked 510 Stanford students to mark the seats they preferred given “110 seats in an inside room with artificial illumination where you can see and hear perfectly from all portions of the room” (Farnsworth, 1933, p. 373). Figure 1 is a modified version of this map where 7 subjects checked the middle seat of the 1st row, and 17 students preferred the seat just behind it. Farnsworth’s study showed that for these Stanford subjects, the seat position at which Griffith’s subjects received the best grades was also the most preferred seat in the house.

<i>Front of Room-Platform</i>										
2	1	1	1	5	7	3	1	3	0	2
0	0	1	8	8	17	13	5	0	0	0
2	1	6	9	17	56	26	13	2	0	1
1	1	0	12	19	38	15	10	3	0	1
3	2	1	7	12	24	19	2	3	1	7
2	0	1	3	5	21	6	2	1	0	2
0	1	1	3	2	9	0	3	3	0	0
0	0	2	3	2	5	3	1	3	0	0
0	0	0	1	0	0	0	0	0	0	0
1	2	0	1	4	13	5	0	0	1	6

Figure 1. Classroom seating preference map (Adapted from Farnsworth, 1933).

Griffith, Farnsworth, and subsequent researchers interviewed their students and got several explanations why their students preferred the seats near the front and center (and performed better academically in those seats than in other seats in other areas in the classroom). Students could give multiple answers, so these percentages do not equal 100%. The majority of subjects (68%) “just liked” the seats they checked and could not

cite a specific reason. Thirty-five percent of students avoided the back and sides of the room because students in those locations were noisier and more inattentive. Front seats were avoided by 1% of students because of possible “spray” from the professors’ mouths. Twenty-one percent claimed the front and center seat region was the point toward which the lecturer most frequently directed his attention (Farnsworth, 1933).

Is Seating Choice Related to Attitude?

Walberg (1969) suggested that a relationship exists between physical and psychological distance in a classroom in that pupils who choose the front and center of the classroom have a more positive attitude toward learning and school than do pupils seated at the back and sides of a room. Adams and Biddle (1970) reported that verbal communications were highly concentrated in the center, front and middle of the classroom. This zone of increased activity was labeled the “action zone” and supposedly applied to any gender or teacher age, any grade-level or subject area of any class. Additionally, Adams and Biddle (1970) found that teachers spent 70% of their time in the center front of the room, 15% along the sides and the back, and the remainder of the time in the aisles. This concentration toward particular area may help us understand why students consciously or subconsciously move toward these areas of the room to receive the most attention.

The front and center seats in the Adams and Biddle (1970) “action zone” have come to be termed “action seats” (Totusek & Staton-Spicer, 1982). Studies that defined “action seats” suggested that the high interaction in “action seats” was a result of students with similar personality traits preferring to sit in central areas. In their study, Totusek et al. (1982) administered a 16-personality Factor Questionnaire to try to determine whether

specific personality traits might lead students toward central seating that might eventually lead to those students' successes. Subjects in the Totusek study were 285 undergraduate students enrolled in 2 sections of an introductory communication course at a large university. Analysis of variance and *t* tests were performed on their data, and it was determined that several personality factors were significantly different for those who chose "action seats" and those who did not. Students who chose to sit in action seats had a greater tendency toward creativity, an extraordinary imagination, absorption of ideas, and an unconventional approach to learning than those who sat in non-action seats (Totusek et al., 1982).

Experimental findings have shown that students who chose frontal or central seats are more creative, assertive, aggressive and competitive (Totusek et al., 1982). These students have greater success in doing things (Becker, Sommer, Bee & Oxley, 1973; Walberg, 1969), have higher self-esteem and are more attentive (Hillmann, 1991). They are more externally oriented (Pederson, 1994) than students who choose side or back seats in a classroom.

Is Seat Choice Related to Frequency of Teacher-Pupil Interaction?

Available data suggests that front-center seats make student achievement possible. This "action zone" facilitates positive attitudes about the course and pupil participation. Do students choose those seats because they want to participate more, or do these students participate more because of their location? Could it be that teachers do pay more attention to these front and center students even if no additional verbal interaction occurred? This suggests that proximity to the instructor, eye contact with the teacher and non-verbal cues could also help keep a student's attention.

Later, Delefos (1972) investigated the nature of interaction in the classroom by using 53 elementary school children. Delefos wanted to determine whether there was an area of the classroom that received an unbalanced share of the teacher-pupil interaction and whether this area could be defined as the same “action zone” defined by Adams and Biddle (Delefos, 1972). The Delefos study went further and attempted to describe where (and how often) a teacher moves in a classroom and whether this mobility might be related to the existence of a primary area of interaction. The observers in this study were able to quantify the episodes of communication between teacher and student, and they kept track of classroom locations where these interactions occurred. The two teachers who participated in the study were not informed of the exact nature of the study. Data was collected for 155 minutes in each class. Delefos (1972) determined that pupils seated further from the teacher were not singled out for communication as often as those seated at the front of the class, whereas pupils seated in the middle seats and the back were more likely to initiate communication with the teacher than to receive it. The large number of observations taken in the classrooms coupled with the high observer agreement certainly questions the constrained “action zone” as defined by Adams and Biddle (1970).

The various studies agreed that a myriad of environmental factors played roles in shaping and defining student to teacher communication. Yet, these studies went back to previous research that revealed that the highest student-teacher interaction happens in seats that are at the front and center of the classroom, not known at the time as the “action zone.” These studies revealed that student contributions (including eye contact, on-task behavior, and asking and responding to questions) originate more frequently in certain areas of a classroom than others (Sommer, 1967). Adams (1969) concluded that in

elementary and secondary classrooms, front and center seats produced the greatest amount of student participation, and that the amount of participation decreased in a line directly down the center of the classroom. These types of studies suggested that the greatest amount of student-teacher interaction occurs in the front and center-seating positions of a classroom, and this pattern was consistent in college, secondary, and elementary levels.

How Do Seating Charts Affect Performance?

Several studies confirmed that freshmen college students who sit near the front of the classroom performed better than students who sat in the middle or back rows. Many studies examined various performance measures including grades (Holliman & Anderson, 1986), absences (Brooks & Rebeta, 1991), participation (Sommer, 1967), and attention (Schwebel & Cherlin, 1972). While these performance measures vary, they were still adequate representations of student performance and success in the classroom. In my classroom these performance measures are intimately linked. In my Action Research, I observed a very important measure of student achievement (student grades and the relationship to students' attitude toward learning).

Another study showed that students who sit near the front and center of the classroom get better grades and like the instructor more than students who sit in the back or on the sides of the classroom (Becker et al., 1973). Becker (1973) conducted his study in three college classes ($N=82$) at the University of California at Davis, and took place at the end of the quarter when students were well-established in their seats. The students were asked about their grade and how much they liked the teacher. Seating position was significantly related to the reported grade in the course, with students sitting in the front

reporting higher grades and consistently reporting that they liked the teacher more than students in the back (Stires, 1980).

The Marx, Fuhrer and Hartig study (1999) went one step further by using two treatments (semi-circle seating and row and column seating) to investigate the relationship between classroom seating arrangements and frequency of questions students asked. The research showed the semi-circle arrangement was more effective overall for children asking questions. However, the row and column seating had an effective and clearly defined “action zone” where children consistently asked more questions per lesson (Marx et al., 1999). This research also investigated more actively engaged students to determine whether they had specific question asking patterns dependent on their location inside or outside the “action zone.” Adams and Biddle (1970) observed 32 classes and reported that most of the verbal interaction came from students seated in the front and center seats. Koneya (1976) reported a triangle of participation for university students that extended across the front row and ended at the middle seat of the middle row. For at least some grade school pupils (Axelroad et al., 1979; Wheldall et al., 1981) and university students (Montello, 1988), the location in the classroom influences the patterns of communication. These studies suggest that classroom seat location is an expected determinant of a student’s rate of communication. It was even reported that students who were forced to move toward a front and center tended to “receive higher grades despite their preference for back seats” (Benedict & Hoag, 2004, pg. 225).

Seating Charts May Not Affect Student Performance

A 2011 Brigham Young University (BYU) showed conflicting evidence on the effect of seat location on student performance and participation in the classroom. There

are two hypotheses being studied in college lecture halls: 1) seat location influences student behavior and 2) seat preference and selection is associated with personality traits of students (Parker, Hoopes & Eggett, 2011). In the BYU study, half of the class was randomly assigned a permanent seat while the other half of the class had to move. They had been randomly assigned to a group that would have a different seat each class period. Students that were randomly and permanently assigned to the front seats in a classroom made more comments and participated more often than groups that were permanently in the back. However, the group that was selected to randomly move every day showed increased participation with no significant difference between the front and the back of the classroom. This study evaluated both hypotheses with 55 seniors in a BYU science course (Parker et al., 2011). This study allows a meaningful comparison of achievement between students that changed seats daily to students who are required to stay in a randomly assigned seat. This study is useful because the random seating component is a treatment I utilized in my study.

Montello (1988) concluded that there were not consistent effects of seating location on course achievement as measured by grades in the course. Montello claimed that most studies do not include enough information about the task a student is to complete for a grade, so it is difficult to tie achievement to course grades. He did find that higher participation may be an important measure of student success (Montello, 1988). This intrinsic motivation to participate in class can be linked to feelings of enthusiasm and belonging, and the student oftentimes enjoys class at a high level.

In stark contrast to Montello's research, Brooks and Rebata (1991) presented a paper that showed a clear relationship between classroom performance and seating

location preference quoting Montello's research in 1991. Montello wrote an article in *Environment and Behavior* a year later claiming that he was inappropriately quoted and that Brooks and Rebata could not possibly come to their conclusions if they allowed students to choose where they sit. Any relation between post course grades and seat location found in their data may or may not implicate an effect of seat location; it is ambiguous when seats are not assigned (Montello, 1992). This research is directly applicable to my own research, as my nontreatment involves students choosing their own seats. Both of my treatments involve random seating and teacher choices where students are not given the option about where they want to sit.

Perkins and Weiman (2005) randomly assigned seats to a large class of non-physics majors (some were situated toward the front, while others were toward the back), and they went to work determining class performance. Students who initially sat in the front continued to perform well even after moving to the back of the class. Even when these students were forced to the back of the classroom, they continued to have some of the highest levels of classroom participation despite the professor's attempt to "spread out" his attention. However, students that initially sat in the back and were forced to the front continued to perform as if they were still in the back of the room in both areas of grades and participation (Perkins & Weiman, 2005).

In response to these findings, Kalinowski and Taper (2006) randomly assigned seats in a science class for majors and found no differences between students in the front and back. However, they did find a positive correlation between seat preference and a student's GPA. There are possible reasons why these students performed differently when compared to the Perkins study. In the Kalinowski study, the subjects were science

majors (as opposed to non-majors); their class sizes were significantly smaller which allowed the professors to get to know the students better; and the classroom was narrower which may have directed the students' attention toward the front more of the time. The Parker et al. study (2011) reported an average of 50 student comments per class period with 1,144 total comments during the 2,346 hours in this study. The average number of comments made by students in the front was higher than the back, but not significantly at 0.05 level ($p=0.10$). There was no significant difference between the left and the right sides of the room (Parker et al., 2011). These studies show the reader that there is evidence of correlation between seat location and student performance, yet the evidence remains inconsistent.

Does Seating Location Affect Student Motivation to Participate in Class?

Do seating charts play an important role in student success in the classroom?

Perhaps more motivated or capable students prefer to sit in the front because the environmental characteristics of the front-row seats are preferred and may be responsible for the superior performance of students in that area. Koneya (1976) found that students who were classified as highly or moderately verbal showed high rates of participation in class when seated in the front and center of the classroom. Students classified as low verbalizers did not increase their class participation when they sat in front (Koneya, 1976). Thus, although the front of the classroom may offer an advantage, perhaps only a particular type of student will be able to utilize that advantage.

Rebeta and Brooks (1989) and Mercincavage and Brooks (1990) found that freshmen students near the front of a classroom (the first two rows) had higher scores on a scale of achievement motivation (Lindgren, Mortisch, Thulin, & Mich, 1986) than

students who sat in the last four rows of the classroom. The Rebata and Brooks (1989) study is pertinent and likely less biased because the achievement motivation exam was given two months prior to the beginning of the course. Because of this, the data suggests that personality before a class even influences the selection of seats in that course.

To what extent does classroom seating affect student performance in biology class? This is the focus of my study. From observations of my own teaching experience, I assume that students sitting closer to the front of the classroom are more engaged in classroom activities and discussion than the kids that sit in the back of the classroom. I wonder whether forcing the students that sit in the back row forward will influence their participation, accomplishment and outlook for learning. Furthermore, will there be a significant change in the performances of students who are forced from their self-chosen front and center seats to the back half of the classroom?

Most studies I reviewed occurred in college lecture halls where assigning seats to students can be a challenge for a number of reasons. These students are adults and probably enjoy the freedom of adulthood and seating chart free lives. However, there are disadvantages to studies in college environments. Attendance rates in college classrooms tends to decrease as the grading period continues, so it is difficult to conduct research on such inconsistent subject numbers. Colleges and universities have unique problems with very large lecture halls and more variables to consider. In contrast, high school classrooms are much easier to control, as the classrooms are smaller and attendance policies require students to attend class more frequently and regularly.

In my action research, I had the benefit of assigning seats according to my action research requirements as long as the student and parents agreed to participation in my

study. Because of my intense review of the literature, I understood that while many students preferred seats that were front and center, there are not enough of those seats for everyone. How is student learning affected as a result of being “forced” out of a preferred seat? Is it true that these front and center “action seats” might be the best seats in the house, yielding more student participation, and hence better performance? If so, could “action seats” be more effective because of unobstructed views of the instructor, or is it the more frequent eye contact with the teacher that probes the student to be more engaged? I wonder if students who prefer “action seats” might have personalities defined by good study habits and a greater opportunity for success than their peers. My action research will allow me to gauge how performance changes because of placement in “preferred” and “non-preferred” seats in the science classroom.

METHODOLOGY

My action research aimed to assess whether there was a best method of assigning seats in the high school classroom where negative social influence was minimized and student confidence in completing independent tasks was increased. If there was a best seating method that helped students establish working relationships with their entire peer group, did it allow students to achieve greater academic goals? I also wanted to gauge whether student attitudes about being in school and learning science were more or less positive with different seating arrangements. The treatment cycle for this study consisted of three parts, and each segment took place while learning curricula that I developed over the past decade. I wanted my students to learn behaviors that would benefit them throughout their lives. My goal was to maximize each student’s learning and to help

students utilize a metacognitive approach to succeed in his or her life. Mumford (1986) described an effective manager as a person who has learned to learn. He defined this person as one who knows the stages of learning and understands his or her own preferred approaches to it. Statistically I wanted to determine whether individual students and sub-groups performed differently given various seating assignments. I wanted to help students learn how to help themselves.

My project was based on the action research model. My research spanned four biology units from late August to mid December 2011. The units included scientific method, characteristics of life, ecology, cellular biology, and genetics. Motivated by what was learned in Conceptual Framework/Literature Review, my methodology included the various collection tools I used to answer my Action Research, the details of the various treatment designs and details about the participants of the study. Finally, the research methodology for this project received an exemption by Montana State University's Institutional Review Board, and compliance for working with human subjects was maintained.

Participants

The five biology classes of the study were selected because they represented the majority of the sophomore class at BCHS (in addition to some freshmen who tested into biology). The selection process ensured that the data collected captured the attitudes from a truly representative cross-section. Each class contained between 15 and 20 students with a wide range of academic and social skills.

Table 1 describes the demographics of 88 biology students involved in this action research project. The sample includes 17 freshmen, 68 sophomores, and 2 juniors.

Table 1
Classroom Demographics

Category	Number of students	Percentage of students
Total students	88	
Males	44	50.0%
Females	44	50.0%
504 Plan students	9	10.2%
Individualized Education Program	1	1.1%
CRT Performance		
Novice [*]	7	8.0%
Nearing Proficient [#]	26	29.5%
Proficient ⁺	43	48.9%
Advanced ⁼	12	13.6%

Note. CRT Performance

Novice^{*}: students have begun to attain the prerequisite knowledge and skills that are fundamental for work at each benchmark.

Nearing Proficiency[#]: students have partial mastery or prerequisite knowledge and skills fundamental for proficient work at each benchmark.

Proficient⁺: students exhibit solid academic performance for each benchmark, and they have demonstrated competency over challenging subject matter including subject matter knowledge, application of such knowledge to real-world situations, and analytical skills appropriate to the subject matter.

Advanced⁼: students are superior in their performance.

Traditionally, biology is a sophomore class, but 17 freshmen were enrolled in this sample because the freshman class is significantly larger than the sophomore class. In order to level out class sizes, freshmen with the highest statewide science assessment

scores were enrolled in biology. The table shows the number of males and females in the study and the percentages of students on Section 504 plans or Individualized Education Programs (IEPs). The table illustrates the frequency of student achievement at each level of Montana's Criterion Referenced Test (CRT). These demographics describe the level of student achievement for Beaverhead County High School, so that the reader may have some idea how the treatments of different seating methods in this action research project might affect the achievement and attitudes of students.

Data Collection Tools

To triangulate my primary and secondary focus questions, I used a variety of data sources as demonstrated in Table 2. The AR tools described below include teacher interviews, individual student interviews, my teacher journal, a Likert survey of student attitudes and daily multiple choice assessments.

Table 2
Data Triangulation Matrix

Focus Questions	Source 1	Source 2	Source 3
1. Primary: What are the effects of three seating chart methods on student performance in the science classroom?	Teacher and Individual Student Interviews	Likert Survey of Student Attitudes and Teacher Journal	Daily Multiple Choice Formative Assessments
2. Secondary: Do various subgroups perform differently depending when placed in various seating charts?	Individual Student Interviews	Teacher Journal	Daily Multiple Choice Formative Assessments
3. Secondary: What are the effects of various seating changes on student motivation to perform in the classroom?	Individual Student Interviews	Teacher Journal	Likert Survey of Student Attitudes
4. Secondary: How do these different seating configurations affect my attitude and teaching styles as a science teacher?	Teacher Interviews	Teacher Journal	Likert Survey and Individual Student Interviews

Multiple Choice Formative Assessments (MCFAs)

A variety of data collection tools will be described here in detail, and examples of these tools can be found in the Appendices. The daily multiple-choice formative assessments (MCFAs) were simple and consistent classroom assessment techniques that allowed me to track student understanding of daily content learned in the biology classroom. The MCFAs were effective tools since the level of difficulties of each treatment was very similar to the level of difficulties of the others. Also, the curriculum content was consistent with what I have taught in past years, so I was usually able to pull reliable and valid multiple choice questions from my past summative exams. From these five questions, I drew one question from a hat and gave that question to each of the five biology sections. If there were not appropriate questions available because of curriculum variability, I wrote new questions, and one was randomly chosen. This random questioning technique allowed me to reduce bias, so I would not unknowingly choose the easiest or hardest questions depending on a particular class.

These MCFAs informed my teaching because I was made aware of all students' abilities to focus on daily lessons and internalize the daily learning objectives. I had a better understanding of which students stayed on task for each lesson without allowing distractions to affect their learning. This daily classroom assessment technique also helped me assess my own teaching effectiveness. Not only was I able to determine student behavior as a result of various seating charts, but I was able to adjust my teaching styles to help students increase understanding. Studying the performance effects of various seating chart methods was the goal of my action research. However, it was an even more powerful feeling to be able to scaffold my instruction to facilitate each

learner's academic development. These scaffolds assisted each student in building on prior knowledge and internalize new information. I was more effective in helping the learner accomplish the tasks he or she could not otherwise complete by helping the learner through Lev Vygotsky's concept of the zone of proximal development (NYC Teaching Fellows, 2002).

Likert Survey of Student Attitudes

A 73-question Likert Survey of Student Attitudes (LSSA) was devised that measures student attitudes about school, science and their perceptions of how they learn best (Appendix B). This survey required students to identify and record which characteristics in a classroom environment supported learning, and reasons were recorded on why students desired specific seats. In order to determine student tendencies to sit where they like, the questions focused on specific environmental factors that affect seating choice. In addition, each student had a chance to write comments to further clarify their responses for many Likert survey items.

The LSSA was given during a regular class session. Before the survey was administered, I received informed consent statements, and the students were reminded of the voluntary nature of the experiment. I did not mention the explicit purpose of the survey. The results of LSSA provided qualitative data that helped to explain some of the quantitative results of the statistical tests. Each LSSA question was assigned one of the following categories: attitude toward learning, independence, lifestyle and preferences, participation, and seating and learning preference. These questions helped me gain great insight into my students' lives and preferences. Understanding my students in this way helped me to understand the answers to my primary and secondary focus questions. The

LSSA responses also helped me to carefully consider my decisions about where to place students in the teacher assigned seating charts. This survey data helped me consider which students would do well together and which special student needs should be considered when seating students. The write-in comments from the LSSA helped me to understand my student sample adequately.

Individual Student Interviews

While many of the Likert survey responses were further explained with written input, the feedback received from my 10 interviewees proved very useful. Interviews were conducted during the students' available free periods, and I transcribed the students' answers during the interviews. My interviewees were chosen using a stratified random sampling technique. Males and females were equally represented, as were students of varying academic ability (determined by their semester science grades the year previous to biology enrollment). Approximately 20% of the students had A's coming into biology, and roughly the same percentage of students had B's and C's. However, there were 29% of the students with D's and 11% at F's. I combined these last two grade categories to assign students. There were an equal number of boys ($n=44$) and girls ($n=44$), so I determined the following strata to represent the ten interviewees:

- 1 male and 1 female with an "A" grade in their previous science course
- 1 male and 1 female with a "B" grade in their previous science course
- 1 male and 1 female with a "C" grade in their previous science course
- 1 male and 1 female with a "D" grade in their previous science course
- 1 male and 1 female with an "F" grade in their previous science course

In addition to completing interviews during the non-treatment period, they were conducted twice more during periods three and six. During each interview period, interview questions (Appendix E) were the same with the exception of adding probing questions that elicited more detailed student responses specific to the treatments received.

Daily Teacher Journal

Throughout my research, I used a teacher journal almost daily. I answered basic questions including:

- What went well in today's lesson?
- What could be improved from today's lesson?
- How can I improve this lesson next time and in the future?

I also recorded solicited and unsolicited quotes from students. A final section chronicled my attitudes about each treatment. The daily journal allowed me to track individual and class successes and challenges. This analysis gave me the chance to choose effective seats in each teacher chosen seating assignment. The journal helped me reflect how I changed as a teacher on a daily or weekly basis. An excerpt of this teacher journal is in Appendix G.

Colleague Survey

I surveyed 20 colleagues by means of email survey to request information about their current seating practices and reasons for their methods. This survey helped me gain a better understanding of different teacher practices at my school. This survey helped me to better define the value of my study. About half of my colleagues usually do not use seating charts. Those that do use seating charts almost always use them for avoidance of

disciplinary issues. There were very few teachers who used them as a tool to enhance the classroom learning environment. Excerpts from the teacher email survey are included in Appendix F. The questions I asked were:

- Do you use seating assignments (charts) in your classroom? Why or why not?
- What do these seating charts look like? (e.g. alphabetical, random, etc.)
- What are the reasons you think seating charts are important?
- If you don't use them, what are reasons you don't use seating charts?

Data Collection Methods

Throughout the action research process, I utilized a variety of data collection methods in each of the treatment periods to address and answer the research questions. To ensure the different treatments and the non-treatment had similar curriculum difficulty, I requested that two of my AR team members rank the curriculum units according to difficulty. The first teammate is a chemistry and physics teacher and is familiar with the biology curriculum because he has taught it before. The second team member understands the nature of science and learning cycles, and he pays close attention to detail. To estimate difficulty, these men reviewed lecture notes, discussion topics, one laboratory or activity, one homework assignments, and a summative assessment (quiz or exam) and ranked each instrument on a scale from 1 (easiest) to 5 (most difficult).

Table 3 describes how the treatment periods were assigned to specific curriculum units to ensure that the mean difficulty levels were similar. Since my curriculum content has not changed greatly from previous years teaching, the curricula were well-developed.

It was also important that each treatment and the non-treatment occurred over the same number of days and had the same level of difficulty to ensure validity and reliability, so this is the reason 15 class days for each period and a total of 30 days for each treatment and non-treatment type was decided upon.

Table 3
Treatment Periods and Curricula Descriptions

Treatment Period	Treatment Type	# of MCFAs	Treatment Dates	Curriculum Description	Curriculum Difficulty
1 Nontreatment	Student Chosen	15	08/24/11 to 09/15/11	Scientific Method, Microscope Function	3.5 *
2 Treatment B	Randomly Chosen	15	09/16/11 to 10/05/11	Kingdom of Life, Classification	2.6 #
3 Nontreatment	Student Chosen	15	10/06/11 to 10/26/11	Populations and Communities in Ecology	3.0 *
4 Treatment A	Teacher Chosen	15	10/27/11 to 11/16/11	The Human Footprint and Ecosystems	3.3 +
5 Treatment B	Randomly Chosen	15	11/17/11 to 12/07/11	Chemistry Review, Biochemistry of Life	4.4 #
6 Treatment A	Teacher Chosen	15	12/08/11 to 12/23/11	Cell and Membrane Structure and Function	3.1 +

Note. Level of Difficulty is judged by rating each of the curricular items on a scale from 1-5, and then determining the mean of these items.

* The mean difficulty of the two curricula for student chosen seats (nontreatment) = 3.25

+ The mean difficulty of the two curricula for teacher chosen seats (treatment A) = 3.20

The mean difficulty of the two curricula for randomly chosen seats (treatment B) = 3.50

Treatment Periods

Treatment Period Zero: Pretreatment

With the start of a new class in August, 2011, I thought it was necessary for students to get acclimated to the new classroom environment before the treatment periods began. On day one, the students came in and were instructed to choose their own seat. Since my class has a combination of freshmen and sophomores, this pre-treatment time allowed students to move around, so they could be comfortable in their chosen seat. After one week of moving around, students had to choose a seat, and I composed the seating chart for the non-treatment, students choose their own seats. Before the non-treatment occurred, I gave the 73-question Likert survey to all 88 students in my sample. I also interviewed the 10 students chosen with a randomly sampled technique to clarify some of the questions from the survey while gaining better insight to students' attitudes about school and learning science. These students also helped me to understand why specific environmental factors like seating, noise, temperature and distractions affect their learning.

Period One (Non-treatment): Students Choose Their Own Seats

A new school year had begun, and the students had five days to move around and find a seat they wanted to sit in. After this pretreatment, the student's self-chosen seating arrangement was recorded. Students were required to sit in this seating chart every non-lab day during treatment period one. From my teacher journal notes, it was clear that most students arranged themselves in ways to maximize social interaction. However, some students wanted to get a good start to the school year and sit closer to the front to

avoid distractions. Still others wanted to avoid any type of interaction and found seats farthest from the teacher, farthest from their classmates.

This cycle was administered over 15 class days during instruction of the “scientific method” and “microscope function” units. The content and delivery of these lessons were not significantly different from past years teaching the same curriculum. Allowing students to choose their own seats was a new experience for me for this age of student. My teacher journal consistently chronicled fewer curriculum objectives being met daily (compared to previous years) as a result of having to “handle more student distractions.” One September teacher journal entry noted, I can’t believe how hard teaching is when I have less control. Even though seating charts are not necessary with my upperclassmen, these freshmen and sophs [sic] definitely need more guidance! There was an easy QOD [question of the day] about the microscope. Only about half the kids were correct. I know most would have answered it correctly if there would have been fewer distractions. I feel like I am a new teacher again having to relearn discipline techniques.

Each student was given 1 multiple choice formative assessment (MCFA) question daily for 15 days during this treatment cycle. Each student relied only on his or her knowledge and did not enlist the help of others. Depending on the content, I either retrieved questions from past assessments or wrote new questions as needed. I was prepared with at least five MCFAs pertaining to each daily lesson, activity or lab. I pulled one question from a hat. I administered these MCFAs to each student at the end of every class day. Students became accustomed to the consistency as these daily questions were routinely administered in the last five minutes of class. Students immediately moved to

their test-taking seats (where they were separated by one seat) and completed the question of the day. They turned their paper over immediately and waited for me (or my teacher's assistant) to pick up their assessment. The grading scheme was simple. Students were given a "1" if their answer was correct or a "0" if their answer was incorrect. Student scores were input into a Microsoft Excel spreadsheet weekly. Students who were absent did not answer that day's MCFA, and those particular Excel cells were left blank.

Period Two (Treatment B): Random Seating

I used Microsoft Excel's RAND function to create random seating assignments for the first random seating treatment. In the past, I have tried randomizing seating charts, but I rarely stayed with these seating assignments because they did not seem to work as well long-term as my teacher seating assignments. Like the non-treatment, the duration of the period two treatment was 15 school days. Each student was placed into a random seat, and every student had the same likelihood of getting a front and center seat as they did of receiving any other seat in the classroom. During this period two treatment, the curricula focused on Kingdoms of Life and Classification. Two of my Action Research teammates checked the difficulty of my curriculum units for each type of treatment to ensure there was a more level playing field, that the level of difficulty was similar for each treatment. This process will be described in more detail later in this paper. Like the other treatments, a daily MCFA was administered each day of this treatment. In my daily teacher journal, I took notes about student behaviors in these random seats. I also recorded comments I overheard students say. In an October journal entry, I said: 4th period's random seating is worse than the student chosen! Any combinations of people I cannot imagine being together were randomly placed together. I did not get all

the way through the lecture notes today in 4th. One benefit...Dan and Carson were randomly seated together. I can't imagine them spending time outside class, but they work well together in class.

Period Three (Non-treatment): Students Choose their Own Seats

The non-treatment was administered again (before Treatment A (teacher chosen) was used). It was designed in this way because the curriculum sequence and curriculum difficulties were considered when assigning treatments. When 2 of my teammates graded 15 days of the curriculum according to difficulty, the mean of the 1st and 3rd period treatments nearly equaled the mean difficulty of the 2nd and 5th and finally the 4th and 6th curriculum units. Populations and Communities in Ecology was the focus of study during this 15 day nontreatment cycle. As usual, students were required to complete one MCFA toward the last five minutes of every class period. An interesting October comment written during this second nontreatment period was:

On this first day of the second nontreatment, fifth period has arranged themselves in seemingly smarter arrangements. They are not sitting with as many friends as they did in August. Parker moved away from Wes today and sat by Levi, and this is a good move because Parker and Levi did well together in the random seating period. Parker's motivation (and grades) has increased in the last month, and I got a phone call from his mom asking what had changed. She called other teachers asking they seat Parker in the same way.

Period Four (Treatment A): Teacher Chosen Seating

The first teacher chosen seating treatment occurred next and lasted for 15 class days. In assigning seats, I took special consideration to ensure students were in the best arrangements based on my judgment and knowledge of student needs. Teacher seating allowed for special accommodations, consideration of which students worked well together, and special placement of students to give them better options to participate in class. For example, students with disabilities could be positioned in ideal locations, and students who worked well in pairs could be placed in close proximity. Like the other treatment periods, a single MCFA was given to all students daily to gauge their understanding of topics learned during that class period. As usual, if students were absent, their data for that day was not considered when determining the mean total performance of the entire sample, the class, and the individual subgroups.

Period Five (Treatment B): Random Seating

For one more 15-day treatment, students were randomly seated in each biology classroom. The students were assigned in the same manner as in the Period 2 treatment. The curriculum covered during this period included a Chemistry review and Biochemistry of Life. Students were administered a single MCFA during the last five minutes of each class period, and scores were entered into the score sheets as 1's (correct responses) and 2's (incorrect responses). Students that were not present to take the assessment did not receive a score; a "blank cell" was retained in Microsoft Excel and not considered during data calculation. As usual, my teacher journal helped to explain how seating changes affected students' motivation to perform in the science classroom:

I am surprised how much the level of noise went down in Period 4 today! After only four days in this treatment, there is a good combination of students working well together. The other classes are doing well too. It surprises me that this second random seating assignment treatment is yielding better motivation and performance for most students across the board.

Period Six (Treatment A): Teacher Chosen Seating

For the final treatment period, students were placed into new teacher chosen seating assignments. The curriculum studied during this treatment period was Cell and Membrane Parts and Function. To ensure that I would have a “fresh perspective” when I assigned seats for the second teacher chosen treatment, I made and followed some rules about seating assignments. For instance, no student could sit in the same location as he or she had in the earlier teacher choice seating chart. Also, each person could not be sitting next to more than one similar person as they did in the last teacher assigned chart (the four directions surrounding them, front, rear, right and left). Hypothetically, if John was sitting in the middle of the classroom for the first seating chart, he probably had four classmates sitting in the four directions around him. If Bill sat to the left of John in the first arrangement and was now sitting behind John, none of the other students who initially sat in the other locations near John could occupy the seats near him again. This type of arrangement took a great deal of time to organize, but it did prevent me from forming “pods” of students and moving those same pods to different locations in the room with the seating chart change. Students with Individualized Education Programs and Section 504 statuses were still accommodated but were moved to different locations in the classroom within the recommended accommodation zone.

As with all other treatment periods, the students sat in their assigned seats daily, and they were given a MCFA daily within the last 5 minutes of each class for 15 days. The delivery of these assessments was consistent with the other treatment periods, and students were so used to taking these MCFAs that I did not need to look at the clock anymore. I did not really need a clock because the students moved like clockwork to their test taking seats with five minutes remaining in each class. The process became very streamlined, and toward the last four to six weeks of the study, very little time was used on data collection.

Toward the end of this final treatment period, I administered a shortened version of the first Likert survey that focused on more specific questions relating to student learning in biology and how their perception about classroom environment (including seating) changed throughout the research period. The Likert questions focused on student motivation to learn as a result of the seating changes. After completing the Likert survey, I completed personal interviews with the same ten students that were selected at the beginning of the research process. These students were asked questions to clarify their attitudes about the seating charts they had experienced.

DATA AND ANALYSIS

My Action Research was rich with meaningful qualitative and quantitative data. I realized that there were only so many pieces I could analyze while answering my primary and secondary focus questions. The data I collected in this study opens up many possibilities of identifying new focus questions and researching them. I was able to use a combination of Likert Survey responses (categorized by student gender, past

performance, and state science exams) and student responses to their daily multiple choice formative assessments to study my primary focus question: What are the effects of three seating chart methods on student performance in the science classroom? I could evaluate those same tools in addition to individual student interviews and my teacher journals to investigate my first sub question, how various subgroups performed in different seating charts. The second and third secondary focus questions focused on student motivation to perform well and how this study affected my attitude and teaching styles. The Likert survey, student interviews and teacher journals helped me to explore answers to these questions.

A Qualitative Look at Surveys and Teacher Journals

The Likert Survey of Student Attitudes provided a large amount of data, a lot of which I was not able to use in this capstone paper. Since my project has changed a great deal since its inception (during the time the LSSA was devised), many Likert questions are not as applicable as they once were. A description of this survey is in Appendix C, and a description of Likert analysis can be found in Appendix D. Some of the student attitudes about seating and learning are described in detail in those Appendices. I look forward to using this data in future action research projects.

Teacher Journal Explains “Level of Teaching Comfort”

In my teacher journal, I tracked a daily “level of comfort” for each treatment. When I was completing this, I was inspired by the “comparative pain scale” that doctors use to determine pain level where “1” is very mild pain and a “10” is unspeakable or unimaginable pain (Harich, 2002). On my teaching comfort level scale, a “1” was a

perfect day where I had no distractions, and I was able to efficiently complete the daily teaching objectives. A “10” was a very difficult day where distractions were numerous, teaching objectives were not met, and there were many lost educational opportunities. A “10” might be the day where I go home and cry a little. The range of responses between 1 and 10 were a way to score each day that was journaled. There were approximately 15 values determined for the non-treatment, treatment A, and treatment B. The mean value and the range of rankings for “level of teaching comfort” are displayed in Table 4.

Table 4
Mean Teaching Comfort Level for each Treatment Type

<i>Treatment Type</i>	<i>Mean Comfort Level</i>	<i>Median</i>	<i>Data Range</i>
Nontreatment: Self-chosen	6.1	5	3-9
Treatment B: Random	4.6	5	3-6
Treatment A:Teacher-Chosen	2.6	2	1-4

One secondary focus question inquires about how different seating charts affected my attitude as a teacher. Table 4’s data is just one way of defining how my attitude changed through each treatment period. The comfort level is important because feeling at ease with the control I have over my class allows me to be more spontaneous during my lessons. Ultimately, the more comfort and control I perceive, the more likely I am to successfully provide differentiated instruction to all students. My daily journals and the ranking of comfort levels demonstrated that the different treatments had a notable influence on my level of comfort and how effective I was at teaching the daily objectives. The level of difficulty was highest for the non-treatment, the self-chosen seats, and it was lowest for treatment A, teacher-chosen seats. Journal entries supported the fact that my attitude is more positive and I feel the highest level of control when I exercise my right to

assign my class seats. Looking at how random seating and student chosen seating lead to more difficult teaching days gives me more confidence to assign seats knowing full well that my healthy attitude as their teacher in these circumstances likely makes learning a more positive experience for them. When I take the time to assign a class seats, I know I am doing everything in my power to help them learn and grow. Just as we were changing from the non-treatment to the teacher chosen seating assignment, I made a notable journal entry:

I feel much more comfortable choosing seats again. I feel comfortable with and feel like I'm pretty good at! We'll see...it will be interesting to make comparisons between kids test scores now versus non-treatment scores. I spent a lot of time last night devising the seating charts. It was probably the longest time I've spent assigning seats. I felt it paid off today! I had the lowest stress day since the beginning of the year. I maximized kids' performance by considering: special needs students, separation of students who do not do well together, encouragement of students I believe will work well together (and constructively) and just simple consideration of what I think is best for every kid! I hope I'm right...that I am the best judge of seating assignments...as long as I take the time to do it right.

The individual student interviews (Appendix H) were valuable pieces of information because they allowed me to ask questions and get clarification on any pieces of information that I did not fully understand. For example, during the non-treatment, I noticed that the "A" students (usually the males) chose seats near the back of the room. Based on their Likert survey responses, I could not understand their rationalization to sit

in the back when their female counterparts were more than likely to choose a front and center seat. My “A” male interviewee said that he chooses a backseat because:

I like hanging out with friends at school, and my friends like to sit in the back. I’m bored in school. The stuff is too easy. I wish we could have a science class where all of my pre-calc friends could be in the same class. Discussions would be better and I wouldn’t get teased for being a nerd. At least science is not too bad. In most my classes, I can read my book all day and some teachers don’t even notice me.

This male “A” student was more interested in maintaining his friendships and flying under the radar than he was in sitting closer to front of the class to maintain a little bit of an edge with his grades. When I asked the same question of the higher achieving females, they were less concerned with sitting by friends and more concerned with “not missing a thing” as my “B” female student clarified.

Statistical Analysis Procedure

As explained in the Methodology section, there were three treatment conditions. The non-treatment group was given the opportunity to choose their own seating assignments to establish “baseline” levels of performance. Hypothesis testing was performed to determine if random seating or teacher chosen seating assignments led to an increase in student performance when compared with the non-treatment, student chosen seating arrangements. Analysis of student chosen seating (SC), teacher chosen seating (TC) and randomly chosen seating (RC) regimes was first performed using the entire class. The hypothesis testing procedure was then repeated on various subgroups. Subgroups included each gender, and low- or high-performing students based on each student’s science grade upon entering the class.

Measuring Whole Class Performance

Hypothesis testing for the whole class will be discussed in detail in this section to demonstrate how Table 5 should be interpreted. The following sections will emphasize the practical implications of the hypothesis testing results.

Hypothesis Testing to Compare Random-seating vs. Student-chosen seating

The first hypothesis states that students given a random seating assignment would achieve a significantly greater mean MCFA score than when they were given a choice of where to sit. Equation (1) shows the null and alternative hypotheses for the paired one-tail two-sample t significance test for comparing the mean MCFA scores.

$$\begin{aligned} H_0 : \bar{X}_{SC} &= \bar{X}_{RC} \\ H_a : \bar{X}_{SC} &< \bar{X}_{RC} \end{aligned} \quad (1)$$

Section A of Table 5 shows that the mean MCFA score when seating is randomly assigned (\bar{X}_{RC}) of 67% was roughly equal to the scores under the student-chosen seating (also 67%) assignment regime (\bar{X}_{SC}). The test statistic indicates no significant difference in performance, $t(87) = 0.68$, $p=0.496$.

Table 5
Student performance under alternative seating conditions

	Descriptive Statistics of Test Performance			<i>t</i> statistic	
	Student Chooses Seat Assignment (NonTreatment)	Random Seat Assignment (Treatment 2)	Teacher Chooses Seat Assignment (Treatment 1)	Randomly-chosen seating compared to Student-chosen seating	Teacher-chosen seating compared to Student-chosen seating
<i>A. Whole Class (n=88)</i>					
Mean	0.67	0.67	0.70	0.68	3.49****
Std deviation	(0.44)	(0.45)	(0.43)		
<i>B. Grouped by Gender</i>					
<i>Females only (n=44)</i>					
Mean	0.67	0.67	0.71	0.97	2.87**
Std deviation	(0.44)	(0.45)	(0.43)		
<i>Males only (n=44)</i>					
Mean	0.66	0.66	0.70	0.93	2.38*
Std deviation	(0.44)	(0.46)	(0.43)		
<i>C. Grouped by Past Grades</i>					
<i>High performers (A to C+ students, n=49)</i>					
Mean	0.75	0.75	0.81	0.84	4.45****
Std deviation	(0.40)	(0.42)	(0.38)		
<i>Low performers (C to F students, n=39)</i>					
Mean	0.56	0.56	0.58	0.78	1.36
Std deviation	(0.49)	(0.49)	(0.49)		

Note. * $p < 0.05$, ** $p < 0.01$, **** $p < 0.001$

Hypothesis Testing to Compare Teacher-chosen seating vs. Student-chosen seating

The next hypothesis states that students given a teacher chosen seating assignment would achieve a significantly greater mean MCFA score than when they were given a choice of where to sit. Equation (2) shows the null and alternative hypotheses for the paired one-tail two-sample *t* significance test for comparing the mean MCFA scores.

$$\begin{aligned}
 H_0 : \bar{X}_{SC} &= \bar{X}_{TC} \\
 H_a : \bar{X}_{SC} &< \bar{X}_{TC}
 \end{aligned}
 \tag{2}$$

Section A of Table 5 shows that the mean MCFA score with teacher-chosen seating (\bar{X}_{TC}) of 70% was significantly three percentage points higher than under the student-chosen seating assignment regime (\bar{X}_{SC}). The data strongly support the alternative hypothesis that teacher-chosen seating improved the MCFA scores, $t(87) = 3.49, p < 0.001$.

Performance When Grouped by Gender

Performing the same one-tail two-sample t tests after separating the data into female and male subgroups saw very little differences when compared to measuring whole-class performance. With an alpha level of .05, the effect of the randomly-chosen seating was not statistically significant. For females, $t(43) = 0.97, p = 0.337$. For the male subgroup, $t(43) = 0.93, p = 0.359$. However, when analyzing the effect of teacher-chosen seating compared to student chosen, females were $t(43) = 2.87, p = 0.006$ and males were $t(43) = 2.38, p = 0.022$. These values suggest that student performance is significantly better for both genders with teacher chosen seating compared to the non-treatment, and the effect was slightly greater for females (Table 4).

Performance When Grouped by Past Grades

Separating the data into students entering the class at the beginning of the year in the “A to C+” grade range and the “C to F” grade range showed noteworthy results. Both groups of students showed no significant difference in performance when changing from the student chosen to the randomly chosen seating regime. The high performers were $t(48) = 0.84, p = 0.404$, whereas the low performing subgroup was $t(38) = 0.78, p = 0.440$. The improvement of high-performing students is significantly greater when

moving from student chosen seating to teacher chosen seating arrangements, $t(48) = 4.45$, $p < 0.001$. A very remarkable finding of this study is that low-performing students show no significant improvement no matter how seating is assigned. When comparing student-chosen to teacher chosen seats for low-performing students, $t(38) = 1.36$, $p = 0.181$.

Relevant Sample Data from Interviewees

Interviews and Surveys: Student Performance in Various Seating Arrangements

Figures 2 and 3 are performance summaries for the ten interviewees, and these students were representative of my sample because of the stratified random sampling process I employed to select them. The following figure shows assessment scores for high level students (A and B students) in all three seating methods. Compared to the nontreatment ($M = 0.75$, $SD = 0.17$), the random assigned seats for all high level sample subjects was less successful ($M = 0.72$, $SD = 0.21$). With the exception of the “A” female, the entire teacher chosen seating arrangements led to higher performances on

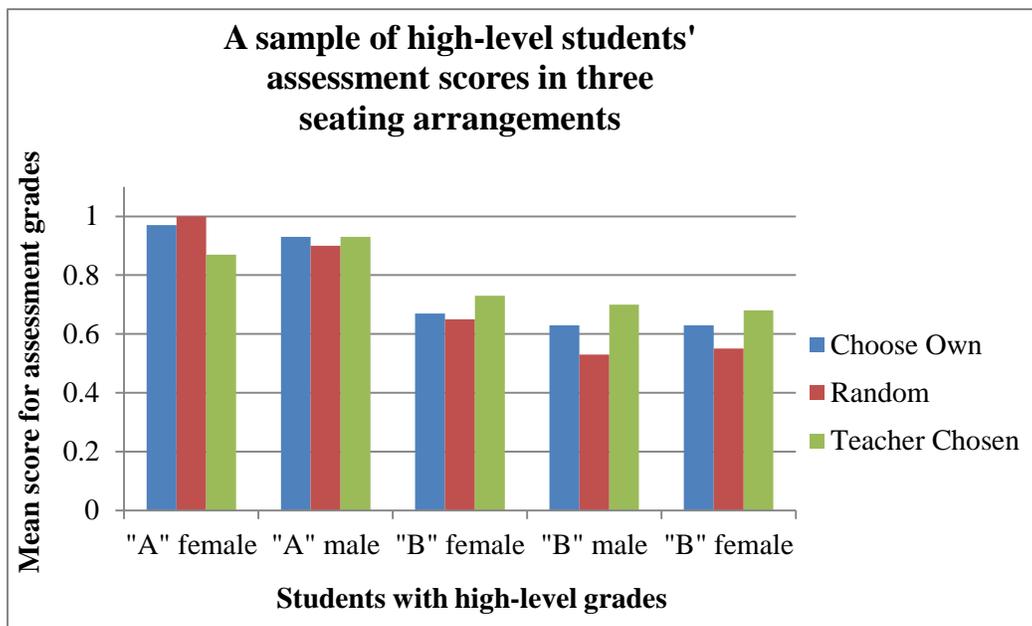


Figure 2. High-level students' scores in three seating arrangements.

daily assessments ($M = 0.78$, $SD = 0.11$). This sample data was consistent with the analysis of statistical values from whole class data.

Both the female and male “A” students performed well through all treatment phases. According to survey and interview responses, these students did not prefer back row seats. The female student strongly preferred a front row seat, while the male claimed to be neutral for front and middle seats. When she was allowed to choose her own seat, the “A” female sat in the front and center, and she was also assigned front and center for the random seating assignment. She scored 98% or above on MCFAs during these treatment phases, but her performance dropped to an 87% when I assigned her a seat in the second row closest to the aisle (away from the smart board and teacher). My “A” male student was the only “Advanced” CRT student of my interviewees. Even though he claimed to show no preference for the front or middle seats, he was one of the students fighting for a front and center seats on the first day of student chosen seating. When I assigned him a seat in the second row, he had the same mean score during those 30 days of MCFAs ($M = 0.93$).

Figure 3 demonstrates how low-level student performance varies based on different seating methods. With the exception of the “D” female, all students scored higher on at least one of the treatment cycles when compared to the nontreatment ($M = 0.50$, $SD = 0.19$). For this sample, low level students assigned seats by the teacher had more success when compared to student chosen seating ($M = 0.60$, $SD = 0.09$). My low-performing (“C” to “F”) student interviewees made up a small sample of my population, and their scores were significantly better than the student chosen nontreatment. This contradicted the whole-class data. One explanation of this data discrepancy might be the

fact that by spending extra time with these students, I got to know them very well during the treatment durations. Getting to know them allowed me to accommodate them well according to their strengths and weaknesses as students.

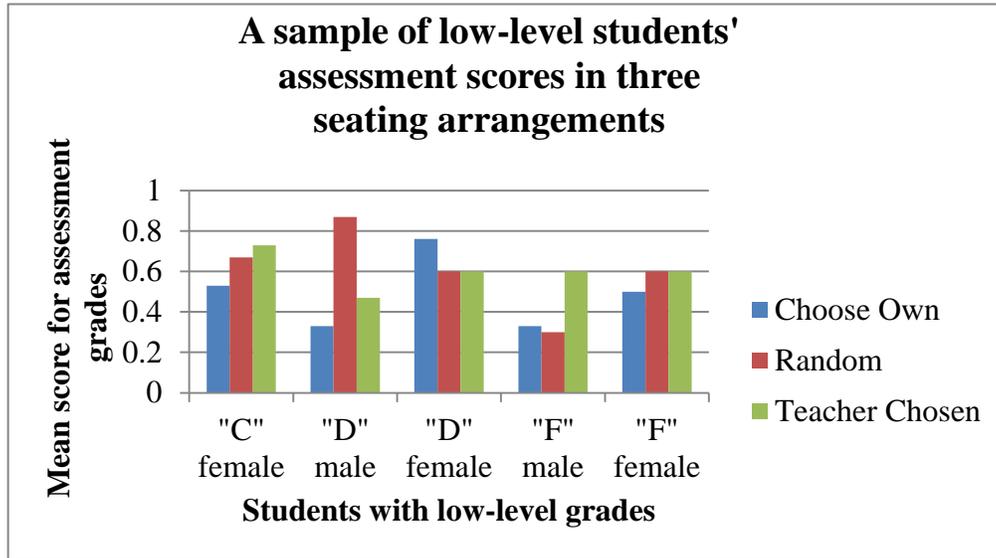


Figure 3. Low-level students' assessments in three seating arrangements.

One explanation for the "D" female's relative success (77% mean assessment score) for the non-treatment was because of her seat location. While she preferred a back-row seat, she positioned herself near the window, and she described it as the position that "(the teacher) you walk down the window aisle most often, so even though I'm in the back, it seems like I get more help from you than the students that sit in the front row on the other side." This was an interesting statement. Even though she was a struggling student, she put a great deal of thought into why she chose the seat she did. It is important to note that the "D" female sat in the back-row toward the middle for the first non-treatment period. It wasn't until the second non-treatment that she made her observation about my constant movement down the window aisle to that location, a place she perceived to be a great place to sit to be successful. In fact, during the first non-treatment

phase, her mean test score was about 66%. But during the second non-treatment, she boosted her score nearly 20 percentage points to 87%.

In their survey responses, each of the four “D” and “F” students agreed or strongly agreed that they were most comfortable with a back-row seat. During the non-treatment, these students chose seats in the back two rows. The “D” and “F” male students ($M = 0.33$, $SD = 0.01$) performed significantly lower on their MCFAs when compared to the “D” and “F” female students ($M = .63$, $SD = 0.20$). Of these struggling students, the girls performed equally well with the random and teacher chosen seating. An interesting outlier is student #48, the “D” male, who performed significantly better with random seating where his mean score was 87%. He was randomly assigned to the first row for the first treatment cycle and the second row for the second random seating treatment. This proximity to the front of the classroom and to the teacher may have been the difference for him. It is noteworthy to mention that this student has ADHD. He sat by a very talkative friend during the non-treatment phase and scored about a 30% average on his MCFAs. During the teacher chosen seating, I overlooked the fact that a seat by the fish tank was not a good option. He was incredibly distracted watching the fish swim. He scored low at 48% in the teacher chosen phase. For these reasons, random seating worked well for him.

Figure 4 displays student assessment performances arranged by CRT test scores. As mentioned earlier, the CRT is the Criterion Referenced Test that all Montana students take at various grade levels. The Advanced students scored a 90% or better for all methods. They were also able to perform well when they chose their seats for themselves. Most of these students seem more aware of the conditions necessary to perform well in

any class. Of the Novice, Nearing Proficient and Proficient groups, the teacher chosen treatments led to the most student success.

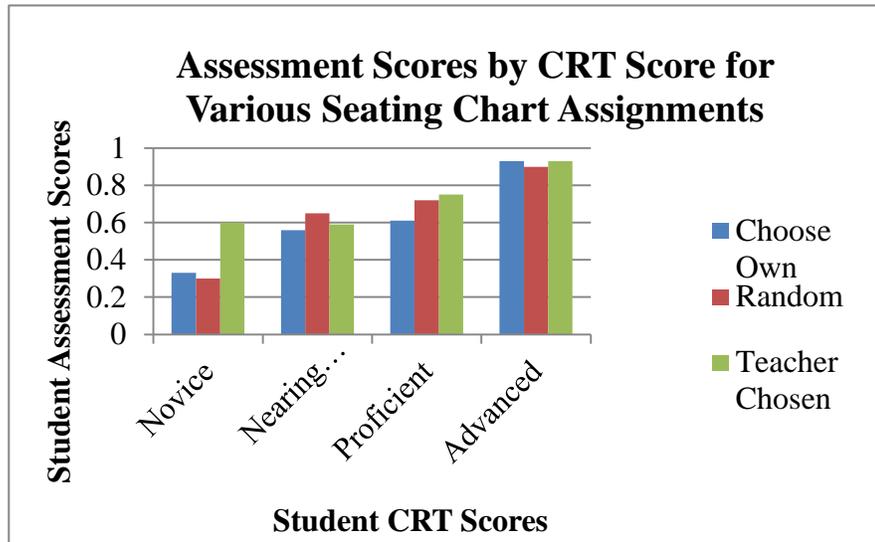


Figure 4. Assessment scores by CRT Score for Seating Chart Assignments, (N=88).

This quantitative and qualitative data analysis helped me to understand the answers to the focus questions of my Action Research.

INTERPRETATION AND CONCLUSION

In August, 100 new students will be walking into my classroom. Some will have high hopes of sitting close to the teacher, while others will have a strong need to distance themselves from the front and center. Others will not seem to care where they sit as long as they are within shouting distance of their best friend. As the new year draws closer, I will gain more confidence about meeting these new students. One important factor makes this approaching school year look even more inviting. My Action Research has provided

valuable intelligence on how to organize my future classroom to ensure a positive, successful experience for all.

My research was revolutionary because it occurred in the more controlled environment of a high school classroom. This was in stark contrast to most published studies that were completed in the postsecondary classroom. The focus of my literature review was research that measured the effects of seating choice on academic success, but I could not find studies that definitively determined reasons students chose the seats they did. My study was able to continue where these other studies left off. Not only did I better understand what motivated students to sit where they did (using tools including Likert surveys and individual interviews), but I determined reasons students' behaviors changed as a result of seating changes. My AR confirmed that each student has unique needs and that communication with these students is the most important factor in understanding these needs.

The vast quantity of data gained in this study informed my teaching short-term, but it also gave me the tools to help design future classes. My Action Research opens up many doors for future research. The primary focus of my study was on how various seating assignments affected students in my biology classroom. More specifically, I wanted to identify how various seating methods affected student academic performance. I determined that my students scored significantly higher on their multiple choice formative assessments (MCFAs) when seated in teacher-chosen versus self-chosen seats. There are a few explanations for why teacher chosen seating significantly helped the high-level students but did not affect the low-level students. When the students were broken out into subgroups where high-level students were defined as "A to C+" students

and low-level students were “C to F” students, there was an interesting occurrence. While the high-level students scored significantly higher with teacher-chosen seating, the low-level students did not score differently in any seating design.

When my study group was subdivided by gender, my statistical tests suggested that both genders performed significantly better with teacher chosen seating compared to student-chosen seating, and females performed slightly better than males. When I investigated how my ten interviewees (subdivided by state exam scores) performed for all treatment periods, teacher chosen seating led to the most success overall. Advanced students did equally well when choosing their own seats and with teacher chosen seats. However, the lowest performing novice group performed almost thirty percent better with teacher chosen seating when compared to student-chosen seating. These interviewees likely performed better with teacher chosen seating because I had the opportunity to know these students, and was more able to consider their educational needs through the teacher chosen seating process.

Another secondary question focused on how various seating treatments affect a student’s motivation to learn science. Student motivation was monitored at various times throughout the study by reviewing survey and interview responses. At the beginning of the school year, before getting to know my students, I observed overwhelming pessimism from a few lower-achieving students. One of these students was randomly chosen to be my “F” male interviewee. In those early days his attitude was so negative that I remember wondering what new tricks I would have to use to inspire him. In the first interview, he said, “I hate school! I’ve heard your class isn’t that bad because you are nice. I don’t like being bugged by teachers or by anyone. I like privacy. I like the back because my

teachers do not usually call on me back there.” His past failures plagued his confidence before he even walked into my classroom. Through the course of the study, he performed poorly no matter where or how he was seated. A conflicting example of how student motivation changed involved my “C” male interviewee. In the beginning, he said, “I don’t really like school too much. I’d rather be home. It doesn’t matter where I sit. I do just crappy in all my classes no matter where I sit.” When asked what factors make learning science easiest, he said, “I like working with Dakota in labs. Don’t assign me to any other partners I don’t like.” Throughout the study period, he was required to work with other students and interact even though he felt uncomfortable. By the end of the research period, his motivation changed drastically, “I realized I can be a leader in any lab group. I feel more comfortable working with other people, and Dakota is doing better too.” This student’s motivation was sparked by my AR treatments, and many other students were positively affected by movement to less familiar locations in the classroom.

A final secondary question asked, “How do different seating arrangements affect my attitude and teaching strategies?” My AR helped me to have the most positive year of teaching ever. My job became much easier because the more comfortable I felt, the more I was able to get to know my students. In a healthy learning environment, students’ confidence is shown more frequently through acts like raising their hands to answer questions or engaging independently in meaningful discussion with their neighbors about relevant content. Since choosing my students’ seating locations gives me the most comfort (and many students perform better), I will continue to choose seats for my students. The Action Research process helped me advance one more step toward my ideal classroom where all students are excited to come to class every day.

With all of the amazing things I learned, there were some challenges with the design of this experiment, and as I consider how I will further my research, I need to consider these challenges and make some changes. While interviews were fantastic modes of getting information about student attitudes, my sample size was too small especially considering the fact that my sample was broken out into subgroups based on grades and gender. Also, the interviews revealed such important information that I felt the need to continually interview to clarify events occurring daily in the classroom. Rather than relying so much on my ten interviewees, I will give a shorter Likert style survey in the future that allows students to expound on more of their responses.

Another challenge of this study is replication of the study by other educators. Different teacher researchers will have various expectations for how a classroom should operate. Defining a healthy classroom environment is different for everyone. My success was possible because I invested a great deal of time and energy into building effective seating charts. Understandably, most teachers do not have the time to devote, and they quickly assign their students alphabetically to their seats. Oftentimes these students are not moved again for an extended duration. To me, it seems difficult to imagine the same kind of success for other teachers.

My daily multiple choice formative assessment questions were great representatives of student understanding. Even though the students knew the questions were not “graded,” I still witnessed competition to do well on them. The same question was given to all 88 biology sections across five sections and 6.5 hours. These questions were not considered high stakes, but I could not be sure that the question (or its multiple

choice answer) was not being shared between classes. In the future, I will change the way I ask these questions to my students.

Now that I have discovered why some students are less inspired to learn biology, my principal concern is finding ways to inspire the "un-inspirable" student. Even with a variety of hands-on, applicable and fun activities, this small percentage of my population doesn't seem to budge from stagnation. A small percentage of my population, the lowest level interviewees, experienced the most success of all struggling students. I believe this can be attributed to my communication with them about their needs. Taking the effort to get to know these students bolstered their confidence. In addition to getting to know these low-level students in the future, I will continue searching for ways to help them.

VALUE

My Action Research was an extremely valuable process. I was inspired to get to know my students at a level where I understood the intricacies of their personalities and beliefs. This knowledge helped me to build a better seating chart which allowed these students to experience more success in biology class. Students saw how invested I was in getting to know them, and their motivation to come to my class and learn science became evident within the first few weeks of the study.

There are many studies that I am interested in completing in the future. My valuable data source is a treasure trove of information and an excellent starting place for new research studies. For example, I would be interested in studying whether seating special needs students with IEPs and 504 plans in the front of the classroom is truly the best

move for these students. Placing these students in key seats and measuring their performances would help me and fellow teachers understand more about how these students learn.

I am also interested in having all students take a personality assessment (e.g. Myers-Briggs personality assessment). While some studies have shown the statistical validity and reliability of these types of assessments to be low, it would be an interesting activity in helping kids identifying themselves as one of Jung's two categories: the rational (judging) functions like thinking and feeling or the irrational (perceiving) functions including sensing and intuition. Many university studies have been completed on whether or not personality plays a factor in a student's seating choice. Completing a study in the same fashion and then determining whether introversion or extroversion tendencies affect seating choice, would help me to understand how personality might be key in affecting student academic performance.

The term, "action zone" was coined by Adams and Biddle (1970) in their seating research as the front and center seat where students perform the best. I would like to investigate whether there is an "action zone" of student seating success. In other words, is there a best seat (or group of seats) in the house? I would be able to circulate a sub-group of students through key "action zone" seats and determine whether there is as much success in this zone as past researchers claim. I would also like to study whether the "action zone" varies for students with varying learning styles. For example, does a kinesthetic learner have a different "action zone" than a visual learner?

Finally, I would like to have a few neutral observers come into my classroom to record the number of minutes I spend teaching from different locations in the classroom

while they record which students ask the most questions and from which seating locations those questions originate. I would like to determine if there is a relationship between teacher position in the classroom and numbers of questions asked from different areas in the classroom. When one of my low-performing students informed me that I spend a majority of my time teaching from the “window aisle,” I knew that I needed to start evaluating how much I move around the class. This movement is another way my teaching has been immediately informed...something I have been working on the last few months, and I have purposely moved much more as a result of my Action Research.

The AR process has helped me to evaluate my teaching and the way I interact with my students. As an educator I am refining my skills daily, and this process has given me the tools to reflect on my abilities and make changes as needed. It has helped me to appreciate my occupation even more.

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APPENDICES

APPENDIX A

EXAMPLE OF DAILY FORMATIVE ASSESSMENTS

Examples of Daily Multiple Choice Formative Assessments (MCFAs)

1. Which of the following is not considered a characteristic of living things?
a. Organization and cells b. Response to stimuli c. reproduction
d. Metabolism e. has a backbone f. homeostasis

2. What is the paramecium's mode of locomotion? How does it move?
a. pseudopod b. cilia c. flagella d. they do not move

3. Organisms interact with one another throughout the living world.
_____ is the branch of biology that studies organisms interacting with each other and the environment.
a. Botany b. Ecology c. Herpetology d. Zoology

4. Phylum Ciliophora includes paramecium and Stentor. This phylum is _____ and _____. **There are two words to complete this answer. Choose the answer with the correct words.**
a. multicellular, heterotrophic b. unicellular, autotrophic
c. unicellular, heterotrophic d. multicellular, autotrophic

APPENDIX B

LIKERT SURVEY

<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
----- 1 -----	2 -----	----- 3 -----	4 -----	----- 5 -----
20. I like to sit by the back door of the classroom.			1 2 3 4 5	
21. I have a hard time hearing if I sit in the back of the classroom.			1 2 3 4 5	
22. I am usually late to class.			1 2 3 4	5
23. I think the teacher thinks I am a bad student.			1 2 3 4	5
Why did you answer the way you did? _____				
24. I like to sit away from my teacher.			1 2 3 4 5	
25. I like to sit away from the chemicals or specimens in the room.			1 2 3 4	5
26. I sit in about the same location in my other classes.			1 2 3 4	5
27. I like to sit near the heater in the classroom			1 2 3 4	5
28. I get good grades in school.			1 2 3 4 5	
29. I sit away from people who appear to be sick.			1 2 3 4 5	
30. I am more likely to raise my hand if I sit in the back.			1 2 3 4 5	
31. Most of my teachers assign seats in their classrooms.			1 2 3 4 5	
32. I am most comfortable sitting near the front of the classroom.			1 2 3 4 5	
33. The activities and labs we do in biology class are fun.			1 2 3 4 5	
34. I like when my teacher chooses my seat in class.			1 2 3 4 5	
Why did you answer the way you did? _____				
35. I try my best to get good grades in school.			1 2 3 4 5	
36. I like to sit near my teacher.			1 2 3 4 5	
37. I like when my teacher assigns lab groups for us.			1 2 3 4	5
38. I feel alert during biology class.			1 2 3 4 5	
39. I am more likely to raise my hand if I sit in the front of the class.			1 2 3 4 5	
40. Biology class is boring.			1 2 3 4	5
Why did you answer the way you did? _____				
41. I am tall.			1 2 3 4 5	
42. I am confused some of the time in biology class.			1 2 3 4	5
43. I am unaffected by the student that messes around in class all the time.			1 2 3 4 5	

<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>		
1	2	3	4	5		
44. I prefer picking my own lab partner for lab activities.	1	2	3	4	5	
Why did you answer the way you did? _____						
45. I do better when I sit next to a friend in biology class.	1	2	3	4	5	
46. If given a choice I would sit in the same seat all year long.	1	2	3	4	5	
Why did you answer the way you did? _____						
47. I feel sleepy during biology class.	1	2	3	4	5	
48. I like to sit close to the door in my classes.		1	2	3	4	5
49. I prefer sitting by boys in class.		1	2	3	4	5
50. I sit in different locations in my classes.	1	2	3	4	5	
If you do, why do you do this? _____						
51. My teacher tries hard to make class a good learning experience for me.		1	2	3	4	5
52. I like to choose my own seat in class.		1	2	3	4	5
53. I am most comfortable sitting in the back of the class.	1	2	3	4	5	
Why did you answer the way you did? _____						
54. The aquarium sounds distract me.		1	2	3	4	5
55. I feel like I get in people's way when I sit in the front	1	2	3	4	5	
56. I get enough sleep at night.	1	2	3	4	5	
57. I like the door open during class.	1	2	3	4	5	
58. I try my best to get good grades in biology class.		1	2	3	4	5
59. I prefer sitting by girls in class		1	2	3	4	5
60. Other students copy my papers often.		1	2	3	4	5
61. I am confused most of the time in biology class.		1	2	3	4	5
62. I do not like sitting by boys in class.		1	2	3	4	5
63. We should celebrate famous biologist's birthdays in class		1	2	3	4	5
64. I like to sit away from students that do not stay on task in class.		1	2	3	4	5
65. I am on task most of the time in biology class.	1	2	3	4	5	
66. Other people copy off my paper rarely or not at all.		1	2	3	4	5

Strongly Disagree *Disagree* *Neutral* *Agree* *Strongly Agree*
 ----- **1** ----- **2** ----- **3** ----- **4** ----- **5** -----

67. If given a choice, I would change my seat in class often. 1 2 3 4 5

Why did you answer the way you did? _____

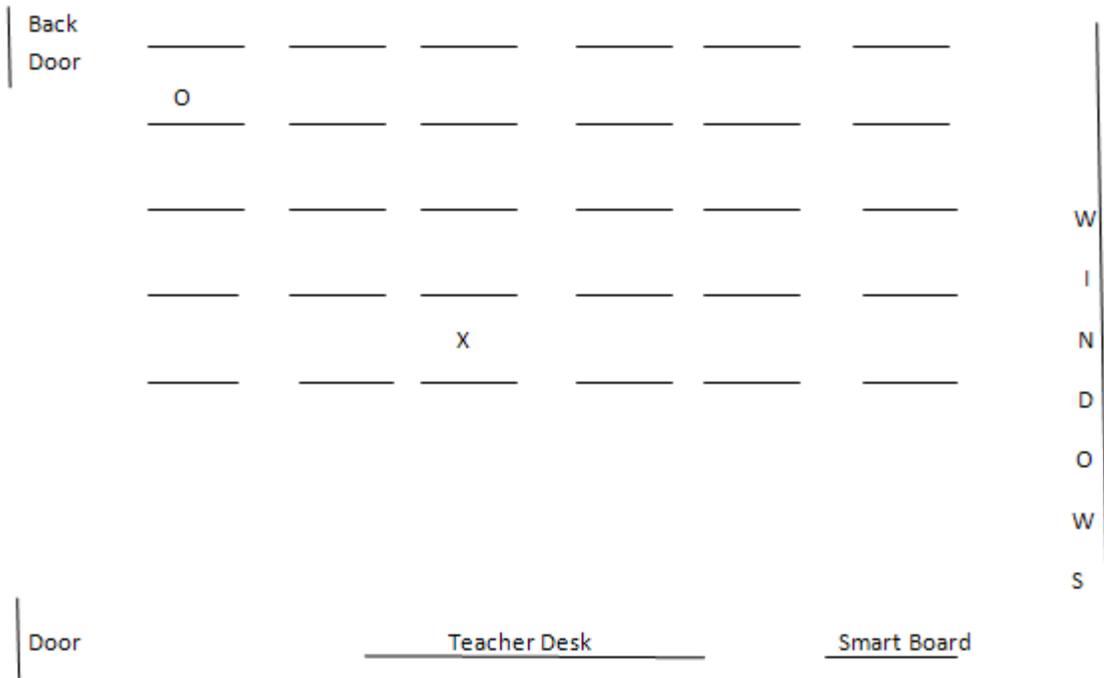
68. My teacher needs to work harder to make biology a good class. 1 2 3 4 5

69. I am rarely on task in biology class. 1 2 3 4 5

72. I understood most or all of the questions on this survey. 1 2 3 4 5

73. Given the following map of the classroom,

- Label your favorite seat with a “1”
- Label your second favorite seat with a “2”
- Label the worst seat with an “a”
- Label the second worst seat with a “b”
- if your best friend sits in seat “X”, draw a “☺” where you would sit
- If your best friend sits in seat “O”, draw a “♥” where you would sit



APPENDIX C

EXPLANATION OF LIKERT SURVEY

About the Likert Survey

I used Likert Scaling to develop a survey (Appendix A). After parental permission was granted for this voluntary service, the 88 subjects in my AR completed the survey. I administered this to my students before my AR treatment periods began. The first step I took in my Likert survey production was defining the focus of my study. This has proved to be a bit of a problem because since beginning this process, I have found it is possible and necessary to narrow my area of research down. In doing that, I have found that several of the Likert survey items I developed do not match the Action Research project that has steadily evolved over the last ten months.

After I defined my general focus for my Action Research, I generated the items that I would use on my scale that was a 1-5 scale. It was very useful to get the help of one of my teammates in brainstorming potential Likert items. We generated more than 100 possible survey items, and then I narrowed my Likert survey to 73 items. Since a "1" is understood as "strongly disagree" with the concept, "3" is "neutral" and "5" is "strongly agree with the concept, the scale had some advantages. When responding to a Likert questionnaire item, students specify their level of agreement or disagreement on a symmetric agree-disagree scale for a series of statements. Thus, the range captures the intensity of their feelings for a given item, while the results of analysis of multiple items (if the items are developed appropriately) reveals a pattern that has scaled properties of the kind Likert identified ("Likert scale," 2012).

Students could tell me how favorable each item was with respect to the concept without telling me specifics about their beliefs. This type of survey allows the opportunity to be honest without revealing too much information. After I made the

decision about which items I would use for the survey, I was able to determine which pairs of items had positive and negative correlations, so I could correctly analyze the data post survey.

There are improvements of how I will determine items to use on the survey in the future. Stats packages can be used to determine Item-Total correlations (Trochim, 2006). I can determine how low the correlation should go before I throw the item out. I want to use this tool in the future. I determined means and standard deviations, and I completed t-tests as well. It was difficult to see how this qualitative data was supportive of my hypothesis like the other data sources were.

As my paper evolved, I found that it was much too difficult to answer two different questions that were my original question. Not only did I want to determine if various seating arrangements affect student performance in the biology classroom, I was originally going to attempt to assess how different seating arrangements affected student attitudes. Since then, I have limited my focus, and much of the analysis I have done with the Likert survey is no longer directly applicable. Although this analysis can be used to reinforce parts of my argument about how seating affects student performance.

APPENDIX D

LIKERT SURVEY FINDINGS

Student Attitude about Seating

From the Likert survey, I was able to gather data about student preferences in classroom seating. The data in Table 1 (Appendix) was calculated based on student preferences to sit in the front, middle and back of the classroom. The front of the classroom preference had the highest positive mean, the middle of the class came in second, while the preference for the back of the classroom had the lowest mean. I also determined the frequency for each classroom location. Students agreed most strongly with the front of the classroom seating preference. Fifty-two students (60%) of the students were neutral when it came to sitting in the middle of the classroom. It could be inferred that more students prefer sitting near the front than near the back while the majority of students are neutral in their response when asked if they prefer the middle of the classroom. One explanation is that more students prefer to sit in the front of the classroom but end up being pushed closer to the middle and the back because fewer seats are available in the front. One female said, "If I did not know anyone in the class and could sit anywhere, I would sit in the front and closer to where the teacher writes on the board. But since I know lots of people, I had to sit somewhere else. I get teased about being a brownnoser if I sit in the front!" One male student had a similar comment, "Sitting near the front is more accepted. Second row's okay. It's almost as good, and I don't get a hard time from my friends."

Table 1 (Appendix) Student seating preference ($n=88$)

Likert Survey: Questions Measuring Student Seat Location Preferences.	I am most comfortable sitting near the front of the classroom.	I am most comfortable sitting in the middle of the classroom.	I am most comfortable sitting in the back of the class.
Mean ($n=88$)	3.08	2.89	2.78
SD or D	25 (28%)	21 (24%)	34 (38%)
Neutral	33 (38%)	52 (60)%	36 (41%)
A or SA	30 (34%)	15 (16%)	18 (49%)

On the first day of the nontreatment where students chose their own seats, four out of the five biology sections left the front row empty. However, the teacher's journal noted that there was one class that situated itself toward the front of the classroom. The student body president and her friends, who are perceived as kind, smart and leaders, sat near the front. All other students followed their lead and sat as near the front as possible. Table 2 (Appendix) shows how students' grades correlated with their preferences for seating choice. I categorized students into two grade ranges: "A to C+" and "C to F" grades.

There was no significant difference between the higher and lower performing students when I compared their middle of the classroom seating preferences, as both groups had 29.5% of their responses recorded as neutral. However, when comparing their preferences for the front and the back of the classroom, there was dissimilarity when correlating grades with preference.

Table 2 (Appendix): *Means and Frequencies of Seating Preference (front, middle, back) n=88*

Students by grades from previous class	I am most comfortable sitting in the front of the classroom			I am most comfortable sitting in the middle of the classroom			I am most comfortable sitting in the back of the classroom		
	Percentage of Students Choosing These Likert Rankings								
	1-2	3	4-5	1-2	3	4-5	1-2	3	4-5
A to C+	11.4%	11.4%	31.8%	13.6%	29.5%	11.4%	33.0%	13.6%	8.0%
C to F	17.0%	26.1%	2.3%	10.2%	29.5%	5.7%	5.7%	27.3%	12.5%

One-third of the high level students said they preferred a front row seat whereas only 2% of lower students agreed with this seating preference. Likewise, one-third of the high level students disagreed or strongly disagreed that they felt most comfortable sitting in the back of the class, whereas only 5% of the lower performing students disagreed with the back preference. The A to C+ students were likely more certain about their choices because only 32 percent of them chose “neutral” for all responses. In contrast, 61% of the C to F students chose “neutral” as their response to the seating preference questions. Their awareness about conditions necessary for success may be one of the main reasons these students perform better than their lower performing counterparts.

Table 3 (Appendix) summarizes the total student group performance on their daily multiple choice assessment questions. It also breaks the information down by gender for each the non-treatment, treatment one and treatment two. There were two 15 day non-treatment periods, two 15-day treatments where seats were chosen randomly, and two 15-day treatments where I chose the seating arrangement. Overall, thirty data points were collected for each student ($n=88$) in the nontreatment phase. Additionally, 30 data points have been collected for each of the two treatment groups.

Table 3 (Appendix) *Treatment Performance Comparisons*

Treatment Type	Whole Class n=88		Male Students n=44		Female Students n=44	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Non-treatment (Students choose)	0.67	0.44	0.67	0.45	0.67	0.43
Treatment 1 (Random Seating)	0.67	0.44	0.66	0.45	0.67	0.43
Treatment 2 (Teacher chosen seating)	0.70	0.44	0.71	0.45	0.71	0.44

The interviews revealed interesting response patterns from each student. Table 4 displays notable responses to my third interview question (Appendix D): “When you feel like you are learning the most, where are you sitting? Why?” I probed students further, “What factors make this seat effective?” and “Can you recall a seating arrangement that you did very well at, and what can you tell me about this seat?” Table 4 (Appendix) lists some responses from two more interviewees as a result of the above questions.

Table 4 (Appendix) *Interview: Which seat helps you perform your best in the classroom?*

Grade and sex	Response
“D” Female	Whenever I can be with my friend sitting in the back, I am learning the most. My brain shuts off when I have to work alone, especially when I have to try to figure out science and math by myself. I have always been horrible at science. I like the back because my teachers do not usually call on me back there. Some days I can read my book all day and some teachers don’t even notice the whole class period.
“C” Male	I just hate being in front. However, I do see the smart board better if I’m closer to the middle. I hate when teachers seat me in the front row. Teachers call on me way too much up

	there. I do better when I pick my own seat.
“B” Female	I always do better in the front because I can’t see or hear in the back. If I’m in the front, I am probably going to raise my hand and answer lots of questions. It seems like the “bad kids” get the front seats by the teacher. I want to sit in the front, so I can learn better.

The “D” female and “C” female have self-reported not performing well in any science class in the past. They generally do not like seats closer to the front row. The “D” female preferred seats in the back, and her responses opened my eyes to the way I treat all students. Even though she has not been a consistent back-row dweller, and I know that I have not ignored this student for more than a few minutes without checking on her, she reports being accustomed to being ignored or forgotten. Perhaps changing her negative attitude by involving her in consistent classroom activities will change her attitude about learning. The “B” female strongly prefers the front of the classroom. She wishes that she could be assigned there more often but noted that “bad kids” usually get the closer seats to the teacher causing distractions and further decreasing the academic climate. If there were no major connections I could make about interview data, I have already learned so much about my classroom. More frequent seating changes are necessary in my classroom. I also need to push students outside their comfort zone to give them opportunities to grow and develop new relationships (both academically and socially).

APPENDIX E

INDIVIDUAL INTERVIEW QUESTIONS

Individual Interview Questions

1. What can you tell me about your past experiences in school?

2. Describe your level of comfort and feeling of success in this class.

Probe-What is it that makes you feel comfortable in class?

Probe-What could be changed to make you feel more comfortable

3. When you feel like you are learning the most, where are you sitting in this class?

Probe-What factors make this seat effective?

Probe- Do you find it is different in other classes?

Probe- Can you recall a seating arrangement that you did very well at?

-- What can you tell me about that situation?

4. Describe the factors that make learning science easiest for you.

Probe-What can the teacher do to help provide this environment?

5. When you walk into a new classroom, what factors influence you to choose your seat on Day 1?

Probe-What would influence you to change your seat any given day?

Probe-How would you feel if you had that type of control, choosing your seat whenever you wanted to meet your educational needs?

6. How do you feel when your teacher makes a seating chart change?

Probe-What types of things should teachers keep in mind when placing students in seating charts?

Probe-If you were a teacher in a class, what might you do in terms of a seating chart, and why might you do that?

Probe-How often do you think seating charts should be change, and should it be changed more or less frequently depending on the type of class?

APPENDIX F

COLLEAGUE INTERVIEW QUESTIONS AND RESPONSES

Questions asked of my colleagues via email

1. Do you use seating assignments (seating charts) in your classroom? Why or why not?
2. Describe what these seating charts look like (e.g. alphabetical, random, etc.).
3. What are the reasons you think seating charts are important? If you don't use seating charts, what are reasons you refrain from using them?

Examples of colleague responses via email

Camy

“I begin each class letting students sit wherever they want. I tell them I will allow them to keep sitting where they want until there are problems. My freshmen usually only make it a month or so before they need a seating arrangement. My seniors rarely if ever need to be moved and my juniors are about 50/50. When I move them I try to rearrange my “troubles” so they are not by one another. I will put them on one of the four corners. I feel that this gives them fewer people to get into “trouble” with. Most of the time I place my “troubles” and then am just random with the rest. I hope it seems random to the kids; I would never want them to think that they are one of my “troubles”.

I let them sit where they want because I want them to feel like they have some part in making the classroom comfortable for themselves. Maybe they have eye problems so they want to sit in the front, maybe they don't get along with someone so they don't want to sit by them, etc. I want them to feel comfortable.”

Christine

“I use seating assignments in Spanish I, mainly because it is freshmen and sophomores and they need a little more structure. If the seating assignment puts a student by his/her best friend and they can't control themselves, then I move them. I vary on what I do for seating, but it is usually alphabetical. For Spanish II, I start out letting them sit where they want to, but if there is too much talking, I move kids. It really depends on the group and how chatty they are. Spanish III, we sit in a semi-circle, usually, and I let the kids sit where they want. This year I have had a hard class—way too chatty. I put them in a spread out seating chart and even on days when I want them in the semi-circle, they don't move. It is a weird class. In that class, some of the kids who struggle with working on their own will sit by a friend—usually 4 of them—two of the 4 don't work very well by themselves and always want to partner up. The rest sit spread out across the front of the classroom and work together or separately.

To me, a seating chart helps control the class since some kids don't work well with their friends. It also makes it easier to take roll. If there is an empty seat, I know

immediately who is absent. If the kids can sit anywhere at any time, I am always counting someone absent who is in the wrong chair.”

Brett

“I use seating charts always. A mathematical random system at first to get them seated. I always fill the seats in the front first and always symmetrical as it is easier for me to see if someone is gone. After a while I get a feel of who can’t sit next to whom and then adjust accordingly. I am honest with the students of why I put them where I do. Some due to IEP or 504s need the seat in front near the smart board. It is important for me as I teach freshman all day and I need structure and order in the classroom.”

Jeff

“Yes. I constantly try to tweak the arrangement to provide the best educationally significant interaction, behavior and meet special needs of students. Makes role simpler, especially for subs. First I begin by separating known or suspected situations to try limit negative interaction. Then account for special needs.(visual, aural, attention deficits, etc....) Constantly monitor to maintain the best level of interaction. I’m less apt to use defined seating in upper division classes to encourage autonomy and allow for more mixing of students, interaction.”

Steve

“I use seating charts in my classroom for two reasons. It cuts down on discipline problems when kids sit by their buddies. Second, it is easier for a substitute to look at a seating chart when taking roll. They are what I decide they are. Sometimes they are alphabetical. Sometimes I arrange the kids by birthday...sometimes by street address or by telephone number. I change things up nearly every year. I’m selfish. It makes it easier for me and also for my subs when I have them to know who is gone, or acting up. I can also modify behavior by moving students who misbehave to another part of the room.”

Bernie

“Yes I use seating charts. The reasons for me using seating charts are:

- 1) To identify names and faces (especially early in the school year or semester)

- 2) Quick to take attendance by visual looking at seating chart
- 3) Easy for my sub to take attendance
- 4) Try to lesson disruptive students by putting them in front (those that like to talk frequently)---allows me to keep a constant eye on them
- 5) Some of my students don't have great eye sight to see my SMART Board to read the notes

My seating charts are random to start with until I get to know the students, then I may adjust them due to certain needs. I also try to mix them up with boy/girl so they are not seating next to each other which may encourage visiting too much. The reasons I think seating charts are important are the above reasons that I use seating charts. The main reason is for me to get to know my students better by putting faces with names.”

APPENDIX G

EXCERPT FROM TEACHER JOURNAL

September 1st

I can't believe how hard teaching is when I have less control. Even though seating charts are not necessary with my upperclassmen, these freshmen and sophs definitely need more guidance! There was an easy question of the day about the microscope. Only about half the kids were correct. I know most would have answered it correctly if they had not been distracted by other kids. I don't know much of anything that went that well today. Normally I am all excited about getting to know kids in their seating charts. This year I still don't know any names because I've had to do more discipline than necessary.

Level of difficulty (LOD): 8

Additional gray hairs 100!

September 6th

It's somewhat of a waste of time trying to teach anything today. Dillon has Montana's biggest weekend no doubt! Probably ½ of these kids had livestock in the fair or were rodeoing. They are slightly out of it today. I wish I could have started with teacher chosen at the beginning of the year. On a good note period 7 is really doing well. They have gotten into a groove working together, and it is working out great! 4th period is difficult. Every year I have a difficult class. This year it is them!

LOD: 6

September 13th

I am starting to get to know kids' names finally! Yikes. Now that I know their names I can finally start forming relationships with them. Usually I feel more in control by now. Kids are used to the MCFAs that I give daily. I don't even need to say anything. They just automatically get into their appropriate seat. That is a good thing that it can be so flawless. 4th period is still a pain in the butt. There is a group of students in there that don't seem to be in my class for the right reasons, and it is very frustrating. Most of the other classes are settling in and not trying to be the class clown so much! We are now into plenty of labs and activities with microscopes, so it feels like the kids are learning a lot and being productive finally! Christian asked when we were going to get to change

seats again. He said, “Even though we got to choose these seats. I’m kinda getting tired of being in the same place. Plus I wanna move up so that I can pay attention better.” I was happy to tell him that tomorrow is the last day of the first nontreatment period!

LOD: 5

September 15th

Today was the first time with the random seating assignments. I fooled around with the random generator a bunch last night trying to figure it out. What I finally admitted to was that I really wasn’t fooling with it, I was subconsciously unsatisfied with the way the seating charts were coming out, and I was literally restarting it until I found one I liked. When I figured out I was doing this with the first class, I made myself STOP! Then everything was truly random on the first time. It was helpful to get to know my special needs right off the bat because I placed them in seats that weren’t quite front and center but were still ideal for their learning disability. Students were excited to move seats. I was thrilled to move seats too! I honestly thought period 4 was going to put me in the hospital with a stress induced heart attack!

It amazing how much I would have changed the random seating assignments if I could. There were kids placed together that I would have to be crazy to seat together. It is also amazing that after Day 1, things didn’t seem as scary as they could have been. In fact with the option of sitting together, there seemed to be fewer distractions. Perhaps this is because Howie was not yelling across the room at Frank!

LOD: 5

September 26

We are about half-way through the first random seating treatment, and I can’t believe that I didn’t have to remind any students to be quiet or stop talking while I was talking today. On an even more positive note, kids that don’t normally talk to other kids outside their social group are talking freely to a new neighbor today. I’m really getting to know kids now, and I’ve started to ask them about some of their tastes and preferences about where they like to sit. I was amazed at how wrong some of my assumptions were!

☺ There was an interesting study I read about that looked at seating preference. It was

amazing how many kids wanted seats in that “front and center” action zone but were pushed out of it because they were not early enough to class.

During the nontreatment, I allowed kids to pick lab partners. It was not surprising that they picked their good buddy. Today during our cladistics lab, there were brand new lab groups and many times it was groups of kids that became neighbors only after the random seating.

LOD: 3

October 3rd

I wish I didn't have to change this seating arrangement so soon!. Kids are doing well, and I don't get stressed out thinking about some of the more difficult periods of the day! I'm going to do the nontreatment again even though I'd like to do 15 days with teacher chosen. Mike and Ryan did the curricula rankings and it only makes sense to do it this way. Very low stress days finally. Too bad I had enough stress for an entire school year.

LOD: 3

October 4th

Last day of random! 4th period's random seating is worse than the student chosen! Any combinations of people I cannot imagine being together were randomly placed together. I get to finally change this arrangement! I did not get all the way through the lecture notes today in 4th. A benefit...Dan and Carson were randomly seated together. I can't imagine them spending time together outside of class, but they complemented each other nicely in this class. I'm not sure how their scores will fare, but I'm thinking class averages will be lower (especially 4th period).

Students have been in the randomly assigned seats for a while now. Jordynn is making huge strides compared to the nontreatment. While this treatment cycle's curriculum is scored having slightly less difficulty (2.6 vs. 3.5 difficulty), Jordynn is doing well. In the last two week, she scored perfectly on her question of the day. She chose to work with Josee today instead of Jessica. This was a good move because I say Jordynn doing at least 50% of the group's lab work. She is also doing well sitting next to

Forest and Linden. Forest and Linden are pretty quiet, and Jordynn seems to be much more settled down and engaged. On her Likert at the beginning of the year, she claimed to “hate science.” However, when I let her know that I observed her improvement; she said proudly, “I feel like I can do it! I’m going to see how far I can go without missing any questions of the day!”

LOD: 4

October 6

This is the first day of the second nontreatment, and fifth period arranged themselves in what seems like smarter arrangements. They are not sitting with as many of their friends as they did back in August. Parker moved away from Wes today and sat by Levi. This was a good move because Parker and Levi did well together in the random seating period. Parker’s grades have gone in the last month, and I got a phone call from his mom asking “what has changed?” She has even solicited phone calls to a few other teachers asking for a similar treatment, to see if they can help him “get away from bad habits.” This is one positive I’ve seen. Fourth period is still having difficulty, even out of the random assignments.

LOD: 6

October 25th

I am so glad that I will not have to allow students to choose their own seats again! I feel like I am neglecting the learning process letting them choose their own seats. They want to be independent and be trusted to make their own decisions, but it is clear that they are unable to make their own decisions. Choosing friends over performance is a confusing and difficult decision to make.

LOD: 5

October 27th

I feel much more comfortable now that I’m choosing kids’ seats again. This is what I feel comfortable with and feel like I’m pretty good at! We’ll see...it will be interesting to make comparisons between the way kids take tests now and the way they

did versus my nontreatment. Maybe teacher does not know best. I spent a lot of time last night devising the seating charts. I know for a fact that was the longest amount of time I've ever dedicated to doing that ever! And it paid off. I felt like I had the lowest stress day since the beginning of the year. I truly think I maximized kids' performance capabilities by considering: special needs students, separation of students who do not do well together, encouragement of students I believe will work well together (and constructively) and just simple consideration of what I think is best for every kid! I hope I'm right...that I am the best judge of seating assignments...as long as I take the time to do it right. I decided to make rules though! Next time I choose seating charts, I should make sure that the chart is really mixed up from this treatment's seating. There should be different students surrounding any particular student...maybe with the exception of one student (because it might be difficult to do all four!) I'll see how it goes.

LOD: 1 ☺ ☺ Finally!!

November 22nd

I am surprised how much the level of noise went down in Period 4 today! After only four days in this new treatment period, I can see a good combination of students who are working well together. The other classes are doing well too. I wonder what was different when comparing this seating assignment method to the other random seating assignment. Must be luck! As far as I know, I was consistent with the methods. It will be interesting to see if they are as quiet and focused in 12 days at the end of this period as they are today. One can only pray! I am excited to have a sub after Thanksgiving when I go on my trip! I might actually get a good report!

LOD: 3

December 5th

Kids might have less focus today because this is pretty tough subject matter for them! Biochemistry is one of those chapters that you can expect pain as a teacher when you grade assessments. You go through that whole thing: I thought I taught them that many times. How could they not have gotten it? Then you are brought back to reality! You didn't teach it well enough and you better find a way to teach it in a much more

effective fashion next time! Almost finished up with the last randomly chosen seating arrangement. I wonder how things would have been different had I paired kids up in a seating chart where one higher level student could help a few low performing students in his vicinity! I guess it is something to think about for next time. Today was a good day. My lesson went well, and kids did pretty good on their question of the day! Yeah 😊
LOD: 3

December 21st

Well, because I got sick and missed a few days, I had to do two days' worth of two multiple choice assessment tests. It worked all right for the nature of the lesson because on both days we did two different activities/labs in class. So in effect, it was two different but related concepts. It was important for me finish up my data collection before our two week Christmas break! I really wanted to start taking a look at the data. Kids are so distracted today. That might help to explain why multiple choice assessments were all over the place. These were relatively easy concepts too! Yikes ☹️ Looking forward to get out of the data collection phase. It has been such a big part of my life that I've become sick of it. It will be nice to just seat kids where I think they should be without worrying about the ramifications if I don't do something just right!

LOD: 5

APPENDIX H

SAMPLE OF STUDENT FIRST ROUND INTERVIEW TRANSCRIPTS

(A female)

1. "What can you tell me about your past experiences in school?"

I like school. All my classes are pretty cool. I really like science and learning Spanish. I don't enjoy that we have to take P.E. Class. That is so boring, and I'd rather work out on my own.

2. Describe your level of comfort and feeling of success in this class.

I love this class. I like that we do lots of cool things that help me learn better. I also like to work with lots of other students to solve problems.

Probe-What is it that makes you feel comfortable in class?

The teacher! You make all of us feel good...like we can learn!

Probe-What could be changed to make you feel more comfortable

Nothing really. I feel good.

3. When you feel like you are learning the most, where are you sitting in this class?

I feel like I can learn anywhere in the class. If I am in the back, I do fine. If I'm in the front, I will probably do good too. I might ask more questions in the front. I also might not read my book as much in the front of the classroom. Anytime there is a down time or transition I like to read my book.

Probe-What factors make this seat effective?

I do better when I pick my own seat.

Probe- Do you find it is different in other classes?

I do pretty good in all my classes. It is easier to learn in some classes especially when the teacher keeps things under control and doesn't let the silly students get out of control.

Probe- Can you recall a seating arrangement that you did very well at? What can you tell me about that situation?

I do fine no matter what. I can turn off the distractions pretty easy.

4. Describe the factors that make learning science easiest for you.

I like lots of activities. I hate book work and unnecessary work. So much of Earth Science was unnecessary work...what a waste of time. I love this class. It is my favorite science class I've ever taken.

Probe-What can the teacher do to help provide this environment?

You do everything just right, Mrs. H!

5. When you walk into a new classroom, what factors influence you to choose your seat on Day 1?

I like to sit near the window. The sunshine makes me feel good. In here it is awesome that I can sit near the window and near the heater at the same time. I also like to sit on the left side because I can see the smart board better. There are certain kids I avoid. Do I have to tell you specifics?

Probe-What would influence you to change your seat any given day?

If I felt distracted by a person near me, I would move far away from them. If I started to fall behind in understanding the work, I would move closer to the front to make sure I didn't miss any details.

Probe-How would you feel if you had that type of control, choosing your seat whenever you wanted to meet your educational needs?

I don't know. I trust you to make that decision for me too. I feel comfortable choosing for myself, but it would be hard to have a good class if some of the immature kids could choose their own seats.

6. How do you feel when your teacher makes a seating chart change?

I don't mind it...it is like a change of scenery.

Probe-What types of things should teachers keep in mind when placing students in seating charts?

Eyesight issues...they should sit up close. The loud obnoxious ones should sit away from each other.

Probe-If you were a teacher in a class, what might you do in terms of a seating chart, and why might you do that?

Move Howie and Caleb away from each other. They make it difficult for others to learn. I would also change it up a lot because it gets boring staying in one place too long.

Probe-How often do you think seating charts should be change, and should it be changed more or less frequently depending on the type of class?

Every two weeks is perfect. Although if I got really comfortable with a lab partner next to me, I'd want to stay in the seat forever, so I guess it is really mixed feelings!

(C male)

1. "What can you tell me about your past experiences in school?"

I don't really like school too much. I'd rather be at home.

2. Describe your level of comfort and feeling of success in this class.

I don't know.

Probe-What is it that makes you feel comfortable in class?

I like working with Dakota. I don't like the other kids.

Probe-What could be changed to make you feel more comfortable

Let me work with Dakota!

3. When you feel like you are learning the most, where are you sitting in this class?

I like the back probably best...then the middle. I don't like being stared at in the front.

Probe-What factors make this seat effective?

Too much pressure up front

Probe- Do you find it is different in other classes?

No

Probe- Can you recall a seating arrangement that you did very well at?

I don't think it really matters. I seem to do just as crappy in all my classes no matter where I sit.

-- What can you tell me about that situation?

I would just rather be doing anything but school.

4. Describe the factors that make learning science easiest for you.

I like working with Dakota in labs.

Probe-What can the teacher do to help provide this environment?

Don't assign me to any other partner that I don't like.

5. When you walk into a new classroom, what factors influence you to choose your seat on Day 1?

Not the front! Never the front! Then I look for my friends.

Probe-What would influence you to change your seat any given day?

Some teachers spit on you when they talk. Not you Mrs. Hammang! But it's gross. I would move back if that happened.

Probe-How would you feel if you had that type of control, choosing your seat whenever you wanted to meet your educational needs?

I would like that. I think most kids like it a lot being able to choose I mean.

Shouldn't teachers trust us anyway?

6. How do you feel when your teacher makes a seating chart change?

I don't know. It doesn't really matter

Probe-What types of things should teachers keep in mind when placing students in seating charts?

I don't like most people, so I want to be put by my friends no matter what.

Probe-If you were a teacher in a class, what might you do in terms of a seating chart, and why might you do that?

Let kids do whatever they want.

Probe-How often do you think seating charts should be change, and should it be changed more or less frequently depending on the type of class?

Once a good seating chart goes, there should not be any changes. I also don't want to work with people around me. I don't like them and they don't like me.

(B female)

1. "What can you tell me about your past experiences in school?"

I like school. Dillon is cool.

2. Describe your level of comfort and feeling of success in this class.

This class is better than Earth Science. Last year science sucked.

Probe-What is it that makes you feel comfortable in class?

You. It actually seems like you care about us doing good. I get excited to come here.

Probe-What could be changed to make you feel more comfortable?

Nothing. If we had a homeroom like in elementary school, I'd want you to be my homeroom teacher so I could see you more and learn biology more. Biology is way neater than learning about rocks and volcanoes.

3. When you feel like you are learning the most, where are you sitting in this class?

If I did not know anyone in the class and could sit anywhere, I would sit in the front and closer to where the teacher writes on the board. But since I know lots of people, I had to sit somewhere else. I get teased about being a brownnoser if I sit in the front!

Probe-What factors make this seat effective?

I always do better in the front because I can't see or hear in the back. I don't know why I don't want to do better.

Probe- Do you find it is different in other classes?

Not really

4. Describe the factors that make learning science easiest for you.

Not having any tests would be good. I am so bad at taking tests. It's like I get all the stuff in class...and then I can't do the test ever. I study too.

Probe-What can the teacher do to help provide this environment?

No tests...ha ha...just kidding! Being nice and understanding

5. When you walk into a new classroom, what factors influence you to choose your seat on Day 1?

My friends. I gotta sit by them no matter what or they don't talk to me no more.

Probe-What would influence you to change your seat any given day?

I wish I could be in a class where my friends are not mean to me. I would sit in front if I had no one to bug me.

Probe-How would you feel if you had that type of control, choosing your seat whenever you wanted to meet your educational needs?

I'd really like it.

6. How do you feel when your teacher makes a seating chart change?

It always makes me stressed. I don't like certain people and I worry I'll have to be by them and deal with their crap.

Probe-What types of things should teachers keep in mind when placing students in seating charts?

They think that all of us get along with everyone, and they want us to work together. I don't like working together with anyone, and I won't like science if I'm forced to work with someone I don't want to.

Probe-If you were a teacher in a class, what might you do in terms of a seating chart, and why might you do that?

I would give kids a chance to pick their own seats and then if they screw up, the teacher can move them or kick them out.

Probe-How often do you think seating charts should be change, and should it be changed more or less frequently depending on the type of class?

Never. If I am comfortable, it just makes me

(B male)

1. "What can you tell me about your past experiences in school?"

School bores me most of the time. I have trouble coming to most classes and not falling asleep.

2. Describe your level of comfort and feeling of success in this class.

I'm actually getting a good grade in here. My first A- ever in a science class. It's cause I actually don't mind this class

Probe-What is it that makes you feel comfortable in class?

I like how it feels relaxed in here.

Probe-What could be changed to make you feel more comfortable?

Nothing really.

3. When you feel like you are learning the most, where are you sitting in this class?

Sitting near the front is more accepted. Second row's okay. It's almost as good, and I don't get a hard time from my friends

Probe-What factors make this seat effective?

I don't like to be teased by my buddies, so sitting in the second row is good. I like to be near the teacher, and I like to be able to see the board. My eyes aren't good, I lost my glasses and my contacts hurt.

Probe- Do you find it is different in other classes?

I could sleep through most classes and still get a B

Probe- Can you recall a seating arrangement that you did very well at?

-- What can you tell me about that situation?

I never paid close attention.

4. Describe the factors that make learning science easiest for you.

Labs

Probe-What can the teacher do to help provide this environment?

More labs.

5. When you walk into a new classroom, what factors influence you to choose your seat on Day 1?

I just don't wanna be in the back or the front. I like to sit so I can see the board. Teachers stand in front of their writing , so I like to sit far enough over so I can see around them.

Probe-What would influence you to change your seat any given day?

Distracting people

Probe-How would you feel if you had that type of control, choosing your seat whenever you wanted to meet your educational needs?

I think I'm old enough to do that. A lot of people are not mature enough.

6. How do you feel when your teacher makes a seating chart change?
I'm not sure how it helps anything other than helping them learn names in the beginning. I don't think most teachers know how to make a good one.

Probe-What types of things should teachers keep in mind when placing students in seating charts?

Keep the loud ones separated. Maybe at opposite sides of the classroom. They'll still find a way to talk. Frustrating!

Probe-If you were a teacher in a class, what might you do in terms of a seating chart, and why might you do that?

Keep the loud ones apart.

Probe-How often do you think seating charts should be change, and should it be changed more or less frequently depending on the type of class?

As often as necessary. When things start getting out of hand. When it gets too loud mostly.

(F female)

1. "What can you tell me about your past experiences in school?"

I like school. I am just not very good at it. It seems like I try, and I don't do good. Some of my middle school teachers were not good. I think I lost a lot of my smartness back then cuz I used to be smart in grade school.

2. Describe your level of comfort and feeling of success in this class.

I feel pretty good. I struggled to get a D in science before. Now I'm getting a C and I actually like it.

Probe-What is it that makes you feel comfortable in class? Probe-What could be changed to make you feel more comfortable?

You are pretty good to have as a teacher. So I like it here. I also like having my friend here in class. It is a happy time coming here.

3. When you feel like you are learning the most, where are you sitting in this class?

My brain shuts off when I have to work alone, especially when I have to try to figure out science and math by myself. I have always been horrible at science.

Probe-What factors make this seat effective?

I don't know. Anywhere I guess as long as I'm not working by myself all the time. If the teacher doesn't embarrass me, I would like the front but they always call on me and embarrass me there. I hate when teachers seat me in the front row. Teachers call on me way too much up there.

Probe- Do you find it is different in other classes?

Not really

Probe- Can you recall a seating arrangement that you did very well at?

-- What can you tell me about that situation?

When I have teachers that call on everyone equally it doesn't really matter where you sit. You can raise your hand when you know something.

4. Describe the factors that make learning science easiest for you.

An understanding teacher that helps me. Not so many worksheets!

Probe-What can the teacher do to help provide this environment?

Keep doing what you are doing. My mom can't believe I am going to try to take Chemistry next year!

5. When you walk into a new classroom, what factors influence you to choose your seat on Day 1?

Friends. Where are they sitting? I want to be near them.

Probe-What would influence you to change your seat any given day?

If my friends move, then I have to move too.

Probe-How would you feel if you had that type of control, choosing your seat whenever you wanted to meet your educational needs?

That would be nice. But not everyone can handle that responsibility.

6. How do you feel when your teacher makes a seating chart change?

Depends on the teacher.

Probe-What types of things should teachers keep in mind when placing students in seating charts?

Some kids will distract the whole class if they are put by a noisy friend. These kids have to be separated.

Probe-If you were a teacher in a class, what might you do in terms of a seating chart, and why might you do that?

Separate the loud and noisy kids. And don't just assume that if you have a struggling student they are bad! I am not bad but teachers think I am because of my grades.

Probe-How often do you think seating charts should be change, and should it be changed more or less frequently depending on the type of class?

Not ever if you find a good seating chart. Sometimes it takes a while to find it though. Then you should change every week until there is a good seating chart.

(D Female)

1. "What can you tell me about your past experiences in school?"

I hate school. I would rather be doing anything else.

2. Describe your level of comfort and feeling of success in this class.

No offense. I don't like science. I'm not good at it. My friends are the ones that make it okay.

Probe-What is it that makes you feel comfortable in class? Probe-What could be changed to make you feel more comfortable?

I wish I didn't have to take this class. I wish I didn't have to take any classes. My parents say I might have to drop out so I can work anyway.

3. When you feel like you are learning the most, where are you sitting in this class?

Whenever I can be with my friend sitting in the back, I am learning the most

Probe-What factors make this seat effective?

I just hate being in front. However, I do see the smart board better if I'm closer to the middle.

Probe- Do you find it is different in other classes?

Not really. Not all teachers work hard to make us try to enjoy class. Even though I really don't like this class, I can see that you care.

Probe- Can you recall a seating arrangement that you did very well at?

-- What can you tell me about that situation?

No.

4. Describe the factors that make learning science easiest for you.

Working in groups with my friends with no pressure from the teacher to answer questions I don't know. I hate when they ask me and I don't know.

Probe-What can the teacher do to help provide this environment?

They can know more about me. Know that I don't like to be pressured. I could even talk to the teach and let them know when I feel comfortable with the stuff in class. Then they could ask me questions.

5. When you walk into a new classroom, what factors influence you to choose your seat on Day 1?

I just want to get there quick so I don't have to sit in the front!

Probe-What would influence you to change your seat any given day? **I do need to be able to see the board.**

Probe-How would you feel if you had that type of control, choosing your seat whenever you wanted to meet your educational needs?

That would be nice. But teachers are not cool like that.

6. How do you feel when your teacher makes a seating chart change?

Nervous that I'll have to be by the kids that don't like me. That would make it so bad.

Probe-What types of things should teachers keep in mind when placing students in seating charts?

We don't always work good with other kids. I will work much better in a lab group with my friend than I do with other kids I don't know. I don't care about making friends.

Probe-If you were a teacher in a class, what might you do in terms of a seating chart, and why might you do that?

I don't know.

Probe-How often do you think seating charts should be change, and should it be changed more or less frequently depending on the type of class?

Every few weeks would be good. Class is less boring if you can move around.

(C female)

1. "What can you tell me about your past experiences in school?"

I was really smart in elementary school and middle school. High school got a lot harder and I have a hard time in my classes especially science, math and English.

2. Describe your level of comfort and feeling of success in this class.

I feel comfortable in here. I like coming here.

Probe-What could be changed to make you feel more comfortable?

You make me feel like I am not stupid. And that I actually know cool stuff in biology. Thank you.

3. When you feel like you are learning the most, where are you sitting in this class?

If I'm in the front, I am probably going to raise my hand and answer lots of questions.

Probe-What factors make this seat effective?

It seems like the bad kids get the front seats by the teacher. I want to sit in the front, so I can learn better.

Probe- Do you find it is different in other classes?

No. except some classes it doesn't matter where you sit. You still get treated like you are not as smart as the A students.

Probe- Can you recall a seating arrangement that you did very well at?

I try my best no matter what.

-- What can you tell me about that situation?

I don't think it is the seating chart that matters as much as the teacher's attitude about being there in school and teaching you.

4. Describe the factors that make learning science easiest for you.

Labs and activities. Working with my friends and having my teacher check on how I'm doing.

Probe-What can the teacher do to help provide this environment?

Keep doing what you do.

5. When you walk into a new classroom, what factors influence you to choose your seat on Day 1?

I want to sit near the front. But most people don't like the front row, so it is easy to get a seat there.

Probe-What would influence you to change your seat any given day?

I noticed that some teachers really cover up their writing at the board. I sometimes have to move a few seats over so I can see or I get behind. And that sucks.

Probe-How would you feel if you had that type of control, choosing your seat whenever you wanted to meet your educational needs?

I'd like it. Most teachers...I just have to tell them I like the front. And they put me there. Sometimes I can tell them I have a harder time hearing, and they'll put me in the front.

6. How do you feel when your teacher makes a seating chart change?

As long as the teacher knows what I need, I feel pretty good about it you know.

Probe-What types of things should teachers keep in mind when placing students in seating charts?

Ask kids what they need to do good in class. And then really listen to them. I think kids know what kind of environment they need. And teachers should trust us.

Probe-If you were a teacher in a class, what might you do in terms of a seating chart, and why might you do that?

Listen to kids!

Probe-How often do you think seating charts should be change, and should it be changed more or less frequently depending on the type of class?

As often as needed. If a class gets too crazy, a new seating chart might be necessary.

(A Male)

1. "What can you tell me about your past experiences in school?"

I like hanging out with friends in school. But I'm bored. The stuff is too easy.

2. Describe your level of comfort and feeling of success in this class.

I like science, so it's not that bad. I wish there weren't so many students that are not smart. We could move at a much faster pace in class, and then I wouldn't get bored in here either.

Probe-What is it that makes you feel comfortable in class?

An easy going teacher that asks good questions and doesn't move at a slow pace.

Probe-What could be changed to make you feel more comfortable?

Wish we could have a class where all of my pre-calculus friends are in here. Discussions would be so much better.

3. When you feel like you are learning the most, where are you sitting in this class?

Some days I can read my book all day and some teachers don't even notice the whole class period.

Probe-What factors make this seat effective?

When I finish my work ahead of everyone, I like to be able to read. I know you see me reading but you don't get mad because you know I've done my required work.

Probe- Do you find it is different in other classes?

They don't always let me read, and I hate busy work.

Probe- Can you recall a seating arrangement that you did very well at?

-- What can you tell me about that situation?

I can do well almost anywhere in the classroom as long as I put my mind to it!

4. Describe the factors that make learning science easiest for you.

I just love science. I'm good at science. It is hard to screw up my experience except by not offering it in the first place. I love this class because I love the life sciences.

Probe-What can the teacher do to help provide this environment?

You are doing everything perfect already. Wish I had you for AP Bio!

5. When you walk into a new classroom, what factors influence you to choose your seat on Day 1?

I guess I really don't think about it a lot...although I would prefer not sitting in front. The middle or back is okay though.

Probe-What would influence you to change your seat any given day?

Even though I like sitting toward the back, if I can't see the teacher or start to struggle, I'd move up.

Probe-How would you feel if you had that type of control, choosing your seat whenever you wanted to meet your educational needs?

I like that type of control.

6. How do you feel when your teacher makes a seating chart change?

I don't know. I don't mind it. As long as the teacher understands me and what I need, I do fine.

Probe-What types of things should teachers keep in mind when placing students in seating charts?

Students that can't handle themselves appropriately should be separated from each other. Students that can't handle themselves should be put into a separate class period from each other.

Probe-If you were a teacher in a class, what might you do in terms of a seating chart, and why might you do that?

I would listen to my students needs first. If that didn't work, I'd seat kids by alphabetical order to get to know them. At that point, I could pick out who is having trouble and get them moved.

Probe-How often do you think seating charts should be change, and should it be changed more or less frequently depending on the type of class?

I think that seating charts should change often enough so that the class does not get stagnant.

(D male)

1. "What can you tell me about your past experiences in school?"

I like school. I just have a lot of trouble with school. I really want to get better. I have a IEP, and I like getting the extra support for that.

2. Describe your level of comfort and feeling of success in this class.

I like this class. My parents can't believe I am getting a C in Biology. I think it's because of all the help and stuff I get from you guys. I did not like Earth Science. It was so boring, so to come into hear to learn about living stuff is really sick

Probe-What is it that makes you feel comfortable in class? Probe-What could be changed to make you feel more comfortable?

I like working with you Mrs. H. you care so much about your students. And I feel lucky. I want to take your Health class next year!

3. When you feel like you are learning the most, where are you sitting in this class?
Closer to the front of the room so I can see the teacher. My IEP makes me sit there anyway. Really though I wish I didn't have to sit right in the front. Second row would be just as good. And I wouldn't feel like the teacher was right on top of me.

Probe-What factors make this seat effective?

I like sitting up close so I know what is going on. I don't like to be bothered by the noisy kids in the back.

Probe- Do you find it is different in other classes?

No

Probe- Can you recall a seating arrangement that you did very well at?

I am usually in the front, so it doesn't matter.

4. Describe the factors that make learning science easiest for you.

I like labs. I like learning new things. I like you cause you are excited about teaching. I also like kids that ask good questions in the class to make things exciting.

Probe-What can the teacher do to help provide this environment?

You do good stuff already. I like to do different things every day. That is really sick.

5. When you walk into a new classroom, what factors influence you to choose your seat on Day 1?

I don't know. I try to tell my friend to sit up front cause I know I have to. But I usually can't make them sit by me. So, it doesn't matter anyways

Probe-What would influence you to change your seat any given day?

Nothing really

Probe-How would you feel if you had that type of control, choosing your seat whenever you wanted to meet your educational needs?

I wish teachers would trust me that I would do okay in the second row or even further back.

6. How do you feel when your teacher makes a seating chart change? **It doesn't really affect me with my IEP.**

Probe-What types of things should teachers keep in mind when placing students in seating charts?

Students sometimes should know where they want to be so they can learn really good. Maybe they should ask us kids what is best.

Probe-If you were a teacher in a class, what might you do in terms of a seating chart, and why might you do that?

Ask kids to help me make decisions.

Probe-How often do you think seating charts should be change, and should it be changed more or less frequently depending on the type of class?

As long as they are changed enough that everyone gets a chance to sit somewhere else that is all that matters.

(F Male)

1. "What can you tell me about your past experiences in school?"

I hate school.

2. Describe your level of comfort and feeling of success in this class.

I don't know. I guess it's not that bad. You are nice and all.

Probe-What is it that makes you feel comfortable in class?

I just don't like to be bugged by teachers or by anyone.

Probe-What could be changed to make you feel more comfortable?

I like my privacy.

3. When you feel like you are learning the most, where are you sitting in this class?

I like the back because my teachers do not usually call on me back there. Then I can do my work and not have to worry about being called on.

Probe-What factors make this seat effective?

No worries.

Probe- Do you find it is different in other classes?

Some teachers call on you to embarrass you. That happens in English.

Probe- Can you recall a seating arrangement that you did very well at?

No. I suck at school.

4. Describe the factors that make learning science easiest for you.

I like science movies. They are cool. Like discovery channel or the good movies you showed us this year so far. They are good. I don't like movie guides.

Probe-What can the teacher do to help provide this environment?

All movies all the time and no homework.

5. When you walk into a new classroom, what factors influence you to choose your seat on Day 1?

I just go right to the back in the corner furthest from the teacher. I hate when they make me move up.

Probe-What would influence you to change your seat any given day?

Annoying stupid kids annoy me. I want to move away from them sometimes.

Probe-How would you feel if you had that type of control, choosing your seat whenever you wanted to meet your educational needs?

I don't really even care about my grade. I just want to get through the day.

6. How do you feel when your teacher makes a seating chart change? **Whatever. You seem to get it that I do better back here. I hope that doesn't change later in the year.**

Probe-What types of things should teachers keep in mind when placing students in seating charts?

Whatever they want should be thought about. I get it that everyone has their own learning way. Why can't teachers get it too?

Probe-If you were a teacher in a class, what might you do in terms of a seating chart, and why might you do that?

I don't really care.

APPENDIX I

INSTITUTIONAL REVIEW BOARD EXEMPTION



INSTITUTIONAL REVIEW BOARD
For the Protection of Human Subjects
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MEMORANDUM

TO: Angela Hammang
FROM: Mark Quinn, Ph.D. Chair *Mark Quinn CD'*
 Institutional Review Board for the Protection of Human Subjects
DATE: November 22, 2011
SUBJECT: "The Effects of Three Different Seating Arrangements on Academic Performance and Attitude in the Science Classroom" [AH112211-EX]

The above research, described in your submission of November 22, 2011, is exempt from the requirement of review by the Institutional Review Board in accordance with the Code of Federal Regulations, Part 46, section 101. The specific paragraph which applies to your research is:

- (b)(1) Research conducted in established or commonly accepted educational settings, involving normal educational practices such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.
- (b)(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability, or be damaging to the subjects' financial standing, employability, or reputation.
- (b)(3) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (b)(2) of this section, if: (i) the human subjects are elected or appointed public officials or candidates for public office; or (ii) federal statute(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.
- (b)(4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available, or if the information is recorded by the investigator in such a manner that the subjects cannot be identified, directly or through identifiers linked to the subjects.
- (b)(5) Research and demonstration projects, which are conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine: (i) public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs.
- (b)(6) Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed, or (ii) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the FDA, or approved by the EPA, or the Food Safety and Inspection Service of the USDA.

Although review by the Institutional Review Board is not required for the above research, the Committee will be glad to review it. If you wish a review and committee approval, please submit 3 copies of the usual application form and it will be processed by expedited review.