

HOMOGENOUS GROUPING OF HIGH SCHOOL STUDENTS
IN PHYSICS LABS TO PROMOTE ENGAGEMENT

by

Audra Bonhorst Hawkinson

A professional paper submitted in partial fulfillment
of the requirements for the degree

of

Master of Science

in

Science Education

MONTANA STATE UNIVERSITY
Bozeman, Montana

July 2024

©COPYRIGHT

by

Audra Bonhorst Hawkinson

2024

All Rights Reserved

ACKNOWLEDGEMENTS

I am deeply indebted to my science reader, Benjamin Spicer for reviewing my work and providing valuable insight.

I also need to acknowledge Dr. Walter Woolbaugh for providing feedback and guidance during the capstone process.

I offer my thanks to Dr. Brenda Donelan for reviewing, offering suggestions for improvements for improvement and being all-around supportive in the process. I also thank Mr. John Arnold for support and advice gleaned from his earlier capstone.

Finally, I want to thank my family for the support and opportunity to complete this project.

NATIVE AMERICAN HERITAGE

I am a member of the Standing Rock Sioux Tribe. It was once part of the Great Sioux Reservation. The tribe consists of Lakota and Dakota nations and is situated in North and South Dakota (*About - Standing Rock*, 2022). The tribal headquarters is in Fort Yates, ND.



TABLE OF CONTENTS

1. INTRODUCTION & BACKGROUND	1
Context of the Study	1
Focus Statement/Question	2
2. CONCEPTUAL FRAMEWORK	3
Framework	3
3. METHODOLOGY	7
Demographics	7
Treatment	8
Data Collection and Analysis Strategies	9
4. DATA ANALYSIS	11
Results	11
5. CLAIM, EVIDENCE, AND REASONING	16
Claims From the Study	16
Value of the Study and Consideration for Future Research	17
Impact of Action Research on the Author	18
REFERENCES CITED	20
APPENDICES	23
APPENDIX A: Grouping Survey	24
APPENDIX B: Institutional Review Board Exemption	26
APPENDIX C: Questionnaire Post Class	28
APPENDIX D: Interview Questions	34

LIST OF TABLES

Table	Page
1. Data Triangulation Matrix.....	10

LIST OF FIGURES

Figure	Page
1. The Ethnic Distribution of Davenport West High School..	7
2. Students' Perception of Group and Participation Treatment Class	12
3. Students' Perception of Group and Participation Comparison Class.....	12
4. Students' Answers to Group Work Will Help me in the Future...	13
5. Students' Comfort in Their Group	13
6. Students' Comments on Answers for Group Work Enjoyment Responses.....	14
7. Students' Opinion on Group Work Post Treatment.....	14
8. Comparison Class Students' Opinion on Group Work	15

ABSTRACT

Due to equipment and time restraints, high school physics labs are done primarily in groups. Group work is regarded as beneficial for students also to aid in learning in with groups. Often times, however, I have observed one or two students will complete the labs while other lab members are minimally or not contributing. Typically, I organize students randomly in groups by physical location in the room or let them choose their own groups. For this study, homogenous groups of three or four students were established based on survey questions regarding student's opinion of group work and grade expectation for this high school physics class. The goal was to determine if the homogenous groups would be more engaged and active in labs. The physics class is a nine-week block schedule class that is the lowest level physics class that meets school graduation requirements. Students were observed during the term to monitor engagement which was recorded in a teacher journal. Students were also given an end of the class survey to determine their opinion on the grouping in the class and the class in general. A comparison class was also given the same survey. Several students from the treatment class were also interviewed on their experience. Most students felt they were similar to their group mates and felt valued and safe to contribute. However, this didn't translate to enjoying the class or feeling that labs were a positive to all students. The most positive result was that students that normally feel that they can't participate in labs, felt comfortable contributing. Another interesting trend was that a newly added experiment of making a paper cup speaker during our magnet and electricity sections was the favorite of all students that expressed a favorite lab. The students enjoyed making an object that they use in everyday life.

CHAPTER ONE

INTRODUCTION AND BACKGROUND

Context of the Study

At a large high school in the Midwest, I teach chemistry and physics which are required for graduation. The majority of students fulfill their physics requirement with a one nine-week block scheduled physics class. Students are engaged in hands-on experimental labs in science classes and the engagement aids students in learning the material is conventional wisdom. Lab reports are predominantly individual, but evidence/data is shared among the students in the group. Lab reports are typically in the claim, evidence, reasoning format (CER). The goal is to have students justify the claim by explaining how the data supports it.

However, I have observed that some students sometimes intentionally avoid participating in labs. I have also observed that the same students will occasionally participate in labs when placed with different people as lab partners. Allowing students to choose their own lab groups was considered as students often feel more comfortable with those they know. However, this has a major downside in that every student may not know someone and may make labs a stressful experience. Also, social engagement may be prioritized over completing the experiment.

Student engagement is a student's perceived interest in learning the material and interacting with peers during labs and other group projects (Sabbott, 2016). I have observed that the comfort level of some students with others in their lab groups greatly impacts their participation in a lab. Currently labs are set up semi-randomly with others in the same area of the room.

Focus Statement/Question

Science laboratory assignments aid students in understanding principles and interest in science classes. Working in groups is necessary due to equipment limitations and to encourage dialog among students to understand laboratory results.

Primary Research Question: Does grouping students with similar attitudes towards group work for laboratories increase the student's engagement and performance in labs?

Secondary Research Question: Does preventing students from being the lone ethnic minority or gender in a group increase engagement?

CHAPTER TWO

CONCEPTUAL FRAMEWORK

Framework

Groupwork is accepted as beneficial in a science class (Springer et al., 1999), however, there is less agreement of how groups should be formed. A group can be an informal pairing that occurs for an in-class discussion or quick assignment to more formal longer-term groupings. A study (Donavan et al., 2018) compared the success of groupwork with heterogeneous and homogeneous work groups that were selected by the instructor. It also compared these with student selected work groups. The study showed that heterogeneous groups, selected by analyzing student's previous science classes and GPAs, showed a greater benefit for lower scoring students. The lower scoring students showed the most growth and did not negatively impact the higher scoring students' attitude towards the group.

The size of the group can also impact the participation and engagement of students. The groups consist of three or four members which is the recommended group size from several sources (Johnson & Johnson, 1986). This allows more interaction from the students but will also accommodates the amount of available lab equipment.

The fundamental concept of creating strong lab groups is that student will benefit from working together. There is a practical side of dividing into lab groups as there is also a limit of space and lab equipment. However, learning to productively engage in cooperative and collaborative learning are essential parts of working in a group. One study found that "The main effect of small-group learning on achievement, persistence, and attitudes among undergraduates

in SMET was significant and positive” (Springer et al., 1999, p. 29). SMET is defined as science, mathematics, engineering, and technology classes.

The Springer article also stated that from the meta-analysis of data that group work had a d value of about .5 which is classified as a moderate effect of student outcomes. The d value is a measured of standardized mean differences. Student self-esteem was cited as one of the positive outcomes. Higher performing students did well in any situation, though. Homogeneous groups had lower, medium and higher performers on a pretest grouped together. The heterogeneous groups had groups with various levels grouped together along with information on GPA. The heterogeneous groups had the largest change from the pretest to the post-test scores 20.27 ± 5.36 pre-group work vs 39.71 ± 7.99 post while the homogeneous averages went from pre 21.45 ± 5.16 to post 38.70 ± 7.59 . The self-selected group had the lowest improvement.

The attitudes towards group work surveys showed minor improvements generally when compared to the beginning surveys. This was true for all groups. The conclusion was that heterogeneous groups were the most successful. The conclusion also had a warning about self-selected groups may cause discomfort for some students that didn't know others in the class.

Other researchers have also studied heterogeneous, homogeneous and self-selected groups based on pretest scores. In their discussion the homogeneous groups had a slight edge in improvements from pre to post test scores. The researcher believed that the self-selected groups didn't have much if any prior relationship to the other members (Lawrenz & Munch, 1984).

The participation of all students and comfort of all students may increase in a homogenous work group. Students that may rely on higher achieving students will be required to work harder if in a homogenous group. This will prevent lower achieving students from

“piggy-backing” or relying on higher achieving students (Pinton, 2012). Student engagement and participation is as valuable in high school classes as the final grade. Participation aids the student in problem solving skills while a grade may be borrowing group mates’ answers.

The gender of a student may also impact the comfort level of the student in the group. A student may feel isolated if they are the lone gender or ethnic group member. This can lead to unintended consequences such as “Particularly when the subject is a nontraditional major or career choice for the minority, distributing-or, often, isolating-one minority student within each majority group may lead to the minority student dropping out of the group, the course, or the major” (Rosser, 1998). If possible, groups while heterogenous should also not isolate a student. In upper-level math and sciences this may be difficult but it may impact a student’s attitude towards the class.

The way that teachers interact with groups can also have an impact on how successful a group can learn. Establishing ground rules for group work and checking in on groups without encouraging dependence on the teacher aids the development of the group. Observers noted that what teachers considered a problem in small group work such as getting the correct answer too quickly differed from the researchers (Hofmann & Mercer, 2016). They also observed that teachers often failed to have the students explain the reasoning for their answers. Students getting stuck in and not progressing was also seen as reason to hurry the students to find a solution and perhaps shortchange the discovery process. As a classroom teacher, I can empathize with these situations as working with small groups entails a lot of running between groups and I can understand trying to help too much to insure that students will arrive at correct answers.

Another study showed that teacher's interaction can have an impact in the performance of the students (Gilles & Khan, 2008). The primary goal was to help the student's interaction by teaching them how to work together to enhance problem solving skills. Teachers were trained on guiding groups on problem solving skills to help them work together more effectively. Problem solving skills will benefit students in all areas of life not just science class.

A study of computer science college students showed a difference in achievement in grouped versus a control group that didn't work in a collaborate learning group. Heterogenous groups had a greater achievement impact. The intent of the grouping matter as this study shows "finds a collaborative environment with heterogeneous grouping superior over an environment comprising homogenous students in terms of academic achievement. Contrary to this, in terms of learning experience, homogenous learning environment was better. Hence, it can be concluded that the superiority of the type of collaborative learning environment depends on the results you want" (Kanika et al., 2022, p. 6376). In regard to a graduation requirement physics class, this is an important distinction. As important as student achievement is, having students comfortable and engaged may encourage more attendance and participation.

These articles provide direction for answering the questions by establishing a process to compare groups and for verifying that the reasoning that the way students are grouped for labs or other group work can impact the outcome in student achievement. Student engagement was the greater focus for my project; however, greater student engagement impacts student performance in the classes.

CHAPTER THREE

METHODOLOGY

Demographics

Davenport West is located in a small city of Davenport, IA with a population of approximately 100,000. It is one of three major public high schools in Davenport. It is in the furthest west side of the city and the school includes students from surrounding rural areas. The racial demographics from the school's website is 62% White, 12% Black or African-American, 14% Hispanic, 9 % Multi-racial, 3% Asian, and less than 1% Native American or Pacific Islander (Figure 1). Davenport West has 56% male and 44% female students. The school is 56% low income. (US News Report n.d.)

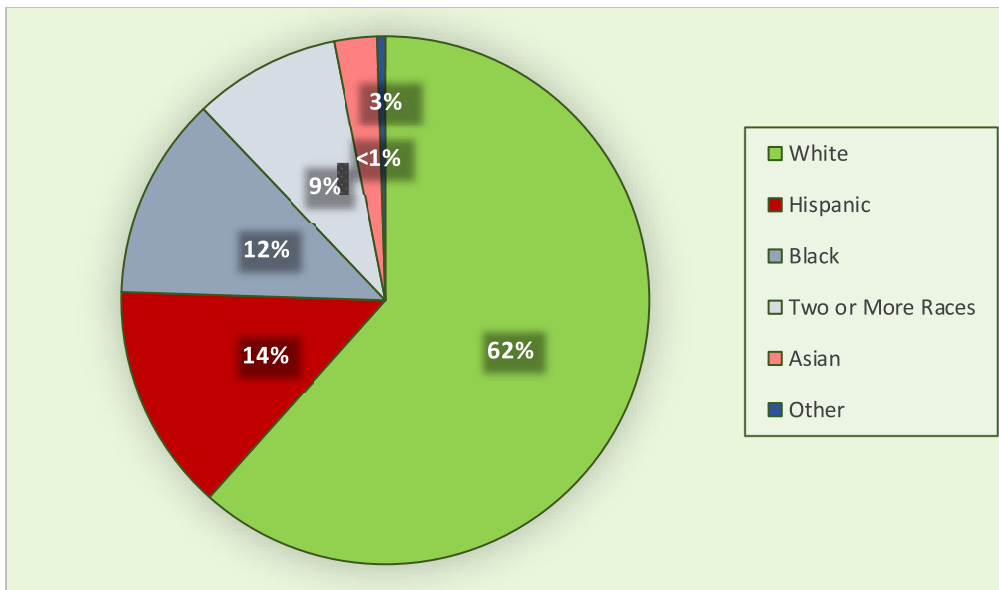


Figure 1. The ethnic distribution of Davenport West High School, (N=1500).

Davenport West has students from the rural and urban areas. Approximately 56% of students qualify for free or reduced lunches. The percent of students that enroll in a post-secondary program within a year of graduation is 48.15%. The four-year graduation rate is 76.85% which is below Iowa's average of 89.86%. (Iowa, S. O. n.d.).

Treatment

Similarities in work group members such grade expectations and group work styles were weighed in creating lab groups that are fairly homogenous in achievement goals and group members. Data from grade expectations and group work styles were gathered from survey questions (Appendix A) administered at the first day of class on a voluntary basis. Students who did not reply were placed to round out groups if necessary. The survey questions were chosen based on a survey that was provided to me from a professor that groups their students. This supported my confidence in the survey. The class originally had 23 students that were divided into six groups of three to four students. One group had students who were not expecting a high grade. Two groups expected high grades. One group didn't fill out the survey and several missed the first day. Two groups were expecting moderate grades. Two students left before the end of the term. The class ended with three groups of three and three groups of four.

The class is high school physics which is a graduation requirement. It is a one 9-week term class on a block schedule. This year the students are heavily seniors due to a lack of physics sections being taught. The students range from high achieving students to struggling learners. There is an honors physics class that replaces this one for students who will likely be going into engineering or a physical science major post-secondary.

During both the treatment term and the comparison class, students who were not actively engaging were interviewed as to why they are not participating. This information was used to change work groups, when necessary, and to increase student participating and engagement.

Data Collection and Analysis Strategies

The data collection methods described below were approved by the Institutional Review Board at Montana State University consideration for human test subjects (see Appendix B). I administered a Likert survey (Appendix C) about views on group work at the beginning of a previous class term. The information from the previous term class verified that the answers provided the type of information that was sought thus verifying the validity of the survey. The survey is the same survey used for data collection at the end of the AR project with the exception of one question. A chemistry class that I taught the same term with a similar student make up but random and varied grouping was also administered the Likert survey at the end of the term. The answers were gathered using a Google form with Likert questions with five choices. The values were imported into a Google Sheets spreadsheet for analysis. Some questions also had open response questions following them to give more information.

The teacher journal is used to determine whether or not the homogeneous groups were making an impact on student engagement during the class based on my observations. It is a Google document with entries that were submitted over the term. Any observations were dated and were based on my observations only.

Student interviews to determine grouping impact were given to 6 students. (Appendix D). Two students from higher achieving, middle and lower achieving groups were interviewed. A total of six students were selected and voluntarily answered questions. The interviews were

recording in a Voice memo and then transcribed using a phone app. The transcriptions were saved without student names or identifying information in a Word document.

The following data triangulation matrix was reviewed by professors and by fellow master's candidates to validate the reliability of the methods.

Table 1. Data Triangulation Matrix.

	1	2	3
Primary Question	Does grouping students with similar attitudes towards group work for laboratories increase the student's engagement and performance on labs?		
Collection Method	Survey at the beginning of term to group students	Questionnaire at the start/ the end of term on group work attitudes for treatment group and random group	Teacher journal
Reasoning	Establish treatment groups	Determine treatment impact on attitudes towards group projects	Reflect on project benefit learning vs effort required
Secondary question	Does grouping students with similar race, ethnic background or other similarities allow the student to be comfortable and more engaged with the lab?		
Collection Method	Use observations of student interactions to prevent any students feeling isolated in a group	Student interviews on group work attitudes for a treatment class and randomly grouped class	Post lab student interviews with students that are not participating Teacher journal observations
Reasoning	Group creation to avoid isolating students	Student feedback on satisfaction of group	Identify other reasons students don't participate

CHAPTER FOUR

DATA ANALYSIS

Results

Analysis of the Likert survey post-treatment data indicates that the students felt comfortable with their groups (Figure 2). Since the groups were designed to match similar students to each other, this demonstrated that the survey aided in creating cohesive groups. One participant post survey asked to be moved to a different group and that was accommodated. They felt that they weren't accepted by the group. They were the same gender but different ethnicity and a very different personality type. The groups were based on grade expectations and opinion of groupwork from the group placement survey. When possible, avoiding a lone member of a gender or minority was also factored into the group decision making.

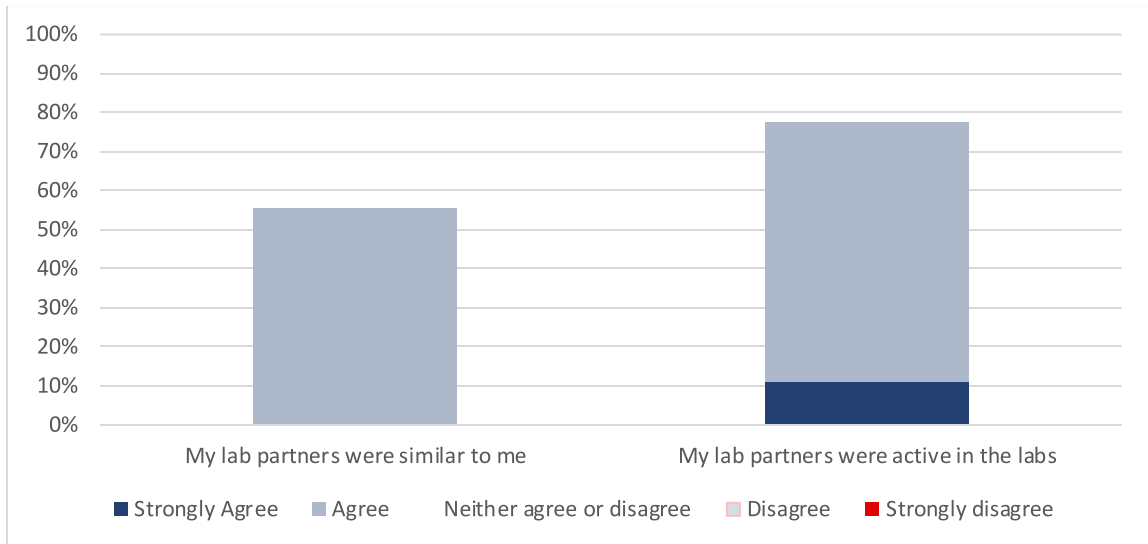


Figure 2. Students' perception of group and participation treatment class, ($N=9$).

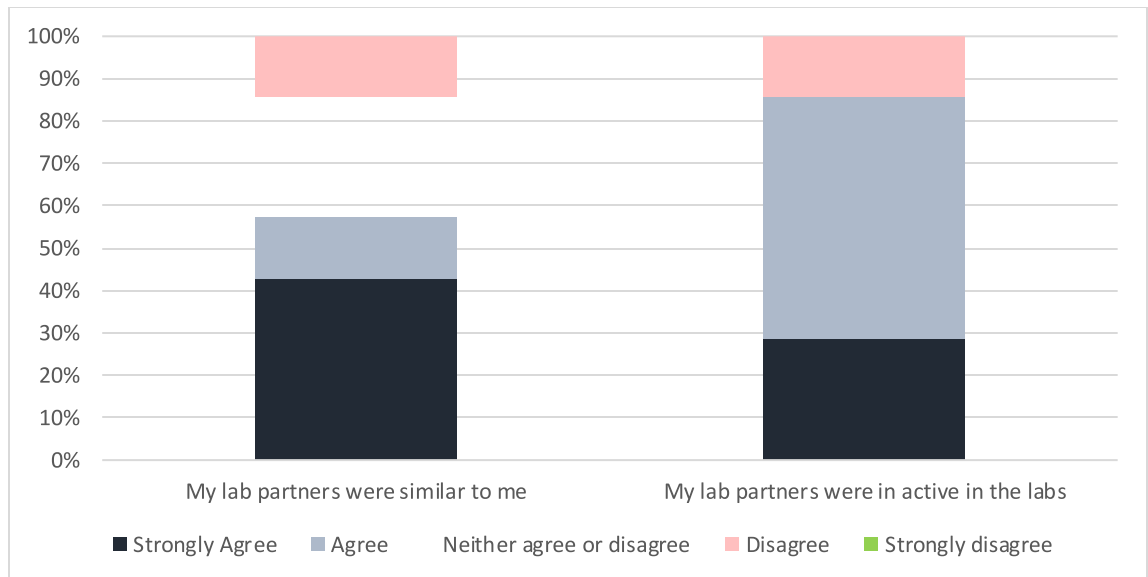


Figure 3. Students' perception of group and participation comparison class, ($N=7$).

Although a segment of students does not enjoy group work, the vast majority of students feel that group work prepares them for the future. This was true in the comparison class and in the treatment physics class. (Figure 4).

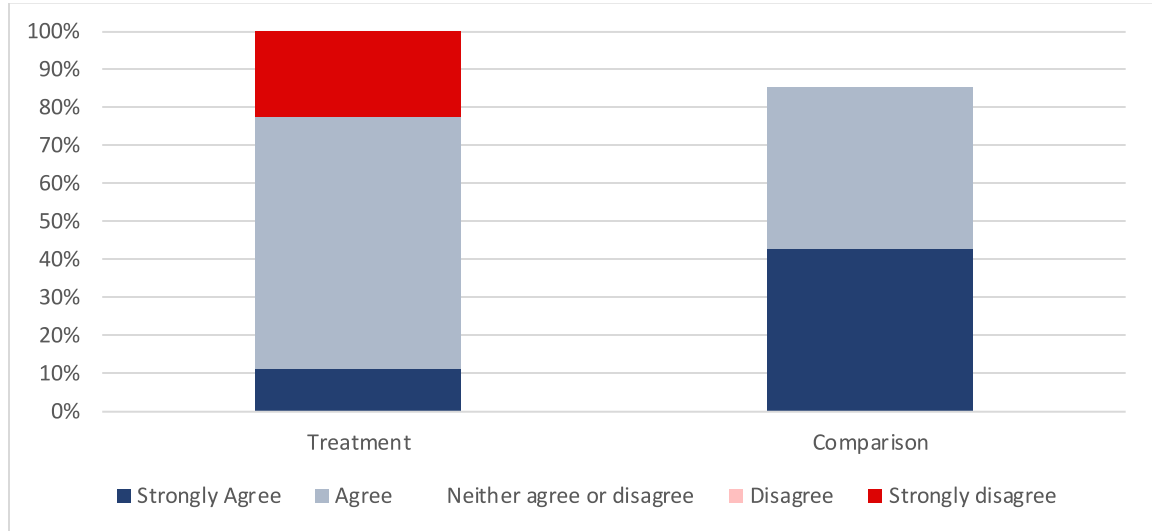


Figure 4. Students' answer to group work will help me in the future, ($N=9$, $N=7$).

According to the end of term survey (Figure 5), the students in the treatment group felt that they were valued members of the team and that they were able to offer opinions without judgement.

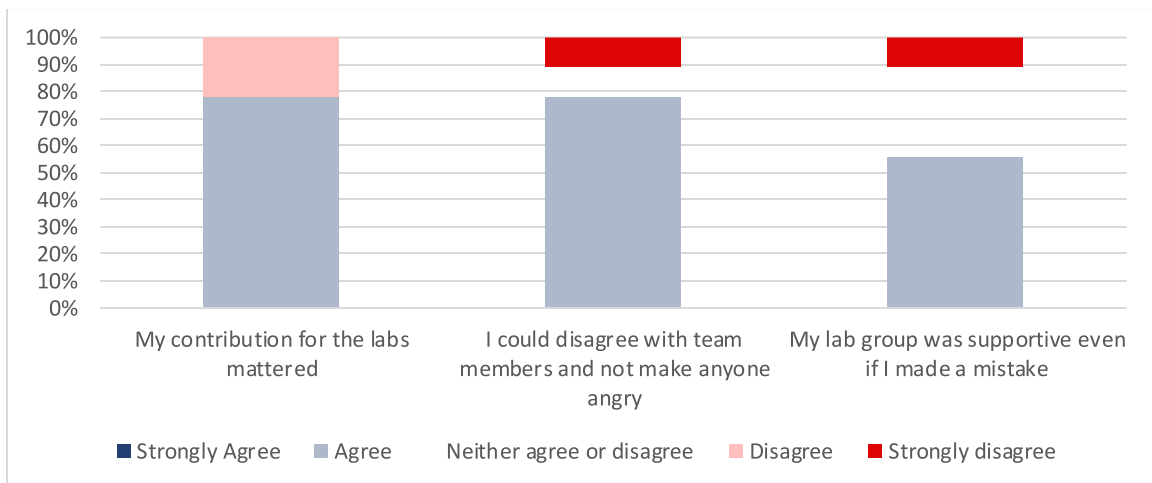


Figure 5. Students' comfort in their group, ($N=9$).

Despite feeling comfortable in the groups, this didn't translate to more enjoyment in the class or in group work. Twenty-two % of students indicated that they didn't like group work on

the placement survey. One of the students that was interviewed and didn't indicate a bad experience in the class but still indicated that they didn't like group work. "Okay, did you enjoy working with your group this term? No, I'm not a fan of group work." This was an excerpt from the transcription of the interview. One critique from the survey that explained the answer about labs not making the class enjoyable was "It made it harder because they were long and hard to complete."

Explanations on why or why not working in groups was enjoyable	
Positive "You learn different stuff with different people." "Good to have other brain around instead of one"	Negative Group didn't work well together (2) "I don't enjoy group work"

Figure 6. Students' comments on answers for group work enjoyment responses, ($n=5$).

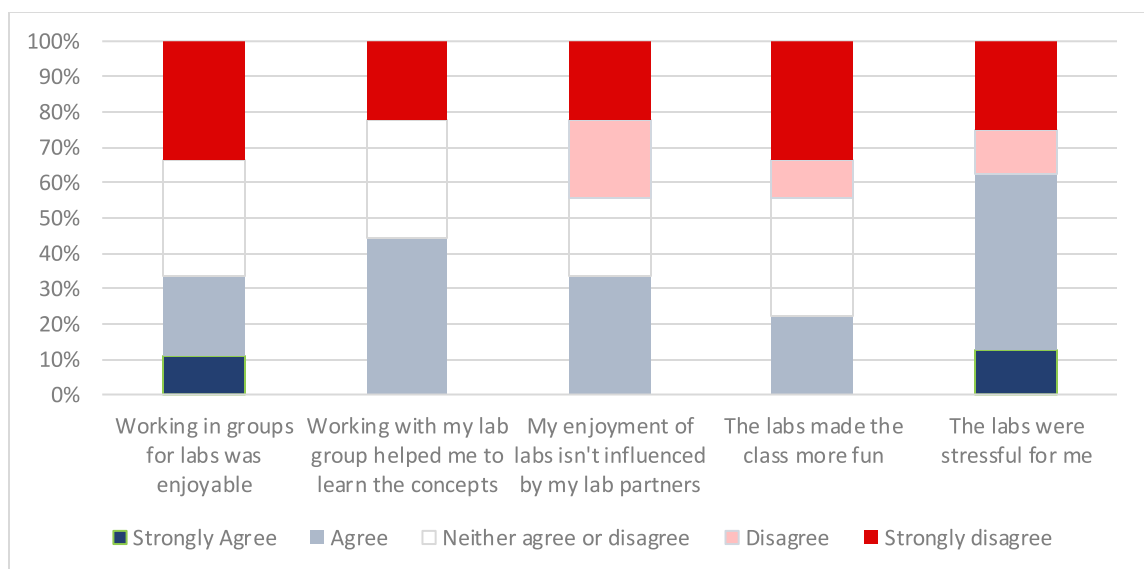


Figure 7. Students' opinion on group work post treatment, ($N=9$).

The comparison class had a better opinion of the group work. None of the students felt that the labs were stressful and the respondents thought the labs made the class more enjoyable.

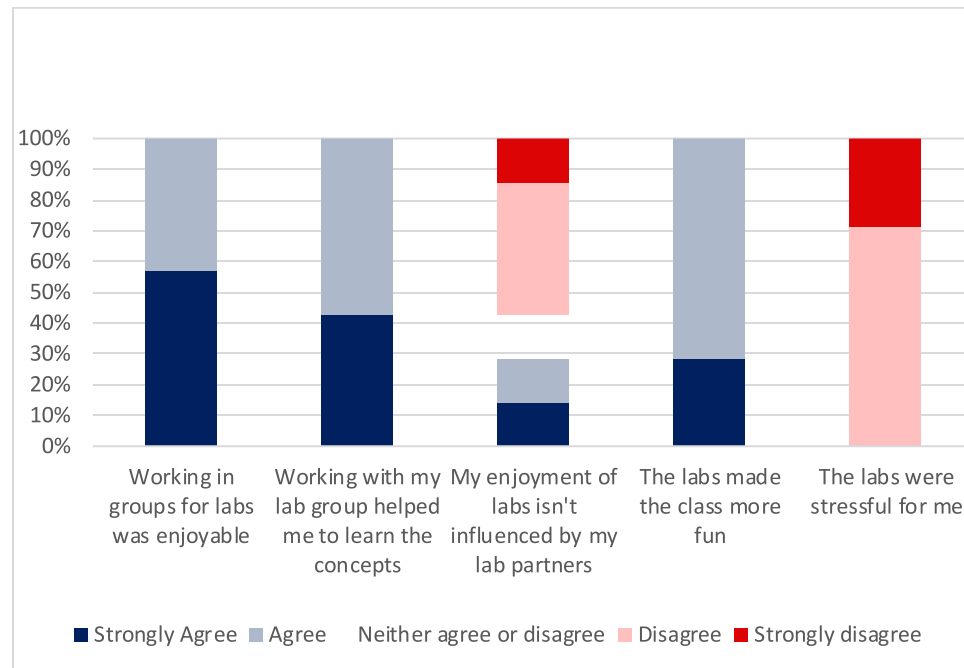


Figure 8. Comparison class students' opinion on group work, ($N=7$).

An interesting theme that developed was the favorite lab for the physics treatment group from the interviews and the surveys was making a speaker out a paper cup, magnet wire, magnets and an auxiliary cord. From student interviews, they enjoyed making something that they related to from actual experience. They were also surprised that it actually worked.

From the student interview's 33% stated that a recommended improvement to the class was to change lab groups occasionally. One student who suggested this liked the groups because their friends were in their group. This was counter to a preconception that I had that keeping the groups the same during the term would help with team and relationship building during the term.

CHAPTER FIVE

CLAIM, EVIDENCE, AND REASONING

Claims From the Study

Grouping students in homogeneous groups allows students to feel comfortable in their groups. According to survey data, students felt that group work is important in their future. Nonetheless, these realizations did not guarantee that the students enjoyed the class more or were more engaged in group activities if others were more similar to them as seen in Figure 5. The comparison group didn't find their groups necessarily alike to them. They also didn't have fixed groups. However, a higher number of the comparison class enjoyed labs and felt they increased the enjoyment of the class (Figure 7). The chemistry labs in the comparison class did not require trial and error which several physics lab required. This may have reduced the stress in the chemistry labs.

There was no clear answer to the sub question about not isolating students as a lone minority or gender in a group. During interviews, one minority student felt more comfortable with a group member that was more similar academically in their group rather than the other members that had similar ethnicity but were less driven. Another student who was the same gender as their group members, but a different ethnicity had been asked to be moved to another group at the beginning of the term. They stated that they did not feel included but did not mention ethnicity. From my observation, it was a very different personality- type issue, and they were successful in the new group.

The students in both the comparison (Figure 3) and treatment class felt that all of the group actively participated which would show engagement (Figure 2). However, since only a limited number of students answered the final survey, this is not definitive. The students that were interviewed didn't have any suggestions on how to improve the groups which could indicate that they were satisfied with the groups.

The homogenous groups did have an impact on individual students who in the past may have not been actively engaged in labs due to academic struggles. One lower achieving student when interviewed expressed that they were able to be an active part of a team and that wasn't always the case in previous lab classes. The students in homogenous groups were forced to actively participate and were able to complete the labs. This prevented lower achieving students from "piggy-backing" or relying on higher achieving students (Pinton, 2012).

Value of the Study and Consideration for Future Research

Although there was limited qualitative data from the study, there was value in the study. One student that was in a group with lower grade expectations stated while interviewed that they were able to participate in all the labs. When asked if that was not normally the case, the student said yes. Also, from my journal I had noted "The low expectations group is still doing well. They worked hard on the experiment but finished last again. It's difficult to not want to do too much for them." I praised them at the end of the class for their effort. It was reassuring that everyone can get the projects done. I was mindful that a teacher's interaction can have an impact in the performance of the students (Gilles & Khan, 2008). I purposefully allowed them extra time although all of the other groups finished lab before them and resisted offering too much assistance.

Future research could include comparing the students in different groupings on the same lab and comparing their behavior. Also, it would be interesting to observe two sections of the same class and same lab to determine if different patterns arise with a side-by-side comparison.

Implementing an oral assessment with groups at the end of the labs to determine if all students understood the lab results would be one way to provide more immediate feedback for the students and to assess if all students are active in the lab and discussions after. With class sizes approaching 30, it is difficult to observe all groups during the actual process so this may indicate group dynamic issues earlier.

One big challenge was the attendance of students. One group was a low interest in school in general and I put them together which was not effective. They often had only one or two individuals present so had to be temporarily rearranged.

Impact of Action Research on the Author

The biggest impact that the research had that is if students are allowed by their peers to work, they can be successful. With one teacher in a class, it is difficult to monitor enough to ensure all students are participating. The inspiration for the lab was a student whose engagement varied greatly depending on who they were working with for a lab. Top students will be successful with a variety of groups. Their intrinsic motivation is getting a good grade. However, with struggling students whose grades are not a high motivation simply being comfortable to explore and challenge themselves helps with trying in the class. Another take away that I have from the study is that I will consider student interest in choosing labs and intend to find ways to condense the lab reports for the students in one term physics. Most are not going into technical

fields and being able to articulate the main points without doing a long write-up should help with their enjoyment and engagement in the class.

REFERENCES CITED

- About - Standing rock*. (2022, February 22). Standing Rock. <https://www.standingrock.org/about/>
- Sabbott. (2016, February 18). *Student engagement definition*. The Glossary of Education Reform. <https://www.edglossary.org/student->
- Donovan, D. A., Connell, G. L., & Grunspan, D. Z. (2018). Student learning outcomes and attitudes using three methods of group formation in a nonmajors biology class. *CBE life sciences education*, 17(4), ar60. <https://doi.org/10.1187/cbe.17-12-0283>
- davenport-community-school-district/west-high-school-7583*. (n.d.). USNews. <https://www.usnews.com/education/best-high-schools/iowa/districts/davenport-community-school-district/west-high-school-7583>
- Gillies, R. M. & Khan, A. (2008). The effects of teacher discourse on students' discourse, problem-solving and reasoning during cooperative learning, *International Journal of Educational Research*, 47(6), 323-340.
- Hofmann, R. & Mercer .N. (2016). Teacher interventions in small group work in secondary mathematics and science lessons, *Language and Education*, 30(5), 400-416, 10.1080/09500782.2015.1125363
- Lawrenz, F., & Munch, T. W. (1984). The effect of grouping of laboratory students on selected educational outcomes. *Journal of Research in Science Teaching*, 21(7), 699-708. <https://doi.org/10.1002/tea.3660210704>
- Johnson, R. T., & Johnson, D. W. (1986). Cooperative learning in the science classroom. *Science And Children*, 24, 31-32
- Rosser, S. V. (1998) Group work in science, engineering, and mathematics: Consequences of ignoring gender and race, *College Teaching*, 46(3), 82-88. <https://doi.org/10.1080/87567559809596243>
- Springer, L., Stanne, M. E., & Donovan, S. S. (1999). Effects of small-group learning on undergraduates in science, mathematics, engineering, and technology: A Meta-Analysis. *Review of Educational Research*, 69(1), 21–51.
- Pinton, Y. (2012). The efficacy of homogeneous groups in enhancing individual learning. *Journal of Education and Practice*, 3(3). https://www.researchgate.net/publication/236177299_The_efficacy_of_homogeneous_groups_in_enhancing_individual_learning
- Iowa, S. O. (n.d.). *Department of Education - Iowa School Performance Profiles*. <https://www.iaschoolperformance.gov/ECP/StateDistrictSchool/DistrictSummary?k=8624&y=2023>

Kanika, C. S., Chakraborty, P., & Madan, M. (2022). Effect of different grouping arrangements on students' achievement and experience in collaborative learning environment. *Interactive Learning Environments*, 31(10), 6366–6378.
<https://doi.org/10.1080/10494820.2022.2036764>

APPENDICES

APPENDIX A

GROUPNG SURVEY

Survey for grouping students for treatment- give one of the first two days of third term

Header: Please answer the following questions. This is not graded and is voluntary.

1. It is important to me that my work group partners strive for a high grades
2. All group members should share equally in completing group assignments
3. I am social and believe the conversing with my work group is important.
4. I feel most comfortable with minimum side conversations and getting work done efficiently
5. I am willing to make suggestions and take suggestions
6. I feel that I won't be successful if I work with _____. Fill in one
classmate if absolutely necessary

These questions were answered at the beginning of the term and imported into a Google Sheet.

APPENDIX B

INSTITUTIONAL REVIEW BOARD EXEMPTION



audra Hawkinson <audrabh@gmail.com>

FW: IRB Protocol #2024-1106-EXEMPT APPROVED

<audra.hawkinson@ecat1.montana.edu>

Wed, Jan 17 at 2:56 PM

Reply-To: <NoReply@topazti.com>

To: <walter@montana.com>, <kelly.beiswanger@montana.edu>, <brenna.szott@montana.edu>, <audrabh@gmail.com>

 At 3:56 PM on Wednesday, January 17, 2024, NoReply@TOPAZTI.com wrote
 Hello Hawkinson, Audra,

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

PI: Hawkinson, Audra

Approval Date: 1/17/2024

Title: Studying the impact on engagement of similar students grouped together for labs

Protocol #: 2024-1106-EXEMPT

Review Type: Exemption

Expiration Date: 1/17/2029

Work described under this protocol may now commence. The PI is responsible for ensuring that the protocol accurately describes research practices being conducted.

- > Review Category designation determined by the IRB can be found in the final section of your protocol.
- > IRB-stamped active Consent Forms are attached within your protocol where applicable.
- > Any changes must be submitted via Amendment prior to implementation.
- > Per the Common Rule, research only requires Interim (annual) Review by the IRB if 1) it was reviewed via Full Committee or 2) is regulated by the FDA.
- > All research is subject to post approval monitoring.
- > All protocol types must be renewed 5 years after approval.
- > Inform the IRB once your research is complete so that the protocol may be inactivated.

Please contact your IRB Program Manager with any questions or if you are in need of assistance. Thank you for your diligence in the care of human subjects research participants.

Institutional Review Board for the Protection of Human Subjects | Office of Research Compliance | Montana State University

Access your protocol anytime at <https://montanaprod.topazti.net/Elements?emailLink=11%2c102%2c10990>.

APPENDIX C

QUESTIONNAIRE POST CLASS

This questionnaire is completely optional and will not impact your grade. Your name or identifying information won't be recorded.

LAB CLASS SURVEY

This is a print of a Google Form Survey

1. Working in groups for labs was enjoyable **Mark only one oval.*

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neither agree or disagree
- ☐ Agree
- ☐ Strongly Disagree

Please explain-

2. Working with my lab group helped me to learn the concepts **Mark only one oval.*

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neither agree or disagree
- ☐ Agree
- ☐ Strongly Disagree

3. My enjoyment of labs isn't influenced by my lab partners **Mark only one oval.*

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neither agree or disagree
- ☐ Agree
- ☐ Strongly Disagree

If you disagree or strongly disagree, please
explain_____

4. I felt like I did all or most of the work when completing labs **Mark only one oval.*

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neither agree or disagree
- ☐ Agree
- ☐ Strongly Disagree

5. My contribution for the labs mattered **Mark only one oval.*

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neither agree or disagree
- ☐ Agree
- ☐ Strongly Disagree

6. I could disagree with team members and not make anyone angry *Mark only one oval.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neither agree or disagree
- ☐ Agree
- ☐ Strongly Disagree

7. My lab group was supportive even if I made a mistake *Mark only one oval.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neither agree or disagree
- ☐ Agree
- ☐ Strongly Disagree

8. The labs made the class more fun *Mark only one oval.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neither agree or disagree
- ☐ Agree
- ☐ Strongly Disagree

Please give an
example_____

9. The lab made me feel like I accomplished something * *Mark only one oval.*

- ☐ Strongly disagree
☐ Disagree
☐ Neither agree or disagree
☐ Agree
☐ Strongly Disagree

The labs were stressful for me * *Mark only one oval.*

- ☐ Strongly disagree
☐ Disagree
☐ Neither agree or disagree
☐ Agree
☐ Strongly Disagree

10. Group work will prepare me for the future *

Mark only one oval.

- ☐ Strongly disagree
☐ Disagree
☐ Neither agree or disagree
☐ Agree
☐ Strongly Disagree

Please
explain _____

11. I enjoy working with different people **Mark only one oval.*

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neither agree or disagree
- ☐ Agree
- ☐ Strongly Disagree

12. My lab partners were similar to me *

Mark only one oval.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neither agree or disagree
- ☐ Agree
- ☐ Strongly Disagree

What was a similarity and difference?

APPENDIX D

STUDENT INTERVIEW QUESTIONS

Participation is voluntary, and you can choose to not answer any questions you do not want to answer and/or you can stop at any time. Participation or non-participation will not affect a student's grades or class standing in any way.: Proceeding with the interview indicates your consent to participate.

1. What is your opinion on school?
2. What is your thoughts on science class?
3. Did you enjoy working with your group this term? Why or why not?
4. Did you group make you feel like a valued member of the team? Why or why not?
5. Did the labs help your understanding of the scientific principles being taught?
6. How would you change the class or lab groups to make the class more enjoyable?
7. What was the most enjoyable lab that we did? Why?