TEAM WORK IN AN INTRODUCTORY ORGANIC AND

BIOCHEMISTRY CLASSROOM

by

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ABSTRACT

The goal of this research was to compare the results of students working in formal, structured groups, which I called teams, with other students in previous sections of the same class who did not work in teams. The students working in teams were surveyed to determine their level of comfort when working in groups as well as to determine the specific drawbacks and benefits of group work from past experiences. Next students scheduled time outside of the class to work as a team and these teams stayed the same throughout the semester with a few exceptions. I completed a checklist of desired behaviors during each of the lab sessions of the class as well as during group work exercises. I did this to gather specific information on student behavior during formal class time as well as informal, non-required meeting times. I interviewed students upon completion of the treatment to summarize their thoughts and feelings. The survey was administered again the end of the semester to determine if student perceptions and behaviors concerning group work changed. Finally, assessment scores were compared to determine if there were gains in student retention of course material between students in the class this semester versus students in previous sections of the class. There were two main differences between the two groups of students. The students working in teams worked through more material than the previous group of students. The students working in teams were also much more willing to rely on their peers as opposed to coming to the instructor for help.

INTRODUCTION AND BACKGROUND

Community and School Demographics

Chief Dull Knife College (CDKC) is located on the Northern Cheyenne Indian Reservation. The reservation is approximately 44 miles long and 23 miles wide. The land surrounding the reservation is used primarily for ranching and coal mining. The reservation population lives within five districts including Lame Deer, Busby, Ashland, Birney and Muddy Creek. The largest of these is Lame Deer district where the college is located. The college has one main building that houses administration, faculty offices, a cafeteria, a bookstore and sufficient classrooms to serve 300 students (Chief Dull Knife College).

Lame Deer, Montana is a poor community. According to the US Census Bureau, 43.1% of the individuals are below poverty level and only 76% of children graduate from high school (US Census Department, 2014). According to Census Viewer, the ratio of males to females is almost even with 1,016 females and 1,036 males in 2010 (Census Viewer, 2012). Still another website, Cheyenne Children Services, reports even more drastic numbers. According to this group, the average per capita income was $4,970 per year with a 78% unemployment rate with 87% of the population living below the poverty line in 2010. The average life expectancy on the reservation is only 57 years old and 63% of the population of the reservation is between 0 and 18 years old with only 3.1% over 65 years old (Wolf, 2016). No matter which source you look at, life on the reservation is difficult at best. Working at Chief Dull Knife College has given me a new

perspective on what it means for students to have a team of people they can depend on to complete their education.

Chief Dull Knife College offers two specific degrees including a two year Associate of Arts degree, and a two year Associate of Science degree. Both of these are in general studies. We also offer a certificate program in Office Skills as well as an Applied Associate of Science degree in Business Management and Administrative Assistance (Chief Dull Knife College). Surprisingly our student body consists of 38% male and 62% female (US News and World Report, 2016). Most faculty members attribute this statistic to the high number of single young mothers trying to better their lives to take care of their children. On the down side, it is normal for up to 80% of our graduates to end their educational career at our school and never move on to another college to earn a bachelor's degree. One of my long term goals is to teach these young people that they *can* be successful in their education. They need to start looking at their peers, the people in the same situation as themselves, as their allies and support to finish their degrees.

During my action research, there were a total of 102 full time Native American students enrolled as full time students, and 13 non Native American full time students. In addition, there were a 95 Native American and 34 non-Native American students signed up as part time students. Of these students, 39% were male and 61% were female (Registrar, CDKC, 2016).

The Research Topic

This year marked the beginning of my sixteenth year of teaching. Over those years I learned many things about working with students, my peers, the administration and families of my students. One thing that has been constant is that I can only *really* influence what is going on in my space, and when the students are with me. Let me elaborate a little on that topic.

My teaching career started in high school math and chemistry classrooms. During faculty and district wide meetings, many of the conversations were focused on state and federally mandated testing, how it was impossible to meet those standards, what the parents should be doing at home and how district wide discipline policies of students should change to improve student test scores. Other teachers complained about the academic level of the students in their classes, and the fact that they should not be expected to have the same outcome as teachers with higher achieving students. Rarely did teachers comment on how pleased they were about the achievement in their classrooms.

Now that I am teaching at the college level, I am seeing the after effects of teacher attitudes that linger from high school. Students who enroll in Chief Dull Knife College generally enroll with placement scores between third and fifth grade math and reading levels. In addition, these students have poor attendance records and most of them have not completed the necessary pre-requisites to be successful in the classes they are taking at Chief Dull Knife College.

With all of this in mind I decided I would focus on what I could do effectively and efficiently in my classroom. I only have fifteen weeks to change the mindset and

study habits of my students. My ultimate goal was to teach them to be more self-sufficient and to become their own advocates. One of the best ways to do this is by working with people who are in the same life situations as you, and to gain the courage to ask questions when necessary. I wanted the students to walk away from the class with a sense of community as well as a solid knowledge of the course content. If I set up a treatment where students rely more on their classmates and less on the faculty to answer difficult questions and to follow through on challenging tasks, maybe I could set the students up for a lifetime of success, not just graduation. The students could build relationships and support that was meaningful enough to last outside of the classroom. Students may also gain the self-confidence necessary to be successful outside of CDKC.

<div align="center">Focus Questions</div>

In addressing the aforementioned issues, I decided the best tactic would be students working in groups or teams. If I could teach the students how to rely on each other and be accountable to each other, they would have more of a commitment to the day to day tasks and classroom activities. Being accountable on a personal level would encourage better work habits and deeper content knowledge and retention. My research questions were built around these ideas.

The major research question was, "How does team and group work elicit a sense of community among students?" There were four sub-questions: 1) "How does self-confidence improve as a result of working in a group?" 2) "Do students perform better on assessments as a result of team work and group exercise?" 3) "How will working in groups solidify concepts for complete understanding and retention of material?" 4) How

do students feel about moving forward in their education as a result of working in groups?" I measured each of these questions using specific techniques that are outlined in the section titled "Methodology".

Support Team

The questions that I decided to work with were derived not only by me but by peers in the MSSE program, family members, fellow faculty, and my administration. My classmates helped me refine my questions to make them more "answerable" and "measurable". For example, my original focus question lacked the word "how" so it read, "Does team and group work elicit a sense of community among students?" and I altered it to the current form of, "How does team and group work elicit a sense of community among students?"

My administration was helpful in offering me extra time to work on my research by lowering my teaching load. They also checked in with me frequently to find out about my progress with the project. Without this support, I don't know how I would find the time to complete the project effectively. In fact, I wondered how K-12 teachers were going to do it!

My specific support team included my husband Jesse who listened to me talk about the interventions and offered suggestions based on what he has learned in the business world. He also suggested that I keep better demographic information on each of the students such as age and where they went to high school. Brian Stiff is a colleague who teaches the biological science courses at the college and was supportive by encouraging his students to spend time working in groups. John Tuthill, the Dean of

Academic Affairs suggested that I check in with him throughout the semester to report my progress and ask to ask him for help when necessary. Irene Grimberg from Montana State University agreed to be my science reader, and I will have additional people at my institution read sections of my work as I complete it.

CONCEPTUAL FRAMEWORK

Previous Studies

Earlier in the MSSE program, I was required to complete a literature review assignment. It was intimidating, difficult and overwhelming at the time. Now I see how beneficial it was. I feel much more comfortable looking at the work of "experts" and relying on their experience to help build my own project. Now, of course, I am glad for the required assignment.

One of the most informative articles that I read dealt with preparing students for group work by setting up a one day experience where common student concerns were addressed (Kapp, 2009). This article described a process an instructor implemented before students were to begin working in teams or small groups. The author discussed the frustrations of both teachers and students when working in groups and decided he would address them during the first hour of the class for a semester by having a team building work session before the students began their work.

This session would address the two most common problems in group learning situations, when one group member takes the project over entirely, called "hijacking" or when there is a student who contributes nothing, the "free rider" (Kapp, 2009).

Next, the intervention is explained in detail. It starts with students physically lining themselves up on a continuum according to their binary (2 options) responses to a series of questions like, "Does following a schedule appeal to you?" (Kapp, 2009). Every once in a while the instructor would explain the advantages of having individuals with different skills and experiences in the project teams.

After the students completed this exercise, they were randomly placed in groups where they had discussions based on positive and negative experiences with group work.

The final step of this intervention was for student groups to write a contract. The contracts "consisted of five to seven objective, measurable, individual behaviors that the team members agreed were important to team performance and to which they were willing to commit themselves" (Kapp, 2009, p. 141). The instructor kept the original copy of the contract and each student received a copy. In addition, students evaluated each other frequently throughout the semester to make sure frustrations and concerns were addressed periodically.

Another study that was beneficial to my research focused on students working in "teams" as opposed to groups. A group is a collection of people working on project but often as individuals rather than together as a unit. Calling the collection of people a team creates an understanding that the goal is common and without input from everyone the project would not be complete. A simple word change made the process more inclusive and meaningful for the students (Sweet & Michaelson, 2007).

Based on their research, Sweet and Michaelson drafted a description of the drawbacks of new working groups versus well established working groups. First, in

well-established groups there is a sense of trust and attention by individual group members. Second, students identify themselves as being part of a "team" rather than being "in a group. Students prefer being team-mates as opposed to a group-member. It creates a heightened sense of membership. Third, members' perceptions based on stereotypes dissolve after they spend quality time together. Fourth, communication in newly formed groups is focused on socializing rather than task oriented. The longer the group/team has been working together, the more focused and organized they become. Fifth, there is a greater deal of learning happening when members feel free to disagree with group members concerning the focus of the project. New team members are more hesitant to voice their opinions and thoughts, which limit the discussions to the members willing to talk. Finally the openness of the discussions increases and the difficulty of tasks decreases because the group has progressed and is embedded in the "work" stage of the process. In summary, rather than switching these groups around throughout the term, it is best to establish the groups and leave them the same throughout the semester.

When I was working through these reviews I rarely came across an article that opposed the general idea of group work. One article in opposition explained that group work was only successful if it was used to reinforce, not introduce, major concepts and ideas. It was also necessary for students to be engaged enough to stay on topic and focused without teacher intervention (Bennett, 2015). Bennett goes on to talk about how he felt like he was "failing his students" because he was not incorporating group work in every one of his lessons. His professional evaluations were marked low by his supervisors, his peers looked down on him (or so he felt) and his students were missing

out because of the lack of group work exercises. He says that though students sit together and have conversations, they did not actually do any learning (Bennett, 2015). I had to keep these reports in mind when I designed my approach. While group work is highly regarded by educational professionals, if not done right or without frequent evaluation, it can be detrimental to the students and instructor alike. I had to take the time to set the experiences up in a way that the students felt they had support and at the same time could ask me for direction.

Next I wanted to make sure that I could intercede when necessary without taking over the entire work session. For example in their report on the effectiveness of teacher intervention Hoffman and Mercer state, "…there is little doubt that if teachers simply leave groups to struggle a lot of educational time will simply be wasted" (Mercer, 2015, p. 2). With this in mind, I planned to set up recitation times outside of regular classroom time so students would not be left completely on their own when it came to working in groups. I did not plant myself in the room with them for the entire hour but I would be available to the groups and would make frequent trips in to the meeting rooms. The same study also stated that "continual teacher intervention or the mere presence of the instructor during group work exercise tends to focus more on the students with the correct answers and those procedures rather than on the dynamics of the group as a whole" (Mercer, 2015, p. 3). This further supported my plan of student groups meeting outside of the classroom and without direct contact with the instructor. After-all the goal was to facilitate student relationships that would last beyond this class.

I wanted to know the best way to assess students during the group work process. I found one particular idea fascinating. In this method, students read the required material from the text book, took a test individually, and then took the same test as a group. The group test had answers on "scratch ticket" so the students had to commit to a specific answer (Hrynchak & Batty, 2012). As the instructor, I would only have to teach the topics that the students did not fully understand. While this idea is exciting and progressive, I am hesitant to go this far in my first iteration of this process. I will modify this by slowly integrating group test items in to the regular assessments. I didn't feel it was fair to throw the students in to the deep end without some background work. I also had to keep in mind the educational background of my students and their minimal reading levels. A completely flipped classroom may be appropriate in the future, but I will have to work in to it at a gentle and reasonable pace.

The last study I looked at involved the process of assessing college level students in an Industrial Technology program at Western Illinois University. The study consisted of 48 students. All students were present for the lecture. Then they were separated in two specific groups. In one group individual learners had to work on their own and in the second group students got to work together. The collaborative groups were allowed to self-select their group of four students. Both groups were given the same worksheets to complete in 30 minutes. The individual learners were given solutions to the worksheet so they could clarify any misunderstandings they had. The collaborative groups had to stick with their solutions without the aid of the solutions. After the allotted time of 30 minutes, both groups took a posttest to assess their understanding and retention of course content.

The collaborative group received half of their points from their group work and the other half from the posttest. The individual group received all of their points from the posttest. When analyzing the results, the students working in the collaborative group scored significantly higher on the critically thinking questions and the scores for the basic skills questions were essentially the same (Gokhale, 1995). Studies like this one make it clear that collaboration between students with common goals makes a huge impact on student success and performance.

METHODOLOGY

Class Selection

Pooling all of the information gleaned from the research of other professionals, I was able to develop a treatment plan that would be appropriate for my teaching environment. I took parts of all of these studies and applied a treatment to my Introduction to Organic and Biochemistry class. I chose this class because I had the students in prior sections of Introduction to General Chemistry and they are familiar with me and with each other. I am also very comfortable with the material and the delivery of the information.

Classroom Demographics

The majority of the students at Chief Dull Knife College are females. There is no exception to that rule in this class. I started the semester with thirteen females and four males. At the conclusion of the study I was down to five females and two males. The high rate of attrition in this class is not uncommon at CDKC. Students are enrolled without completing the prerequisites, students have too many classes, students quit

because they need to get jobs to support the family, students lose daycare, and students

cannot physically get to school due to the lack of transportation. One student said, "It is

about 12 miles to school and when it's cold out I just can't walk that far." The ladies who

completed the class ranged in age from 36 to 19 years old. Both of the males who

completed the class were 19. Four of the females are moms and the two young men are

childless. Both of the young men were accepted to research internships at Montana State

University Bozeman for the summer.

<div align="center">Treatment and Changes Implemented in the Classroom</div>

The treatment for this project was done in four specific phases as described

below. I followed these phases based on the recommendations of my peers as well as the

articles that I previously discussed. Each of the steps is explained in the following

sections.

<div align="center">Phase One</div>

Phase one was used to gauge how the students felt about working in groups. To

do this I administered a Likert-type survey during the first day of class. The original

survey is included in Appendix A and the raw data of the survey are included in

Appendix B. To get a better understanding of the actual information from the survey I

put together graphical representations and they are included in Appendix C and D.

Appendix C is what I considered negative feelings and perceptions of group work, and

Appendix D is positive responses feelings and attitudes toward group work. After I tallied

and analyzed the results, I was ready to move on to the next phase and address the

common frustrations and positive points about group work.

After I administered the survey the first time I immediately realized that I needed to add some open ended questions to get a better idea about *why* students felt the way they did about group work. The amended survey was administered one more time during the semester. The amended survey is presented in Appendix E. The raw data for the responses for the survey is included in Appendix F. Appendix G is a comparison of the surveys that were completed by the students.

Phase Two

The second phase happened during the second regular day of class. First I wrote the words "strongly agree", "neutral" and "strongly disagree" on the board. I read statements to students and they had to stand by the word that best described the way they felt about each of the statements. The statements were common frustrations students have when working in a group.

After each statement was read and the students placed themselves along the spectrum I explained how there were very simple methods we could use to alleviate the concerns they had about group work. I also explained how beneficial it is to have different types of people on the team so they can do the tasks that others don't want to do. I have included the statements and student responses in Appendix H.

Phase Three

Phase three involved the students setting up meeting times outside of the classroom. I handed out a schedule of my available times so that when they met for the first few times I would be available to answer any questions they were having. I included the sign-up sheets in Appendix I. This phase lasted for the remainder of the semester.

Phase Four

Phase four is putting the students to work! I created a checklist for the desired actions and used it during days that I did not lecture. I made observations during the lab exercises as well as when the students were working in their groups. The checklist I used during these observations is included in Appendix J. This phase also lasted the entire semester.

All Phases

A reflexive journal is a tool used to record pertinent information as well as a reflection on those comments to improve teaching strategies. Entries were made on a regular basis or as is necessary. The entries can be reflections on student behaviors or reactions to lessons, instructor comments on the effectiveness of a lesson, common misperceptions students have about a topic etc. In general, it is a journal to correct what is wrong and reinforce what is going well in the classroom.

I kept a reflexive journal during the entire study. I was able to record student comments and concerns immediately following an event. I recorded not only what was happening in the class, but why I found it valuable. I also kept track of what I was doing that was distracting or even frustrating for the students. It will be useful in future sections of Introduction to Organic and Biochemistry as well as the other classes I teach. In addition, I wrote on every one of the student labs about what was working, what needed to be changed and which labs I should eliminate.

Timeline

In the beginning I thought I would be able to apply the treatment the entire semester. I had to stop collecting data for my study at the end of March which meant I had eleven weeks of data to organize and analyze. The survey was administered once at the beginning of the semester, and once at the end of the semester. Observations were done five times in the lab setting and five times during group work sessions. Assessments were done on a chapter by chapter basis, all together the students got through eleven chapters. I continued the treatment for the remainder of the semester but could not include all of the data in this report.

Instrumentation

I used a variety of instruments to measure the results I was getting during this intervention. Table 1 below includes the research questions I addressed, the measurement instrument I used and the method used to measure each one of the variables. I chose the specific measurement tools based on the work done in the conceptual framework stage of the study.

Table 1
Data Triangulation Matrix

Research Questions	Data Gathering Techniques				
	Likert Scales	Observations	Reflexive Journaling	Summative	Formative Assessment
How can I foster working relationships between students by requiring more team-work projects in to the science class?	X	X			

How does team and group work elicit a sense of community among students that carries over to other classes and experiences?		X	X		
How does self-confidence improve as a result of working in a group?	X				X
Do students perform better on assessments as a result of team and group work exercises?	X			X	X
How will working in groups and teams solidify concepts for complete understanding and retention?		X		X	X
Does test anxiety decrease while performance on assessments increase as a result of team and group-work	X			X	X
How do students feel more confident in moving forward in their education as a result of working in teams and groups?			X		

Validity

Assuring both validity and reliability in my instruments was not as difficult as I thought it would be when I was designing my project. Validity is the measure of the soundness of the research. Did the measurement tool I used actually measure what it was supposed to measure? Did I make sure that the data I collected was unbiased? Did the instrument reflect the meaningfulness of the data I was trying to collect?

I helped to insure validity in my research by administering the Likert-type survey twice and had the students complete it while I was not in the room. I had the students put their surveys in a large manila envelope so they would remain anonymous. I was not familiar with student handwriting so the surveys were truly anonymous! Observations were done in the classroom, in the laboratory and in study groups outside of the normal learning environment. Although students were aware that I would be making observations I did it in a way that the students were not aware of when I was doing it. I did not want students to alter their behaviors or contributions because of my observations.

Reflexive journaling was done on a weekly basis at the minimum, and more when student comments and input warranted. Most of the comments I recorded were unsolicited to and were said with candor when students felt they needed to make me aware of something. Many of my journal entries were in reference to what I would do next time I taught the same topic. Validity was ensured in my reflexive journal by reading the passages later and asking myself if the content was relevant to my research. Several times I had to move the comments to an alternate journal which I now keep as a general teaching journal.

I was able to grade summative assessments when the students handed in their formal lab notebooks. I was concerned that the students were not connecting the course content and the major concepts to the lab exercises. The lab write ups included a conclusion that connected course content to the lab exercises, and in their writing I could see if my observations of the labs were valid. Students were given a notebook grading rubric ahead of times so they knew exactly what they needed to include in their notebooks. The challenging part of the lab write-up, from the students' point of view, was writing a coherent, comprehensive summary of the work they did and connecting the lab work with the course content. A copy of the grading rubric for the labs is included in Appendix K.

Grading and assuring validity of the formative assessments was more difficult than I anticipated because of the group work portion of the test. For example, one of my students said, "I don't want my grade to be controlled or affected by what you are doing for your study. It scares me to think about relying on other students for your project." I

had to honor this statement and told the students I would make alterations as necessary if they thought the tests were unfair in any way. I also reminded the students that they were not required to participate in any part of my study and if they preferred they could take individual tests instead of working together.

<div align="center">Reliability</div>

Reliability is the whether I would get the same results if I measured the same things again. Did I make sure that the formative tests were scored accurately? When I was filling out my observation checklist, was I taking my time and getting an accurate view of what was happening in the classroom? Did the students alter their behavior because I was making my observations? Did student contributions to the group change because of my observations or was there an authentic alteration in what the students were doing on a daily basis?

Like validity, I had to answer these questions I was applying the treatment to the students in my class. To help ensure reliability when analyzing the Likert-type surveys, I asked the same question is many different ways. My original plan had me changing the survey to address the concerns of the students but after the group work began, the issues were taken care of by the students without my intervention. This meant that I was able to keep the survey questions similar during both iterations.

Reliability concerning the observations was assured by repeating the process several times and in several settings. I watched the students and let them work and discretely made observations in the lab and in group settings outside of the classroom. Each time that I made the observations I watched each student, looking for the desired

behavior. The student had to display the specific behavior a minimum of three times before it was recorded as a positive event.

Reliability in both the summative and formative assessments was easier to gauge than the other instruments. Because I used a rubric to grade the lab notebooks and the summary written after each lab exercise, the scoring system remained the same throughout the treatment. The formative assessment, a traditional exam after each chapter, was corrected on a right or wrong basis with limited room for subjective answers. These two assessment methods made it simple to assure reliability and consistency in the assessment process.

An exemption to the Institutional Review Board (IRB) process was received from Montana State University's Institutional Review Board and compliance for working with human subjects was maintained. The IRB exemption is included in Appendix L.

DATA AND ANALYSIS

Group Work Continuum

The group work continuum was fascinating to observe. The students were actually eager to start answering the questions and lining up at the board. So many of them not only want to work with a group, but they are ready and willing to help the students that have less confidence and drive. I started making the statements and students were to stand at the "strongly agree", the "neutral" or the "strongly disagree" labels written on the board. They wanted to stand somewhere between the "neutral" end and the "strong" high and low ends of the spectrum. I explained that it was important that we keep the answers simple but the students were insistent. "I don't feel like I am being honest in my answer.

I don't *strongly* disagree, I just disagree". To address this concern, I added the words

"agree" and "disagree" to the continuum written on the board and started the question

session over. Rather than having three choices for a response, the students now had five

choices for their response.

At first I was upset and unsettled by the insistence by my students. How was I

going to apply my treatment if I was running in to road blocks starting the first week?

Then I remember the *purpose* of this research is to help the students advocate for

themselves. Viola! That is exactly what was happening! After thinking about it I was

pleasantly surprised that so many of the students came forward and addressed their

concerns this early in the process!

The exercise lasted fifteen minutes. During the process, I kept explaining how

each one of these statements, whether you agreed or disagreed with them, led to the

attributes that build a strong team. I also kept track of where students stood along the

continuum so I could remind them what strengths each one had when they began working

in their groups. Table 2 shows where students lined up along the continuum followed by

the statements that were made during the exercise.

Table 2
Group Work Continuum (*N*=11)

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I am a very scheduled person and I need tasks to be completed on time	2	3	5	0	1
I have a difficult time making schedules but like to follow one	1	2	5	2	1

I like to be in charge of a group because I am good at delegating tasks	1	4	3	3	0
I like to be a worker and have someone else tell me what to do	2	2	5	0	2
I am intimidated by the intelligence of the group	2	1	4	4	0
The thought of working in a group makes me very nervous and anxious	2	0	3	2	4
I resent it when teachers force me to work in a group	1	1	2	3	4
There are always group members who refuse to contribute	2	0	5	3	1
There is always a group member who takes over the whole task	2	5	2	0	2
If one person in the group is "free-riding", everyone stops working	1	0	1	4	5

Two of the students had a lot to add during this exercise. I kept track of their statements and these are just a few:

"I am good at knowing what people need to do but I feel like I don't like telling them what to do because I feel like I am being mean."

"I don't mind working in a group. It just sucks when the teacher picks the group."

"I don't know if people refuse to contribute or not but I am going to get the work done. I am in this class to learn and I will do whatever it takes to get there."

"I feel like all of the people in this class will work really well together so I am okay with the group work."

A couple of the students stayed in the classroom when the class ended because they wanted to clarify their responses. One student said, "I would not have answered the way I did if I was in a different class. It is because of these specific students that I feel confident in working in a group." Another student said, "I am really excited to do this. All of the students in here are smart and it will be fun to get to know them better." I was surprised by these candid comments because I did not think these students felt that way about each other.

On the other hand, during this session, two of the students stood back and really hesitated when responding to the group work continuum statements. When I questioned them about this they looked at each other, giggled and didn't really respond. I did not want them to feel uncomfortable so I let it go. They did start taking the exercise more seriously after I spoke to them. By the time the semester ended, both of these students had dropped the class along with a two other students. One of the students completely withdrew from school because she got a job. The other student wanted to focus on a Cell Biology class, and did not think she had enough time for both classes. Neither indicated that their decision had anything to do with this intervention.

One of the most amazing aspects of this exercise was the perceptions of individual students compared to the whole group. For example, the two ladies who dropped the course before midterms did not even consider working with others. In my opinion and based on the results of the students who did work together, they could have been successful and found the support they needed to finish the course if they would have kept open minds. Everyone else was excited and ready to work with everyone else. Other

students were more than enthusiastic about starting the whole process and they ended up

being the most successful!

Because so many students dropped the course while I was still collecting data, I

removed the dropped students from the continuum and looked at the numbers one more

time. These numbers are displayed in Table 3 below. Removing the people from this

data who did not complete the course made it clearer that the students who were willing

to collaborate with their peers had an advantage in learning the material from the

beginning.

Table 3
Amended Group Work Continuum (*N*=7)

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I am a very scheduled person and I need tasks to be completed on time	2	3	2	0	0
I have a difficult time making schedules but like to follow one	0	0	4	2	1
I like to be in charge of a group because I am good at delegating tasks	1	3	2	1	0
I like to be a worker and have someone else tell me what to do	0	0	5	0	2
I am intimidated by the intelligence of the group	0	0	3	4	0
The thought of working in a group makes me very nervous and anxious	0	0	2	1	4
I resent it when teachers force me to work in a group	0	0	0	3	4
There are always group members who refuse to contribute	0	0	3	3	1
There is always a group member who takes over the whole task	0	4	1	0	2
If one person in the group is "free-riding", everyone stops working	0	0	1	2	4

As a general rule, the students that made it to the end of the semester were the

same students that spoke up during the initial exercises involving group work. They were

already committed to the class and the team dynamic appeared to be pleasant "add-on" to what they already expected from the curriculum. When I would talk to the successful students in informal settings, they would talk about their frustrations with non-participants. Comments like, "I called her over and over this weekend and she always had an excuse why she couldn't come work" or "I can't keep spending the time trying to get them caught up. I don't mind helping but I can't teach them all of the material from the beginning." One of the students was coming to the lab every Thursday, setting up the labs and offering to help get labs made up. He was doing this to encourage the non-participants to work in a less intense environment. Never, not even ONE time, did the students he offered come in and take the help.

When I reflected on this phenomenon and discussed it with other teachers, I thought that *maybe* the group work forced the students out of the classroom sooner than they normally would have left. When I checked on the progress of the unsuccessful students in other classes, I found the same results. Teachers were giving them chances to make up the course work, tutors were arranged, instructors stayed after hours, students were left to their own devices and STILL the same students either failed or dropped their classes.

<u>The Likert-type Survey</u>

The first data I collected and analyzed was the Likert Surveys. First I tallied the score for each of questions and then I graphed them. I also asked the same question in a variety of ways to determine the validity of the survey questions. The raw data collected is displayed in Appendix B. Figure 1 below is an example of the charts displaying

student responses to survey questions. All of the charted survey results are in Appendices

C and D. Appendix C is a display of negative survey responses and appendix D is a

display of positive survey responses. The sample number for this survey was 8 even

though only 7 students completed the study. I was not able to eliminate the survey of the

student who did not complete the survey because they were done anonymously.

Figure 1. Sample of survey charts, (*N*=8).

<u>Some Surprises from the Survey</u>

I was actually very surprised the results of the first survey. Overall, students liked

working in groups and were not discouraged by the idea. It has been my experience as a

teacher that frustration comes in when somebody is not holding up their end of the

bargain! For example, one student said, "Why wouldn't we want to work with our

friends?" and another said, "If I get the chance to help someone else, I love it." I

expected students to grunt and groan and complain about working together. Because of

their attitudes, it was much easier to set the stage for my research study.

After working together for several weeks, I administered the survey to the students who remained in the class. Appendix F has the raw data as well as the graphs that describe this data. I was quite surprised by the results of the second survey. Before the class began a majority of the students seemed eager to work in groups. They had positive experiences in the past as long as the decision over the groups was up to the students. When I collected the second survey, the responses were much different. Figure 2 below compares responses from one question on the survey. Because 8 students participated in the first survey and only 7 participated in the second survey, I compared percentages of responses rather than number of student responses.

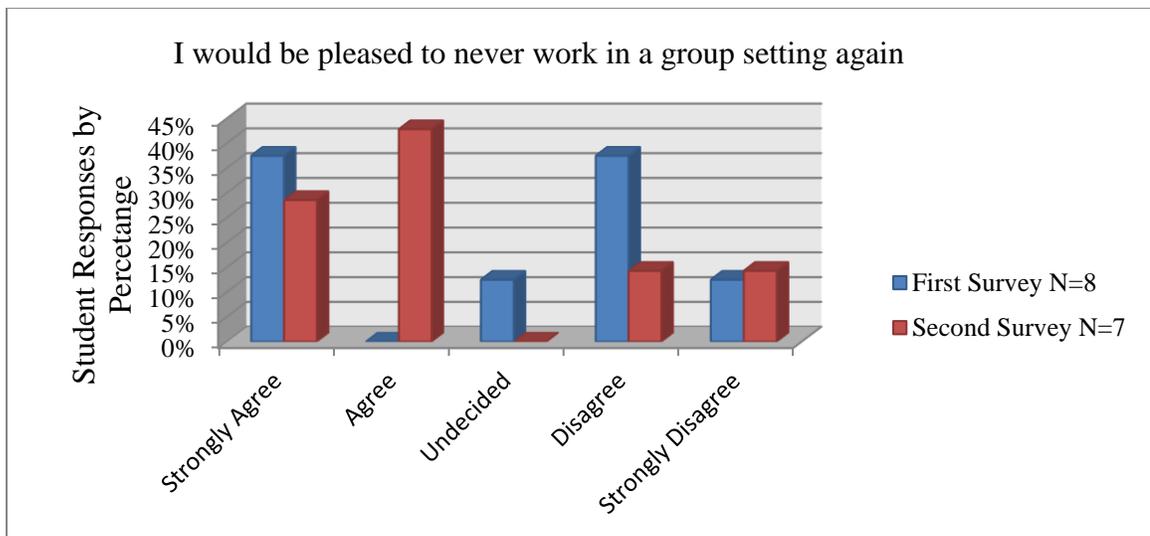*Figure 2.* Comparison of responses to first survey and second survey, (*N*=7).

As you can see in Figure 2, student perceptions about the group changed as the semester moved on. Though the students' grades, participation and attendance were improving, their frustrations with classmates were also climbing! One student wrote, "Sometimes I would have to do all of the work while my *partner* was on her cell phone."

Another student commented, "(I want to) find people that are determined to take advantage to help each other succeed."

The survey responses again surprised me. While students were more positively engaged and on task during class time and during lab exercises, they struggled with the work ethics of other students. Some suggested a set work time that was on the syllabus and having it be a formally, graded scheduled time. Others said they do not want to be around some specific group members ever again.

I took a couple of moments and visited with some of the students about what was going on in terms of group dynamics. One student who were struggling and quickly falling behind came to visit with me about his grade. He knew that he needed to get to class more often and that he would so that he could pass. I asked him if he wanted to work with anyone else in the class and his reply was, "I did not come to school to be "mothered" by those two." His perception was that these two ladies spent more time giving advice about life and less time working on homework as the semester progressed. This was the same student that set up times to do make up labs and never showed up. The student offering to help him was not one of the "mothering" students. It made me wonder about what I expected to hear.

Sometimes I think we ask questions of our students that are not answerable. For example when I ask a student why they didn't come to class for the test they say things like "I didn't understand the homework" or "I forgot about the test." What they really might mean is, "I don't care, I don't want to be here and this class is stupid and I wish I had never signed up for it." I am going to include these types of responses in the surveys

I give students in the future. Maybe resistance to working in a group is really resistance to being in the class altogether! Either way, they learned a lot about being a part of a team and relying on each other.

<u>Observation Checklist and Summative Assessments</u>

I used the checklist during five labs exercise until I was done gathering data. I also used the checklist to observe students when they were working in their groups. This was done over the same time period. I did not observe *every* group work session because I wanted the students to work organically without worrying about what I was writing down. In addition, the students met several times throughout the week and many of these meetings happened while I was teaching other classes and in areas where I did not have access to them. The students met in their groups a total of 32 times during the study and I made five observations during the group work sessions.

As the semester moved on and students were dropping the course, I noticed that the students who actively engaged in group work outside of the classroom were the students that contributed the most to lab exercises. They were not afraid to ask each other questions and they even avoided asking me any questions. In contrast, the students who resisted working with each other in the classroom or in study groups and independently were the least likely to stay on task and the least prepared when coming to the lab.

Table 4 below shows a completed checklist of the observations I made when students were completing a lab on the properties of hydrocarbons. Students F, I, J and K all dropped the course by the middle of April.

Table 4
Observation during Lab Exercise (*N*=11)

Properties of Hydrocarbons 1-20-2016 Student Name	Student K	Student F	Student C	Student A	Student G	Student H	Student D	Student E	Student I	Student J	Student K
Student is talking with group members	1	1	1	1	1	1	1	1	1	1	1
Student understands the goal of the project	1	0	1	1	1	1	1	1		0	0
Student is contributing to the group	1	0	1	1	1	1	1	1	0	1	0
Student stayed on topic	1	1	1	1	1	1	1	1	0	1	0
Student was assigned individual roles in the project	1	0	1	1	1	1	1	1	0	1	0
Student came back to class with their portion of project complete	1	1	1	1	1	1	1	1	1	1	0
Student met with group outside of class	1	0	1	1	1	1	1	1	0	0	0
Student discussed test questions with group											
Student works on homework with group	1	1	1	1	1	1	0	1	0	1	0
Student readily begins working upon entering the classroom	1	0	1	1	1	1	1	1	0	1	0
Student asks questions relevant to the project	1	0	1	1	1	1	1	1	1	1	1
Student correlates course content with project	1	0	1	1	1	1	1	1	0	0	0
Total Points	11	4	11	11	11	11	10	11	3	8	2
Percentage On-Task Behavior	100%	36%	100%	100%	100%	100%	91%	100%	27%	73%	18%

I thought it was important to understand what was going on during these exercises in a visual manner. Figure 3 is a graphical representation that compares the contribution- or percentage on-task- to the lab exercises by student.

Figure 3. Student contributions to the group during lab exercises, (*N*=11).

Of the eleven students that were present during this observation, only seven were present and participating in the group study sessions outside of the classroom. The students with the lowest scores on the observation checklist were the ones not participating in the study groups. It made sense to me because the students working together outside the class compared notes, looked at figures, and made sure their labs were completely prepared before they came to class. In fact, one student said, "I wish it

was mandatory to have the pre-lab work done before we come to class because it takes way too much time to get the other students caught up." I asked why she said this and she explained "We work really hard to be ready and we don't mind helping each other but when someone comes in and expects to jump in to a group it makes us angry. They know where we are and they could come and work with us. We are not going to carry them through this class."

Based on these comments, I made a decision and told the students that they would not have any time to work on the pre-lab write up at the beginning of the lab. If they were not prepared with the pre-lab write up when they came in, they should not come in at all. In addition, I explained that they were only allowed to have their lab notebooks during the procedure. This would ensure that they had a complete and comprehensive lab procedure prepared ahead of time. When they got to class, they *must* be ready to work. This alleviated the frustrations of the "groupie" students.

The lab observations proved to be way more complicated than I had anticipated. As you can see from the checklist in Appendix J as well as Table 4 on page 25, there was a LOT of behaviors to observe. In addition, I had to make sure I followed up with students to find out if they completed their portion of the work, if they met outside of class, and if students talked about the questions relevant to test material. Over the course of the treatment, I was able to make several observations and watched a trend in student performance.

The participation of students F, G, I and J dropped off dramatically the last two weeks of my study. Because we are required to drop those students who have not made

an appearance in fourteen calendar days, I had to drop all four of them. This had a significant impact on my research because I ended up with a group of seven students as opposed to a group of eleven.

Another side note. Student B was pregnant at the beginning of the semester and informed me that she would be having her baby sometime in February. She did in fact leave to have her little boy and did not plan on coming back. The students she worked with outside class became concerned and started to call her. Eventually she came back and told me that it was her classmates who convinced her to come back to class. She said, "I didn't know that people actually depended on me and thought I was smart. I was going to just quit and be a mom but it turns out I like school and I want to come back." Another student heard this exchange and said, "I will come in to school whenever you need and help you get caught up. You are really smart and we like having you around. We can find someone to watch baby while we are working. Don't give up on us." It was amazing to watch! It looks like the group work outside of class is making a much bigger impact than I thought!

As this process played out in front of me, I had to make some personal observations. One of them is my tendency to intervene and save students who don't need saving. If I had jumped in and made contact with this student before giving her teammates a chance to do their magic, I may have completely botched the whole thing!! I was prepared to set up a home-school type environment, have her watch YouTube videos over relevant topics and let her stay home. Her PEERS got her back, not the love of the subject, the comfort in the classroom or her desire to learn. Even though I lost several

students throughout the semester, the ones who completed the class did it with the help and encouragement of their buddies! Hooray!

Independent Study Groups

To foster a team work environment I had the students sign up to work as groups outside of the classroom. Beginning in the fall of 2015, last semester, there has been a strong core group of students who have made it abundantly clear that they are in school to learn and move on to a four year college to earn their bachelor's degree. This group of students immediately signed up for several time slots and they signed up staggered with each other so they would all be able to work with all of the other students. The group of students who are not as focused and do not have a long term plan for their educations walked right past me and the other students and left the classroom.

I considered the level of social development and self-confidence of the students who opted out of the group work. Were they intimidated? Did they dislike other students in the class? Were they immature? Did they have other obligations? When I watched these students around campus, the answer to all of these questions appeared to be no. They ate lunch with the group-work students, they were on the basketball team, they had several options for time slots. I saw them walking from the student activities building to the academic wing of the school, then right past their lab and on to the café. It just didn't make sense. Why were they so resistant to working with people who on all other fronts seemed to be their friend. I again thought that it had to do with the students desire to be in the class in the first place. I have not yet hit upon the magic bullet that will keep students in the classroom.

I offered the sign up grid several times during the first two weeks of class but it remained the same. I even offered extra credit to sign up for a study group and said that if students felt like they would need extra credit by the end of the semester this would be the only option. Still, there were only a core group of students that chose to work together. In the end, four students signed up to work on Mondays at 10:00 which was immediately after the lecture portion of class. Six students signed up on Tuesday at 11:00 which followed the lab portion of the class. Finally, four students signed up to meet on Thursday at 10:00. Table 5 below shows the sign-up sheet with student identifiers written in.

Table 5
Study Group Times (N=7)

	Monday	Tuesday	Wednesday	Thursday	Friday
10:00-11:00	Student B Student A Student D Student G			Student C Student B Student A Student E	
11:00-12:00		Student C Student A Student G Student H Student B Student D			

Grades for the students participating in the group sessions ranged from a 92% for student A to a 73% for student G. As you can see, students F, I, J and K elected not to sign up for group study times. They were the same students who eventually dropped the course.

I have to add a note about students dropping the course throughout the semester. CDKC has a unique policy when it comes to student drops and withdrawals. The President's Council made a unanimous decision to allow students to drop a course up to the Friday before finals. This decision was made because the students loose access to their funding opportunities due to low or non-existent GPA's. In addition, it is recommended that faculty members withdraw students that will fail the course with or without student knowledge of the withdrawal. I don't personally agree with this policy as it takes responsibility from the students. It also appears to make students unaware of the consequences of not completing the requirements of a course.

Most of the students in the study groups were repeats and they just wanted a diversity of study partners. They decided that they would meet in the conference room across the hall from my office and that they would limit the time to one hour. I made many appearances during the first three weeks of the semester then slowly stopped being a strong presence in the room. The students were getting very comfortable asking and answering each other's questions. At times I would go in to the conference room to see a cluster of students standing at the small white board trying to draw a molecule or explain reactions to each other. There were several times that I saw students doing more than just chemistry as well; anatomy and physiology, statistics and algebra to name a few.

In the beginning, the students worked exclusively in a conference room directly across the hall from my office. In the middle of February I found out that the students were also meeting in a room in the back of the library, at people's homes and in empty

classrooms. As you can imagine, I was *thrilled* to find this out! When I asked why they were moving around, they had a variety of responses including the following:

"The teachers upstairs talk really loud. It gets tough to concentrate."

"Student G is always on her phone. She doesn't have as many classes as us so she doesn't have to work like we do."

"The board isn't big enough to do big problems."

"We want to stay on task and work for a longer time. And we need way more space. It is too crowded up there."

Wow!!! I was totally blown away by this! Here I thought that the students were losing steam, and I needed a little kick in the pants. It turns out they were working together all over the school. The librarian told me that if there is not a quiet spot in the library then the students go to a back room, close the door and work for hours. Amazing!

One of the best things that happened during the study was when I handed out a take home test that was to be completed over Spring Break. It was a multiple choice test over three chapters. I don't usually give multiple choice tests in chemistry, but because of this treatment I thought I would try it. I told the students that they were allowed to work together or on their own. They could use their books, the internet, whatever they needed to complete the test. The questions were difficult and many of them had more than one answer that looked right. To my surprise, right after I gave the test out, student E stood up and announced that he would be at the college working on the test and anyone else could join him. Almost all of the students agreed to meet him. This may not seem like a big deal but our school is very small and the only people on campus during spring break

are the administration and a couple of people in registration. The library closes at 4:00 so there are not a lot of options for students to work in the school. The fact that they would have to find a place to work and make sure the room was open was astounding to me.

The student who made this comment came to Chief Dull Knife College from the Great Falls area. He was a student at Blackfeet Community College but came to us with zero credits. He was, to say the least, a very un-motivated student before coming to Dull Knife. He has even admitted as much. Right now, he is a top if not the top student in the course. He has earned and is maintaining a low "A" average in the class.

<div align="center">Formative Assessments</div>

Each of the formative assessments was compared to students who completed the same course the year before. The teaching methods I used the previous year, the students, the way the labs were set up and the group-work option were completely different.   I graphed the results of each of the corresponding assessments to compare the scores. In Figure 4 below, I have graphed the treatment groups test averages compared to the test scores for students in the same class the previous year.

Figure 4. Assessment Comparison for Two Sections of the Same Class, (*N*=6) and (*N*=7).

As you can see, there is not assessment score for the non-treatment group from the spring 2015 class. That is because we only go through chapter 21 in that class. The treatment group finished through chapter 25 which is additional four chapters of material!! It looked to me like not only were the students retaining the information more efficiently but we were working through the material at a much more aggressive rate! I included the actual averages in the figure to see the differences quantitatively as well as visually.

I began this project thinking that the assessment scores were going to give me the most valuable information. I expected to see a drastic difference in test grades from the beginning. It was difficult for me to swallow the facts in the beginning, but relying on science; I did eventually see a trend. The more time I gave my students to build their teams, the better they did and the more work they did.

INTERPRETATION AND CONCLUSION

The overall goal of my research study was to teach my students to be more self-sufficient and to become their own advocates. If I could help the students learn to form their own support groups in the small setting of our college, maybe they would be more confident when moving to the next level of schooling. I cannot emulate the atmosphere of a large university, but I can help our students gain some skills that will aid in their decision making if and when they move on.

During the process, I found out that students already enjoyed working with each other, but didn't know how to go about building their team outside of the classroom. The college and the library close at 4:30 pm Monday through Friday and the whole facility is closed all weekend. Lame Deer is a very small town and there are no other community spaces to meet. If I gave the students a reason and a separate but supported space to meet outside of the classroom, this study shows that some students do in fact benefit.

Student evaluations of instructors are very sporadic at CDKC. If they are given it is usually during the last week of regular class before finals. I took it upon myself to attempt getting evaluations from the students that dropped the course and that effort fell flat. The students were unwilling to participate.

Research Questions Addressed

My main focus question was, "How does team and group work elicit a sense of community among students?" By looking at the empirical data, I found out that students do progress further in the course as well retain the information when they are required to spend time working with each other. One hundred percent of the students who signed up

to work in groups were successful in the class.   They also felt like they had someone to

call if they needed a ride to school, a babysitter, had car troubles or, most importantly,

help with material from this and other classes. In fact, during the last two weeks of the

semester, Student B ended up in the hospital 100 miles away when her mom went in to

heart failure. When she contacted me I suggested she tell her teammates and she

informed me she already had. When I got to class, there was a chorus of students telling

me that Student B would not be in class for a couple of days and that they had it covered.

Another very specific example of community building happened when one of the

students had a baby. She is a young mother of two children, and she does not have the

resources to help herself at this point. Her teammates realized what a desperate situation

she was in and stepped in to help. The young mother, just 19 now, was given diapers, a

baby bath, a portable crib, and clothes for both of her children. The students also had two

baby showers to help provide needed items. Without this sense of community, this young

lady may have just gone without and not been able to complete the semester.

The next most important thing to me was determining if students performed better

on their assessments due to the team work experience. The specific sub-questions were

"Do students perform better on assessments as a result of team work and group

exercise?" and "How will working in groups solidify concepts for complete

understanding and retention of material?" Figure 4 in the previous section addressed this

question. The students slowly built a more solid understanding of course material as

evidenced by the increase in test scores. The average test score of the non-treatment

group from the spring 2015 semester covering 12 chapters of material was 65%. The

average test score of the treatment group from the spring 2016 semester covering 16 chapters was 77%!!

Addressing my sub questions was also very important during my research. "How does team and group work elicit a sense of community among students that carries over to other classes and experience?" This question was extremely easy for me to address. I have given you several illustrative examples of community building in the body of this report. As I was making observations of the lab exercises and the group work happening in the conference room across from my office, I heard students planning next semester's schedules, meeting times to "cram" for finals and general ideas about what they would be working on this summer. After the final exam, four of the seven students made plans to meet between the spring and summer semesters of school. I would call that a success!

The next sub question was, "How does self-confidence improve as a result of working in a group?" One of the most valuable pieces that came out of my research was the constant revolving door of questions at my office! Never have I had so many students coming to me about this class, other classes, advising for the summer and fall semesters and personal "stuff". This was exciting to me because the normally shy inhibited students started showing up and visiting with me beyond what was going on in the classroom! Finally, my students weren't scared to death of me. One specific example was when a student didn't know if she was taking the right classes to go in to a Radiological Technician degree. We sat at my computer, looked up some phone numbers and started the process. By the next week, she had called all of the appropriate people and her questions were being answered. This is a student I had the previous semester that

did not speak to me even ONCE! Now she regularly messages me on Facebook, comes in to my office to sit and visit and is talking more with all of her instructors. Though her grades are not yet reflecting this new found confidence, all of her instructors appreciate her new efforts. One of the math instructors recently said, "If she came in [to school] this semester with that energy she would be one of our top students!"   In fact, of the students that completed this course, 100% had more interaction with me and other faculty members. CDKC is small enough for me to physically *watch* these interactions!

The next two sub-questions I grouped together when I was analyzing the data. "Do students perform better on assessments as a result of team and group work exercises?" and "How will working in groups and teams solidify concepts from complete understanding and retention?" While formative assessments did provide a direct method of comparison between groups of students, I found the most value came from student interactions and completion of course material. I hypothesize that if I slowed down and covered as much material as I did in the previous semester the students grades would have been significantly higher overall. It is important to note that I did not add material on to the regular curriculum this semester, I only finished the required material. In the past I have had to eliminate some of the material due to time constraints and student preparation/limitations. Overall, the students who were encouraged and able to work in a defined group did "better" than those who did not.

The next question was, "Does test anxiety decrease while performance on assessments increase a result of team and group work?" During the first couple of weeks of the semester, the students did report an increase in test anxiety because they were new

to the process. "What if my group studied the wrong stuff?" or "What if I showed my group members the wrong things?!" were common statements. After the first couple of tests, I gave the students the option of using the complete solution guide to check their homework so they would know if they were on the right track. This simple option took a huge amount of pressure off of the high achieving students. The students who chose not to participate in group work simply copied the answers and were further behind than when they started the class. By the end of the semester, students were reporting that they felt less nervous about taking the test because they were all "in the same boat" when it came to the harder questions on the test. In essence, no one felt *alone* during the formative assessment. One student commented, "You know how you get all nervous because everyone else finished the test and you are sitting there forever by yourself?? Well, now that don't bother me [be]cause I know they just read faster than me." That in itself was an effect that I did not anticipate but one I totally appreciate!!

The last question I wanted to address was, "Do students feel more confident in moving forward in their education as a result of working in teams and groups?" The best way for me to measure this was by making notes in my observations while students were working together. I also asked the students several questions when they were working together to elicit reactive and immediate responses as opposed to having them fill out an official questionnaire or complete a survey. Sometimes students think too long when they have to write down an answer and their thoughts are sort of edited. I wanted authentic and honest feedback. Here are some of the questions I asked along with responses from students:

Me: "Do you feel like you know who to go to if you have questions about a class or school in general because you have been working in a group?"

Student: "No. Not really. But I do know that I can talk to one of my friends about my problems."

Me: "Did working in a group make you feel more confident about next semester?"

Student: "Yes! All this time they thought I was the smart one! I never felt that before! I never would have known that if I didn't work with them! Like I did as good as student X on the test and I never thought that could happen!"

Overall, student reactions were very similar. They did not look back on the group experience as a crutch to lean on when they were getting bogged down. They looked at it as a positive, helpful, encouraging environment. It helped them to know who their academic "friends" were, who they needed to avoid and that, if they put the time in, they could do just as well as student X.

<div align="center">Summary</div>

In summary, I feel like the research questions I asked scratched the surface of what could be a very compelling method of teaching in my circumstances. Fostering relationships between students can be very tricky. My goal is NOT to simply force students to take responsibility for different parts of the same project. I want them to take ownership for their *own* education. Regardless of the teacher, the school or the community, they will have to rely on their own reasoning skills and resources. Again, I

feel like I have touched on something that could become very valuable to me and my students and the school as a whole.

There are some simple and concise steps that could be followed by other instructors interested in incorporating team work for their students. First, I would advise the group work continuum exercise. It was valuable to know where students stand before the process begins. Next I would require all students to choose a time to meet outside of the classroom in teams. Being present at the first few meetings helped students understand what was expected of them. After students seem comfortable the instructor should only intrude when students ask for help. This reinforces the idea that students need to advocate for themselves. I would also recommend a detailed checklist of desired behaviors before the process begins. This is a complicated and frustrating but necessary step. Giving the students a copy of the lab grading rubric also made lab expectations very clear and concise for the students. Finally, keep a reflexive journal!! It was so nice to have something to reflect on when trying to modify my lessons for next semester.

VALUE

One of the greatest effects this research has had on me is empathy for my students! It is always beneficial to be on the other end of the deadline/project continuum. So often it easy to stand at the front of the classroom and pontificate about what it means to be a good student without thinking about what it is like to have the responsibilities that accompany being a student. It is rare for a faculty meeting to begin and end with comments about how wonderful our students are doing and how hard they are working.

We focus only on the negative and what the students aren't doing. It would do all of my peers well to sit back in the desk of a student every now and then.

I will begin next semester using the same processes I used during this project. I intend to continue helping students build relationships that go beyond the classroom for the betterment of their education. While some of the effects of these associations are not entirely positive, they are nonetheless valuable. After all, knowing what not to do and recognizing poor work habits in others leads students to introspection in many cases! As an instructor, I stood back and let the students struggle through this lesson. I wanted to interrupt the group work study sessions and say things like, "Remember, you only have about 2 hours to work today" or "I would suggest you leave the study room if you want to visit. Focus on homework here and you will get way more done." Great lessons are sometimes the hardest lessons. I learned that if I left the students alone I was less frustrated at the end of the day. The students learned that some of their peers were not as focused and motivated as they appeared to be so they found new teammates.

In the future, I will take the advice of my students and make the study group's formal and with instructional support for a longer period of time. I will have the students come up with questions for me before we meet as a group and then we can sit and work them out together. I will start the semester by having students come to the board and physically point to the part of the process where they get lost. I will then ask the other students if they can help. I will then slowly remove myself from the situation and let them have the space to themselves so they can ask each other questions and answer them as a group on the board. At least that is my goal!

Next I would change homework requirements. A lot of the time students got caught up in trying to complete all of the homework questions. I will have students ONLY hand in the questions they worked on as a group. This will enforce the idea that everyone's questions matter. It will also clarify that everyone has strong points and points of confusion.

Another great lesson I got from this project was that I was expecting way too little of my students in the past. I assumed that they were struggling with material when perhaps they weren't! My intention of pushing the students beyond their comfort zones in terms of their classmates also pushed me beyond mine! Students craved structure, consistency and, most of all, a *challenge*. I had NO idea! It is ironic that in proposing a project in group work and encouraging students to interact with each other on a more than academic level led me to treating the students as more than learning vessels. My goal was to teach the students how to be better, more effective learners. What I got was me as a better, still growing, more effective teacher!

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APPENDICIES

APPENDIX A

ORIGINAL LIKERT SURVEY

Please answer each one of the following questions as honestly as you can. This is not for

a grade. It is to help me better prepare and present the material for the class to

maximize your experience. Please do NOT put your name on the survey. Thank you in

advance for your contribution.

1=strongly agree   2=agree   3=undecided 4=disagree   5=strongly disagree

1. I like the support I receive from group members.

    1   2   3   4   5

2. I don't like working in a group because someone always takes over.

    1   2   3   4   5

3. My group thinks I don't contribute enough.

    1   2   3   4   5

4. My contributions aren't worthy because I am not as smart as other members of the

    group.

    1   2   3   4   5

5. My anxiety level increases when the instructor tells me I have to work in a group.

    1   2   3   4   5

6. I feel like I have to do all of the work in the group.

    1   2   3   4   5

7. My experience with group work in the past has been negative.

    1   2   3   4   5

8. Each person in my group has contributed equally to the overall project.

    1   2   3   4   5

9. My experience with group work in the past has been positive.

    1   2   3   4   5

10. I have a lot to contribute to groups but am too shy to speak up.

    1   2   3   4   5

11. I would be pleased to never work in a group setting again.

    1   2   3   4   5

12. Group work has helped me develop new friendships in school.

    1   2   3   4   5

13. The worst pat about working in a group is depending on others.

    1   2   3   4   5

14. One person always takes over the entire activity.

    1   2   3   4   5

15. I want to be the person who takes over the entire activity.

    1   2   3   4   5

APPENDIX B

LIKERT SURVEY RAW DATA

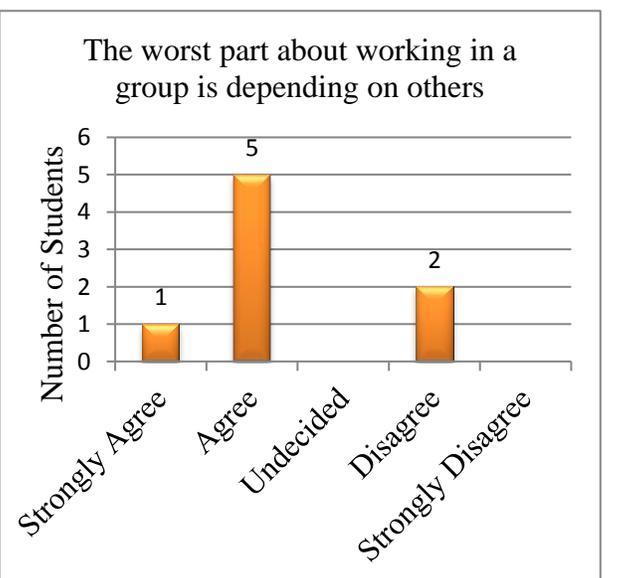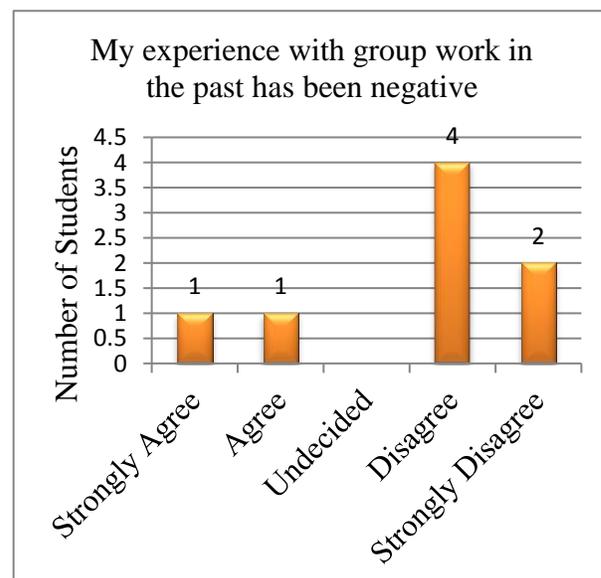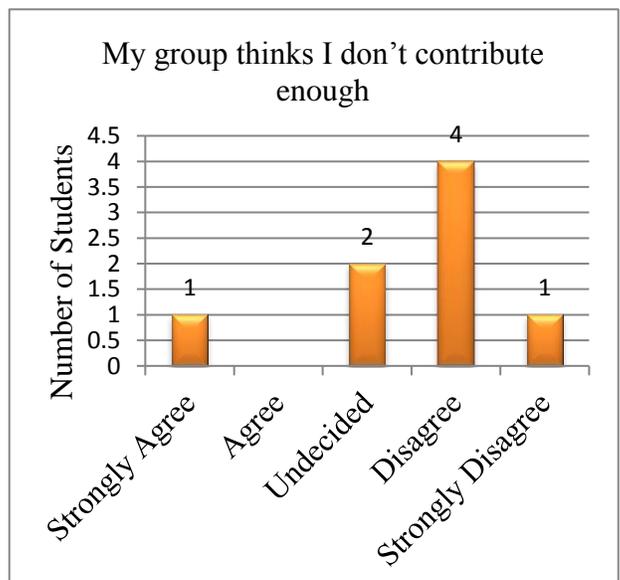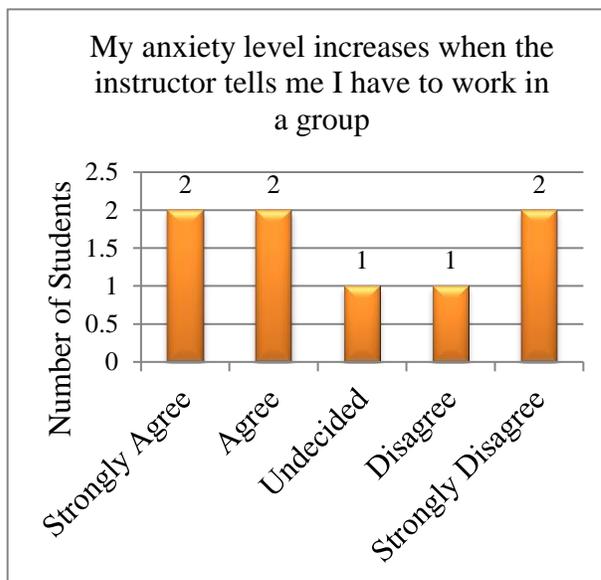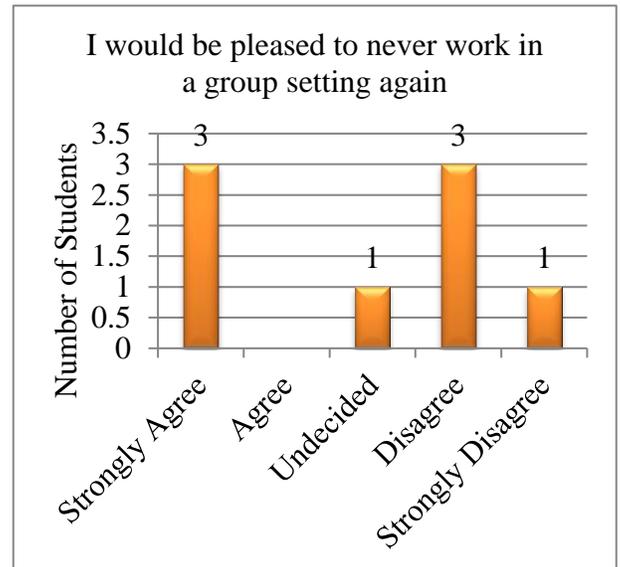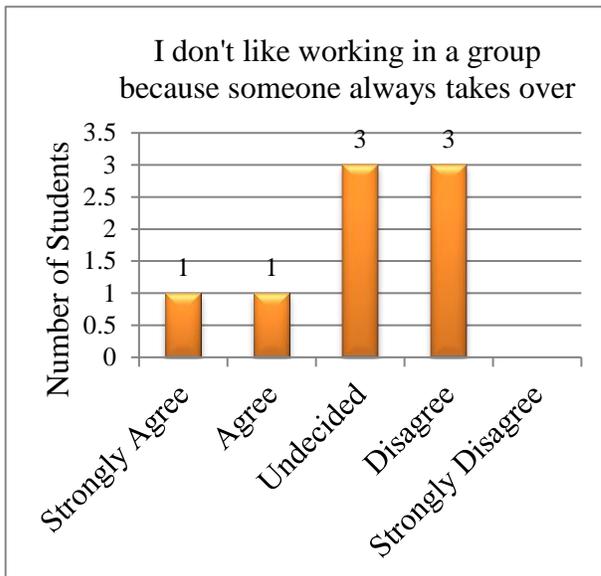| Question	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree	n=8
Working in groups makes me feel frustrated		4		2	2	8
I like the support I receive from group members	3		4	1		8
I don't like working in a group because someone always takes over	1	1	3	3		8
My group thinks I don't contribute enough	1		2	4	1	8
My contributions aren't' worthy because I am not as smart as the rest of the group	1		2	4	1	8
My anxiety level increases when the instructor tells me I have to work in a group	2	2	1	1	2	8
I feel like I have to do all of the work in the group	1	1	2	4		8
My experience with group work in the past has been negative	1	1		4	2	8
Each person in my group has contributed equally to my project		6	2			8
My experience with group work in the past has been positive		5	1	1	1	8
I have a lot to contribute to groups but am too shy to speak up	1		2	4	1	8
I would be pleased to never work in a group setting again	3		1	3	1	8
Group work has helped me develop new friendships in school	2	1	3	1	1	8
The worst part about working in a group is depending on others	1	5		2		8
One person always takes over the entire activity	2	1	1	3	1	8
I want to be the person who takes over the entire activity	1		2	2	3	8

APPENDIX C

NEGATVIVE SURVEY RESULTS

57

I don't like working in a group because someone always takes over

Response	Number of Students
Strongly Agree	1
Agree	1
Undecided	3
Disagree	3
Strongly Disagree	

I would be pleased to never work in a group setting again

Response	Number of Students
Strongly Agree	3
Agree	
Undecided	1
Disagree	3
Strongly Disagree	1

My anxiety level increases when the instructor tells me I have to work in a group

Response	Number of Students
Strongly Agree	2
Agree	2
Undecided	1
Disagree	1
Strongly Disagree	2

My group thinks I don't contribute enough

Response	Number of Students
Strongly Agree	1
Agree	
Undecided	2
Disagree	4
Strongly Disagree	1

My experience with group work in the past has been negative

Response	Number of Students
Strongly Agree	1
Agree	1
Undecided	
Disagree	4
Strongly Disagree	2

The worst part about working in a group is depending on others

Response	Number of Students
Strongly Agree	1
Agree	5
Undecided	
Disagree	2
Strongly Disagree	

I have a lot to contribute to groups but am too shy to speak up

Number of Students

Strongly Agree: 1
Agree: 0
Undecided: 2
Disagree: 4
Strongly Disagree: 1

I feel like I have to do all of the work in the group

Number of Students

Strongly Agree: 1
Agree: 1
Undecided: 2
Disagree: 4
Strongly Disagree: 0

My contributions arent' worthy because I am not as smart as the rest of the group

Number of Students

Strongly Agree: 1
Agree: 0
Undecided: 2
Disagree: 4
Strongly Disagree: 1

APPENDIX D

POSITIVE SURVEY RESULTS

I like the support I receive from group members

Number of Students

Strongly Agree — 3
Agree —
Undecided — 4
Disagree — 1
Strongly Disagree —

Group work has helped me develop new friendships in school

Number of Students

Strongly Agree — 2
Agree — 1
Undecided — 3
Disagree — 1
Strongly Disagree — 1

My experience with group work in the past has been positive

Number of Students

Strongly Agree —
Agree — 5
Undecided — 1
Disagree — 1
Strongly Disagree — 1

One person always takes over the entire activtiy

Number of Students

Strongly Agree — 2
Agree — 1
Undecided — 1
Disagree — 3
Strongly Disagree — 1

I want to be the person who takes over the entire activity

Number of Students

Strongly Agree — 1
Agree —
Undecided — 2
Disagree — 2
Strongly Disagree — 3

Each person in my group has contributed euqally to my project

Number of Students

Strongly Agree —
Agree — 6
Undecided — 2
Disagree —
Strongly… —

APPENDIX E

AMENDED SURVEY

Please answer each one of the following questions as honestly as you can.   Participation

or non-participation in this survey is voluntary and will not be reflected in your grade.

1=strongly agree   2=agree   3=undecided 4=disagree   5=strongly disagree

16. I like the support I receive from group members.

    1   2   3   4   5

17. I have a lot to contribute to groups but am too shy to speak up.

    1   2   3   4   5

18. I want to be the person who takes over the entire activity.

    1   2   3   4   5

    Please explain your answer to this question.

19. Group work has helped me develop new friendships in school.

    1   2   3   4   5

20. I would be pleased to never work in a group setting again.

    1   2   3   4   5

    Please explain your answer to this question

21. I don't like working in a group because someone always takes over.

    1   2   3   4   5

22. My experience with group work in the past has been negative.

    1   2   3   4   5

    Please explain your answer to this question.

8. What would make group work more valuable to you as a student?

9. What can the instructor do to make group work more positive and beneficial?

APPENDIX F

RAW DATA SURVEY 2

Question	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree	n=6
I like the support I receive from group members	1	1	1	1	2	6
I don't like working in a group because someone always takes over	1	1	3	0	1	6
My experience with group work in the past has been positive	1	0	3	0	2	6
I have a lot to contribute to groups but am too shy to speak up	2	0	2	2	0	6
I would be pleased to never work in a group setting again	2	2	0	1	1	6
Group work has helped me develop new friendships in school	1	2	0	1	2	6
I want to be the person who takes over the entire activity	1	0	3	1	1	6

APPENDIX G

COMPARISON OF TWO SURVEYS

67

First Survey *N*=8
Student Responses

Question	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
I like the support I receive from group members	3		4	1	
I don't like working in a group because someone always takes over	1	1	3	3	
My experience with group work in the past has been negative	1	1		4	2
I have a lot to contribute to groups but am too shy to speak up	1		2	4	1
I would be pleased to never work in a group setting again	3		1	3	1
Group work has helped me develop new friendships in school	2	1	3	1	1
	1		2	2	3

First Survey *N*=8
Student Responses as Percentages

Question	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
I like the support I receive from group members	38%	0%	50%	13%	0%
I don't like working in a group because someone always takes over	13%	13%	38%	38%	0%
My experience with group work in the past has been negative	13%	13%	0%	50%	25%
I have a lot to contribute to groups but am too shy to speak up	13%	0%	25%	50%	13%
I would be pleased to never work in a group setting again	38%	0%	13%	38%	13%
Group work has helped me develop new friendships in school	25%	13%	38%	13%	13%
I want to be the person who takes over the entire activity	13%	0%	25%	25%	38%

Second Survey *N*=7
Student Responses

Question	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
I like the support I receive from group members	2	1	1	1	2
I don't like working in a group because someone always takes over	1	1	4	0	1
My experience with group work in the past has been positive	1	0	4	0	2
I have a lot to contribute to groups but am too shy to speak up	2	0	2	3	0
I would be pleased to never work in a group setting again	2	3	0	1	1
Group work has helped me develop new friendships in school	1	2	1	1	2
I want to be the person who takes over the entire activity	1	0	4	1	1

Second Survey *N*=7
Student Responses as
Percentages

Question	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
I like the support I receive from group members	29%	14%	14%	14%	29%
I don't like working in a group because someone always takes over	14%	14%	57%	0%	14%
My experience with group work in the past has been positive	14%	0%	57%	0%	29%
I have a lot to contribute to groups but am too shy to speak up	29%	0%	29%	43%	0%
I would be pleased to never work in a group setting again	29%	43%	0%	14%	14%
Group work has helped me develop new friendships in school	14%	29%	14%	14%	29%
I want to be the person who takes over the entire activity	14%	0%	57%	14%	14%

I like the support I receive from group members

My experience with group work in the past has been negative

I don't like working in a group because someone always takes over

I have a lot to contribute to groups but am too shy to speak up

Student Responses by Percetange

First Survey N=8
Second Survey N=7

Strongly Agree · Agree · Undecided · Disagree · Strongly Disagree

Group work has helped me develop new friendships in school

I would be pleased to never work in a group setting again

I want to be the person who takes over the entire activity

APPENDIX H

GROUP WORK CONTINUUM

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I am a very scheduled person and I need tasks to be completed on time	2	3	2	0	0
I have a difficult time making schedules but like to follow one	0	0	4	2	1
I like to be in charge of a group because I am good at delegating tasks	1	3	2	1	0
I like to be a worker and have someone else tell me what to do	0	0	5	0	2
I am intimidated by the intelligence of the group	0	0	3	4	0
The thought of working in a group makes me very nervous and anxious	0	0	2	1	4
I resent it when teachers force me to work in a group	0	0	0	3	4
There are always group members who refuse to contribute	0	0	3	3	1
There is always a group member who takes over the whole task	0	4	1	0	2
If one person in the group is "free-riding", everyone stops working	0	0	1	2	4

APPENDIX I

GROUP WORK SIGN IN SHEET

	Monday	Tuesday	Wednesday	Thursday	Friday
10:00-11:00	Student B Student A Student D Student G			Student C Student B Student A Student E	
11:00-12:00		Student C Student A Student G Student H Student B Student D			

APPENDIX J

OBSERVATION CHECKLIST

Properties of Hydrocarbons 1-20-2016 Student Name	Student K	Student F	Student C	Student A	Student G	Student H	Student D	Student E	Student I	Student J	Student K
Student is talking with group members											
Student understands the goal of the project											
Student is contributing to the group											
Student stayed on topic											
Student was assigned individual roles in the project											
Student came back to class with their portion of project complete											
Student met with group outside of class											
Student discussed test questions with group											
Student works on homework with group											
Student readily begins working upon entering the classroom											
Student asks questions relevant to the project											
Student correlates course content with project											
Total Points											
Percentage On-Task Behavior											

APPENDIX K

LAB NOTEBOOK RUBRIC

Title_____	
Date of Lab	1
Pages Numbered Properly	1
Even Pages For Notes Only	1
Table of Contents	1
Title	1
Partners Named	1
Proper Notation	1
Blank Pages "X"ed Out	1
Background/Discussion	1
Outline of Procedure	1
Attendance/Preparation	2
Experimental Procedure	2
Independent Work	1
Reports	2
Clean-Up	1
Safety	1
Conclusion	1
	20

APPENDIX L

IRB EXEMPT FORM

INSTITUTIONAL REVIEW BOARD
For the Protection of Human Subjects
FWA 00000165

MONTANA STATE UNIVERSITY

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MEMORANDUM

TO: Mary Noel and Walt Woolbaugh

FROM: Mark Quinn, Chair *Mark Quinn CJ*

DATE: December 2, 2015

RE: *"The Impact of Group Work on Student Assessments"* [MN120215-EX]

The above research, described in your submission of December 2, 2015, 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:

_X_ (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.

_X_ (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.

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APPENDIX M

RAW DATA FOR TEST AVERAGES

	Spring 2015 Non-Treatment Group n=6	Spring 2016 Treatment Group n=7
Chapters 10-12	73%	69%
Chapters 13-14	88%	84%
Chapters 15-16	82%	79%
Chapters 17-18	71%	76%
Chapters 19-21	44%	83%
Chapter 22	NA	80%
Final Exam	71%	66%