Practice Data Set: Grade 9 Biology

Grade Level: 9

Critical Question: *How can small groups be effectively used to increase students’ content comprehension in science?*

Context Information:
The setting for this research is a large high school located in a growing bedroom community of an urban area. The mixed gender/ability groups were chosen by the student teacher-researcher.

The project for this data set is as follows: Four students work together to use an organelle from a cell and attempt to use the unique structure and function of that organelle and its importance to the life of the cell to develop a cure for cancer by altering the way the organelle functions. Groups were instructed to give a PowerPoint presentation describing their proposal for a cure and to turn in a portfolio of their group work over the course of the project.

Data Set Components:
1. Chart and graph showing the average grade of individuals in each lab group
2. Chart and graph showing compiled group responses to a survey about the project
3. Chart showing final group scores on group lab project
4. The survey given to students
5. Observations by the student teacher/researcher during the lab
6. An analytical memo written by the student teacher/researcher

Considering the data
This data set is a little more challenging to interpret. Read through the data set with these questions in mind:

- How do the data inform or not inform the student teacher/researcher about critical factors that may influence small group work?
- How do the data work together or not work together to provide insights into teaching and learning in this classroom? What additional data might you seek if you were the student teacher/researcher?
- Is there any evidence that the small group work is increasing student comprehension of science? Based upon your response, what might you plan to do next if you were the student teacher/researcher?
- Read through the student teacher/researcher’s analytical memo. What, if anything, do you think is missing in the memo? What advice might you give to the student teacher/researcher?
### Action Research Data Set

#### Groups chosen during data set

<table>
<thead>
<tr>
<th>Group</th>
<th>Avg. Class Grade Before Group Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>Above average</td>
</tr>
<tr>
<td>Group 2</td>
<td>Average</td>
</tr>
<tr>
<td>Group 3</td>
<td>Below average</td>
</tr>
<tr>
<td>Group 4</td>
<td>Mixed</td>
</tr>
</tbody>
</table>

#### Responses to cancer group project survey

<table>
<thead>
<tr>
<th>Group</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group function/time use</td>
<td>3.7</td>
<td>3.3</td>
<td>3.7</td>
<td>4.4</td>
</tr>
<tr>
<td>Perceived educational value</td>
<td>3</td>
<td>3.8</td>
<td>4</td>
<td>3.4</td>
</tr>
<tr>
<td>Attitude/interest</td>
<td>2.9</td>
<td>3</td>
<td>3.7</td>
<td>2.9</td>
</tr>
<tr>
<td>Comfort with project</td>
<td>3.5</td>
<td>4</td>
<td>3.8</td>
<td>3.9</td>
</tr>
<tr>
<td>Access to technology</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Cancer project group score

<table>
<thead>
<tr>
<th>Group</th>
<th>Project Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>90%</td>
</tr>
<tr>
<td>Group 2</td>
<td>84%</td>
</tr>
<tr>
<td>Group 3</td>
<td>75%</td>
</tr>
<tr>
<td>Group 4</td>
<td>83%</td>
</tr>
</tbody>
</table>
Table 1 – Data Set
This table shows the average grades for each group at the beginning of data collection for data set #2. The rating represents an average of all four members of each group. Most groups were generally homogeneous with the exception of Group 4.

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<td>Group 4</td>
<td>Mixed</td>
</tr>
</tbody>
</table>

Figure 1 – Data Set Interview Responses
This figure shows the average group response to a set of interview questions answered after the completion of the project. Each member of each group was given the same interview sheet and asked to answer questions on a scale of 1 to 5. Responses are organized to show all groups ratings together for each category of question response.
INTERVIEW QUESTIONS

Interview from Data Set #2

Name _________________________
Period ________________________
Group/Organelle ________________

As you think back about our cancer project, try to think about how well your group worked and how well you contributed to your group.

Answer the following statements by circling the appropriate response:

1. My group got along and worked well together.
   1 2 3 4 5 1=not well 3=okay/average 5=very well

2. Working in a group made it easier to complete this project.
   1 2 3 4 5 1=made it harder 3=about the same 5=much easier

3. My group spent the majority of our time in class working on the project.
   1 2 3 4 5 1=strongly disagree 3=neutral 5=strongly agree

4. My group spent the majority of our time in class not working on the project.
   1 2 3 4 5 1=strongly disagree 3=neutral 5=strongly agree

5. I am satisfied with how my group worked on this project.
   1 2 3 4 5 1=not satisfied 3=satisfied 5=very satisfied

6. How many computers are at your home currently? (a) __________
   How many of them are connected to the Internet? (b) __________
   Do you have PowerPoint? (c) __________

7. What is your general comfort level with PowerPoint?
   1 2 3 4 5 1=low comfort 3=some comfort 5=high comfort

8. What is your interest level in this project?
   1 2 3 4 5 1=no interest 3=some interest 5=high interest

9. What is the educational value of this project?
   1 2 3 4 5 1=no value 3=some value 5=high value
10 How would you compare the educational value of this project to other group projects in this class?

1 2 3 4 5
1=not as valuable 3=just as valuable 5=more valuable

11 How would you compare your interest level in this project to other group projects you have done in this class?

1 2 3 4 5
1=less interesting 3=just as interesting 5=more interesting

12 How would you rate your general attitude before you started this group project?

1 2 3 4 5
1=bored 3=neutral 5=excited

13 How would you rate your general attitude during this group project?

1 2 3 4 5
1=bored 3=neutral 5=excited

14 How would you rate your general attitude after you have completed this group project?

1 2 3 4 5
1=bored 3=neutral 5=excited

15 How would you rate your comfort level with this group project?

1 2 3 4 5
1=no comfort 3=some comfort 5=high comfort

16 How do you feel about being involved in future group projects?

1 2 3 4 5
1=no interest 3=some interest 5=high interest

What else do you want me to know?
Data Set Observation and Interview
January 10, 2005
Conducted in library

**Group #1**

Student A: Spent much of the class period working on the project. First half of work time was spent meeting with group to assign responsibilities and clarify directions. Worked on computer for the last half of the work time.
Student B: Worked on project during much of the work time. Worked on the computer for the second part of the work time.
Student C: On task for most of the work time except for a few times near the end of the class period. Spent much of the first part of the time meeting with group.
Student D: On task for a lot of the work time but distracted and was distracted by another student during the last 5 or 10 minutes of class. Spent the first part of the work time in a meeting with the group to talk about the project.

Group function (interview): This group was working and communicating well with one another about the project and indicated that they were working well together. A couple of the group members expressed frustration that the other two members sometimes distract each other (boyfriend–girlfriend) and don’t get as much accomplished as they should. This group was formed by a combination of two groups which may result in this phenomena.

**Group #2**

Student A: Worked on the project and talked with group intermittently throughout the period.
Student B: Sat on the floor, not working on a computer. Occasionally talked with her group about the project but generally did not appear to be working on project most of the time.
Student C: Worked on the project on a computer much of the time but also spent quite a bit of time talking with other students. The talking was split between the project and other topics.
Student D: Worked on the project intently for much of the class period. She interacted with group members as necessary but mainly seemed focused on getting some work done on the project.

Group function (interview): Group attitude (morale) seems to be good and there seems to be little confusion about the requirements of the project or deadlines. Members seemed to be satisfied with how their group is worked together.

**Group #3**

Student A: Spent most of the period looking for research information on the computer. Was rarely off-task (if ever) during the period.
Student B: Spent most of the period working on the project but he did not appear to have a specific task that he was working on so it didn’t appear that he accomplished very much during the period. May not be entirely clear on the requirements of the assignment.
Student C: Sat on the floor for much of the period while her group worked on computers. Did not appear to be engaged to a significant degree in the project.

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Student D: Spent most of the time working on the computer but did not appear to have a clear direction of what to work on. Did not seem to be working with his group on the project.

Group function (interview): It is interesting that this group seems to work well together but they do not seem to be getting much done even though they are working. They seemed to indicate that each member of the group is doing their part of the work but it was unclear that they actually understand what they are supposed to be doing. This group also indicated that they work well with one another.

**Group #4**

Student A: Worked on project some of the time but sometimes spent time talking with group members about her frustration with her class grade.
Student B: Spent most of her time working on the project but occasionally talked with another classmate.
Student C: Worked on project most of the time, sometimes chatted with group.
Student D: Sometimes worked on project, often appeared distracted by group members talking with one another.

Group function (interview): This group seemed to have lots of questions about how the project was supposed to work. They got along well with each other but they were surprised when I told them that their presentation is due at the end of the week. Overall their group felt as though they function well and they indicated that they are satisfied with their group function.
Analytical Memo

As I continue in my attempt to answer the question “how can small groups be effectively used to increase students’ content comprehension in science?”, I have been collecting data in an attempt to shed more light on the ways in which groups function and how they can be used best. In this most recent round of data collection it seems that the results I have obtained will hopefully be able to provide a clearer picture of the direction this research is headed. The data will be analyzed thematically here as I will look at the general categories of my data and make comparisons between groups based on the data. Four groups have been chosen for study during this data set which has helped to streamline the data collection and interpretation process. The project described here involves groups of four students working to use an organelle from a cell and attempting to use the unique structure and function of that organelle and its importance to the life of the cell to develop a cure for cancer by somehow altering the way the organelle functions. Groups will then give a PowerPoint presentation describing their proposal and will turn in a portfolio of their work over the course of the project.

The groups chosen should give a good cross-section of the class as they exhibit the entire range of academic achievement (from below to above-average) in this class. The first category to be examined here is group time use/group function. There are several interesting items that can be mentioned here as all groups rated themselves above a 3 on a scale of 1 (low) to 5 (high). In the case of Group #2, they scored themselves lower than the other groups but my observations show that they were more on-task than some of the other groups that scored themselves higher. Group #4 scored themselves the highest of all groups in this first category while my observations do not necessarily concur. Group #4 does function well socially but often this social behavior works to the detriment of the group’s progress. I am pleased to note that all groups rated themselves above 3 in this category and so it seems there were no major problems with the groups in this category. On another note, based on my observations it does seem that stronger leaders in Groups #2 and #3 might result in more productive groups.

It seems that an important aspect of a group project is the group’s perception of its educational value to each student. Again all groups rated the educational value of the project at or above 3 and while there is 1 point of variation between the groups’ responses here, based on observation and the final project grade there does not seem to be much connection between this and on-/off-task behavior or the quality of the final product. So it seems there must be another factor that needs to be considered and accounted for which results in the difference in group performance.

As we examine the attitude/interest of each group in this project it should be noted that here I have encountered the first scores of below 3 (posted by three of the four groups). The exception to this trend was Group #3 who scored their attitude/interest above 3.5. The interesting thing here is that although this group seems to have been interested in the project, this did not translate into the quality of the final product or the direction of the group (as seen during observation – more will be noted on this during the next section). On the other hand Groups #1, #2, and #4 scored nearly identically in this section but scored differently on their projects and so we continue to search for a factor that is important to the final outcome of the project.

Often it seems that a group’s comfort or understanding of their task is important so next we will examine groups’ comfort with the project. All groups rated this relatively high (between 3.5 and 4.0) so again at first this does not seem to be connected with the project score/performance. Upon
review of the observation notes however it does seem that my notes for Group #3 do not match their assessment of their own comfort with the project. During the in-class work time on the project Group #3 did not seem to have much direction for their project and did not seem to really understand what they were attempting to do and did not know who was going to do what task. Many of the same comments could be made about Group #2 although a couple group members here did seem to have a basic understanding of what was going on. I also observed Group #4 asking lots of questions about the project which I first assumed to be indicative of their lack of understanding of the project but I now believe that their questions may have come from a basic understanding of the project.

As this project was intimately tied to technology the access to technology was another area of inquiry. One of the first things to jump out of the data in this section is that Group #2 rated themselves high (4) while Group #3 rated their access as low (2). When these findings are compiled with observational data the connection seems to become more significant. While Group #2 did not yield a very high score on the project, this was not due to their lack of access to technology or the low quality of their presentation but was rather due to their failure to turn in a significant portion of their portfolio for the project which resulted in their missing points. On the other hand, Group #3 (based on observation) had a difficult time with technology during both the research and presentation preparation phases of the project. They also indicated that most of them did not have Internet at home and no one had a version of PowerPoint that was compatible with the computers at school. It seems likely that these factors combined may have contributed to the low project score for Group #3. On another note, it must be said that Groups #1 and #4 had the same access to technology and neither had access to PowerPoint at home but Group #1 scored higher than Group #4 so there must be another factor that needs to be considered when considering small group projects. Another question may also need to be addressed here: is it reasonable to ask for the use of specific technology (such as Microsoft PowerPoint) for a particular project or does this adversely affect some groups? In many ways I believe the answer to this is no because I believe that enough time was given for the project but perhaps there needed to be more scaffolding and structure so groups could work more effectively during the time they were given.

As I have been considering how all of this data seems to fit together I have noticed that the final product grades of each of the groups may show that the groups achieved at levels similar to those of the individuals who comprised their group. It does seem that the group score may be shifted up slightly from the previous grades of individuals within the group however. The data do show Group #1 with the highest score (90%) and they also had above-average grades individually before the start of the project while Group #3 had below-average grades before the project and scored 75% (although it should be noted that the group scores for every group generally represented an improvement on the grades of most individuals within the group with only a few exceptions).

After all of this it seems there are a few issues that need to be addressed. First, it is entirely possible that groups may still bias their responses to survey/interview questions because they are afraid of negative consequences on their grades and it is also possible that students tend to avoid giving 1s and 5s as scores although I think enough of these were recorded that I believe this is not the case. I have noticed a very obvious connection in the data (which was discussed in the previous paragraph) and am curious if this may be a connection to the research of Hogan 1999 who suggested that the manner of group formation (student choice vs. teacher choice) should be driven by the complexity of the assignment. In this case the more complex the task the more control students should have over the selection of groups. During the continuation of this research I may experiment with some different group formational techniques. Another important point I have noticed is that the groups who seemed to be effective (especially Group #1) had good leaders and I am curious if the leaders
just do much of the work out of concern for their own grade or if the group actually improves due to the leader. I suspect some of the former but I imagine the latter has a role as well.