Chapter 4

Findings and Discussions

Results

In our Title 1, Program Improvement schools the majority of our students are typically

unmotivated and disengaged due to various factors. Some of those factors may be they do not

see any purpose or value in their education (Prensky, 2005). Another factor may be the students

find the traditional teaching style as boring, especially when they are so accustomed to the

collaborative and communicative freedom of social media such as Instagram, Kik, Facebook,

and YouTube (Chang & Guetl, 2010; Covili; 2012; Round, 2011). With the technology demands

of the 21st century it is more imperative than ever that students are prepared for a job or career

once they graduate (Partnership for 21st Century Skills, 2011).

The purpose of this study was to evaluate the impact of using Google drive to complete a

collaborative project based learning (PBL) assignment. Our primary questions were:

1. What effect does online collaboration via Google Drive amongst students and their

peers have on student engagement and motivation in the classroom?

2. In what way does collaborating with Google Drive impact the students' overall

learning experience?

For the purpose of confidentiality and anonymity of the Teacher-researchers, participants,

and schools in this study, the Teacher-researchers and schools were assigned letter designations:

Teacher-researcher J and Teacher-researcher H. Teacher-researcher J was for Teacher-

researcher who teaches junior high and Teacher-researcher H was for Teacher-researcher who

teaches high school. In order to maintain continuity throughout this action-research paper,

Teacher-researcher J's research preceded Teacher-researcher H's research, as junior high school

precedes high school for students. Maintaining this continuity aided in documenting the transition of junior high expectations to high school expectations.

Both Teacher-researchers began the project with an entry event (BIE, 2014) to stimulate interest in the students and provide a feeling of relevance. Students were given opportunities within the projects to exercise "voice and choice" (Bell, 2010; BIE, 2014) by selecting their own partner or group. Students were also given the freedom to choose how they divided up the tasks (Bell, 2010; Lee & Lim, 2012; Vogel, 2009). Upon project completion, students presented their findings and defended their own views to a public audience (Bell, 2010; BIE, 2014; Lee & Lim, 2012; Vogel, 2009).

Pre and Post Baseline Student Surveys

The table in Appendix D documents the participants' technology skills, technology background, student motivation, and learner satisfaction before and after the intervention. Overall, students showed remarkable growth in their technology skills at both School J and School H (see Table 1).

Table 1: Technology Skills						
Question	**Pre J**	**Post J**	**Change**	**Pre H**	**Post H**	**Change**
1. How well do you understand the basic function of computer hardware components such as the CPU, monitor, keyboard, and file storage.	3.35	4.39	+1.04	3.53	4.32	+0.79
2. How well can you find and start programs on the computer?	4.00	4.48	+0.48	4.41	4.68	+0.27
3. How well can you save files to the hard drive or removable storage such as a flash drive?	3.65	3.91	+0.26	4.71	4.84	+0.13
4. How well can you access, store, and retrieve files from a shareable drive?	3.30	4.04	+0.74	4.12	4.74	+0.62
5. How well can you exit or quit an application?	4.26	4.48	+0.22	4.71	4.84	+0.13
6. How well can you shut down a computer properly?	5.00	4.87	-0.13	4.82	4.95	+0.13
7. How familiar are you with Microsoft Office?	3.74	4.13	+0.39	4.12	4.32	+0.20
8. How familiar are you with Google Drive?	4.61	4.57	-0.04	4.18	4.42	+0.24

9. How well can you create a new document in Google Drive?	**4.61**	**4.44**	**-0.17**	**4.71**	**4.84**	**+0.13**
10. How well can you cut, copy, and paste text on the computer (not cell phone)?	**4.57**	**4.83**	**+0.26**	**4.76**	**4.95**	**+0.19**
Change in Technology Skills			**+3.05**			**+2.83**

However, student motivation and learner satisfaction showed mixed results at both School J and

School H (see Table 2).

Table 2: Student Motivation & Learner Satisfaction		
Question	**Change in School J**	**Change in School H**
Change in Student Motivation	**-1.45**	**+0.10**
Change in Learner Satisfaction	**+0.46**	**-0.53**

Discussion of pre and post survey questions for Teacher-researcher J

The results for Teacher-researcher J suggested the students overwhelmingly felt they

improved in their technology skills at the end of the intervention. The scale used to measure

technology was a 1 to 5 scale for students to rate themselves (Hendricks, 2013).

The positive change of +3.05 was quite significant as it shows the majority of the

students felt more confident with their own technology skills (see Table 4). In other words, the

students showed substantial increase in their own self perception of their technology skills.

Table 4: Technology Skills for School J			
Question	**Pre J**	**Post J**	**Change**
1. How well do you understand the basic function of computer hardware components such as the CPU, monitor, keyboard, and file storage.	**3.35**	**4.39**	**+1.04**
2. How well can you find and start programs on the computer?	**4.00**	**4.48**	**+0.48**
3. How well can you save files to the hard drive or removable storage such as a flash drive?	**3.65**	**3.91**	**+0.26**
4. How well can you access, store, and retrieve files from a shareable drive?	**3.30**	**4.04**	**+0.74**
5. How well can you exit or quit an application?	**4.26**	**4.48**	**+0.22**
6. How well can you shut down a computer properly?	**5.00**	**4.87**	**-0.13**
7. How familiar are you with Microsoft Office?	**3.74**	**4.13**	**+0.39**
8. How familiar are you with Google Drive?	**4.61**	**4.57**	**-0.04**

9. How well can you create a new document in Google Drive?	**4.61**	**4.44**	**-0.17**
10. How well can you cut, copy, and paste text on the computer (not cell phone)?	**4.57**	**4.83**	**+0.26**
Change in Technology Skills			**+3.05**

On the flip side, the two baseline surveys revealed an inverse relationship between student motivation and learner satisfaction at School J (see Table 5). As student motivation declined significantly at the completion of the project and the post baseline survey, the students' expressed a positive learner satisfaction.

Table 5: Student Motivation & Learner Satisfaction for School J	
Question	**Change in School J**
Change in Student Motivation	**-1.45**
Change in Learner Satisfaction	**+0.46**

The significant drop of -1.45 in student motivation (see Table 5) might be due to the students' initial excitement to participate in a Project-Based Learning (PBL) lesson. However after the 15-day PBL lesson, it is possible the students' interest in the project might have waned due to the length of the project, thus affecting their motivation by the post-baseline survey. Or the drop in student motivation might also be due to the fact the post baseline survey was completed after the PBL unit was complete and the students no longer knew what to expect from the class. This second hypothesis is supported by a comment made by Student #5 in his student reflection journal upon completion of the PBL lesson. His comment is: "We finshed and I am bored. (Appendix Q)" Either way, more research is definitely recommended to further explore if the length of a PBL lesson might have an inverse impact on student motivation.

Another interesting result from the intervention revealed the most significant change in the learner satisfaction category for School J was the increase in the students believing "I'm a

team leader." A +0.30 change (see Table 6) in the overall confidence of the students in the

participating intervention group showed they felt more comfortable and confidant being a team

leader. This result correlated with the research done by Bell (2010), Lee and Lim (2012), and

Vogel (2009) as they believe that if students were given a chance to have a "voice and choice" in

their assignment and group roles that they will gain more from the overall learning experience.

This positive change in self-confidence and thus overall learner satisfaction was witnessed in the

"Mythbusting" PBL lesson as well.

Table 6: I'm a team leader						
Question	**Pre J**	**Post J**	**Change**	**Pre H**	**Post H**	**Change**
34. I'm a team leader.	2.87	3.17	+0.30	3.41	3.84	+0.43

Another interesting result from the intervention is the positive increase in how the

students viewed their own intelligence was discovered. The junior high level students increased

in their own self opinion of their intelligence. According to the pre and post baseline surveys,

two students felt it was not possible to change how smart they were (see Figure 1).

Figure 1:

38) How smart I am is something I can change.

- Yes
- No
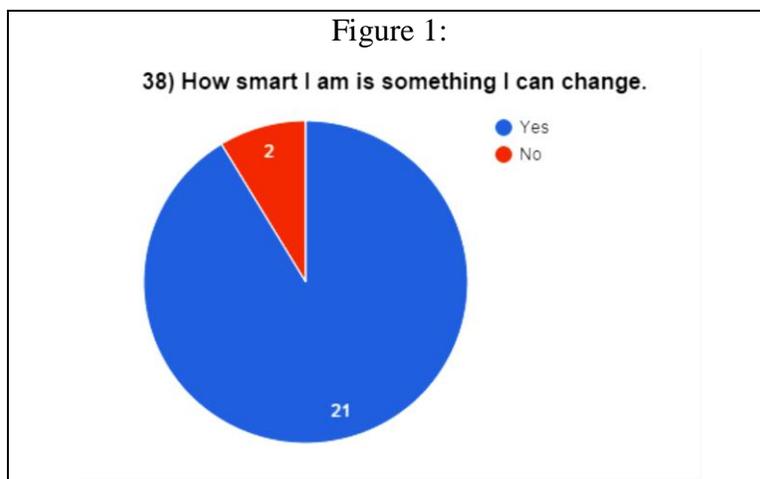
One of those two students in Figure 1 stated: "I don't think i can change how smart i am maybe I

can change my education smarts, but I don't know about my other smarts (Student #8, Appendix

O)". However, after the intervention that same student changed her opinion to "i can change my smartness by learning more (Student #8, Appendix O)".

In addition, question 44 asked the students: "I find myself to be smarter than my classmates". The post baseline results showed an increase of +0.26 (see Table 7). This increase demonstrated how allowing students to be independent thinkers in a project can help to change their own perception of their own self value (Bell, 2010; Lee & Lim, 2012; Vogel, 2009).

Table 7: I find myself to be smarter than my classmates						
Question	Pre J	Post J	Change	Pre H	Post H	Change
44. I find myself to be smarter than my classmates	2.70	2.96	+0.20	2.71	2.79	+0.08

In conclusion, the pre and post baseline showed a decrease in student motivation, however there has been some notable increase in learner satisfaction at the end of the PBL lesson.

Discussion of pre and post survey questions for Teacher-researcher H

The results for Teacher-researcher H suggested the students were largely ambivalent towards collaborating with Google Drive in completing the PBL project. Both of their reflections comments and survey values suggested little change in motivation, engagement, or learner satisfaction. Although for specific students there was some variation, both positive and negative. The reasons for such variation are at the moment unknown and can be a topic for further consideration in future investigations.

The conclusion of student ambivalence was also supported by Teacher-researcher H observations which indicated an initial high level of engagement followed by a large amount of variation in student engagement from day to day and student to student.

Most of the pre and post survey questions (Appendix D) used a 1 to 5 scale for students to rate how well they agreed or disagreed with the question (Hendricks, 2013). These values were then averaged for each question on the pre and post survey for comparison on a question by question basis. Students at School H showed little variation in technology skills from the beginning of the intervention to the end according to the pre and post survey results. Nevertheless, on every question they did indicate some overall improvement; particularly regarding the basic functions of how to use the computer and how well they can use a shareable drive (see Table 8).

Table 8: Most significant Technology Skills Improvement for School H

Question	Pre H	Post H	Change
1. How well do you understand the basic function of computer hardware components such as the CPU, monitor, keyboard, and file storage.	3.53	4.32	+0.79
4. How well can you access, store, and retrieve files from a shareable drive?	4.12	4.74	+0.62
Change in Technology Skills			**+2.83**

In the survey section regarding the students' prior experience and skill the students rated their ability to use a computer in several basic categories (see Table 9). They also rated themselves regarding their experience and ability to use Google Drive (see Table 9). In every category the bulk of the students rated their experiences and skills as high. The scores changed very little from the pre to post survey. Interestingly, one student rated herself as a 4 on the pre-survey for her familiarity with Google Drive, and then on the post survey rated herself as a 3, despite having worked with Google Drive for several weeks.

Table 9: Technology Skills for School H

Question	Pre H	Post H	Change
1. How well do you understand the basic function of computer hardware components such as the CPU, monitor, keyboard, and file storage.	3.53	4.32	+0.79

2. How well can you find and start programs on the computer?	**4.41**	**4.68**	**+0.27**
3. How well can you save files to the hard drive or removable storage such as a flash drive?	**4.71**	**4.84**	**+0.13**
4. How well can you access, store, and retrieve files from a shareable drive?	**4.12**	**4.74**	**+0.62**
5. How well can you exit or quit an application?	**4.71**	**4.84**	**+0.13**
6. How well can you shut down a computer properly?	**4.82**	**4.95**	**+0.13**
7. How familiar are you with Microsoft Office?	**4.12**	**4.32**	**+0.20**
8. How familiar are you with Google Drive?	**4.18**	**4.42**	**+0.24**
9. How well can you create a new document in Google Drive?	**4.71**	**4.84**	**+0.13**
10. How well can you cut, copy, and paste text on the computer (not cell phone)?	**4.76**	**4.95**	**+0.19**
Change in Technology Skills			**+2.83**

For School H there was also little change in the students' motivation according to the pre and post surveys (see Table 10).

Table 10: Student Motivation & Learner Satisfaction for School H	
Question	**Change in School H**
Change in Student Motivation	**+0.10**
Change in Learner Satisfaction	**-0.53**

Interestingly, on the question #27 "I feel ashamed if I score a low grade" the value went up by 61%, the only question which showed a substantial change (Figure 2). This may be a reflection of the students' concerns for college acceptance and scholarship letters since colleges were sending out acceptance letters at the time of the intervention.

Figure 2: "I feel ashamed if I score a low grade"

Pre	Post	Change
2.35	3.79	+1.44
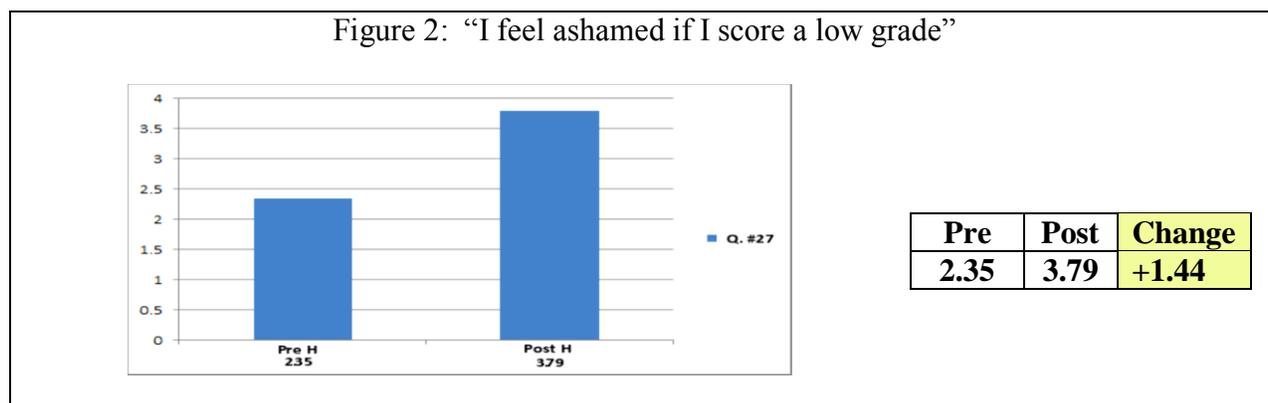
In the free response section the students demonstrated high levels of self-determination in response to the statement "How smart I am is something I can change". Overwhelmingly the students responded in both the pre and post survey that their effort will determine their abilities (see Table 11 or Appendix P).

Table 11: Student Motivation & Learner Satisfaction for School H
Question #44: Pre-Baseline free response
The harder I work, the smarter I get.
I believe hard work can increase one's knowledge on a subject or thing.
The level of understanding I have of a certain subject or concept can be positively altered with effort from my behalf and instruction from someone who knows how to guide the learning taking place; a teacher for example could see that I might be doing something wrong in an attempt to learn or try the concept being taught out for myself and re-instruct the way I'm running the assignment.
One isn't born smart or dumb, it is determined by many factors. With some hard work, anyone can gain intellect.
Question #44: Post-Baseline free response
If I learn more, I can become smarter.
I feel that by learning more, especially with a class that interests me, I can and will be able to learn everything. I want to be able to learn and do things on my own sometimes I do not feel smart enough that I have to ask others for help.
I believe a student can better themselves if they work hard and they deserve what they get because of it.
One can always change how much they know in any given task, subject, or about a given concept, it is a matter of effort.

The overall Learner Satisfaction value showed a slight change of -0.53 (see Table 12). The students also reported a decline regarding their preference to work in groups instead of individually (see Table 12). It would seem this PBL project helped students to discover that they prefer to work alone as opposed to working with partners. This could be an interesting point for further study. Was the size of the group an issue for division of skills? Was the consistent absence of some partners due to school activities a factor?

Question	Pre J	Post J	Change	Pre H	Post H	Change
Table 12: Change in attitude of Group Work vs Individual Work						
30. I like group projects.	4.13	3.91	-0.22	3.35	3.16	-0.19
33. I prefer to work individually than in groups. ***	3.57	3.44	-0.13	3.00	2.47	-0.53
Change in Overall Learner Satisfaction			+0.46			-0.53

Student Daily Time on Task and Reflection Survey

Using student reflection surveys and teacher observation checklist were ways to ensure data validity and confidentiailty in the action-research study. For example, the teacher-observation checklist (Appendix K and Appendix L) provided the teacher viewpoint of how well the students stayed on task without singling out any particular student in the project. Also the students' privacy and confidentiality were protected using the checklist format. Meanwhile the student reflection surveys (Appendix Q and Appendix R) provided a way for the students to anonymously validate or contradict the teacher-observation checklist.

Teacher-observation checklist and student reflection survey for Teacher-researcher J. Teacher-researcher J used a time on task document titled "Teacher-Observer Checklist" (Appendix K) on the days the students were present inside the classroom and working on their computers. This checklist was to document each groups overall engagement and motivation attitudes during various parts of the PBL lesson. A maximum score of 12 was given on this form. If any group was off-task behavior, then points would be deducted for each category the off-task behavior appeared in. This was the quickest way to anaylze if the groups were actively engaged in the project in a limited time environment (see Table 13).

Table 13: Teacher-Observer Checklist Summary

	Group 1	Group 3	Group 4	Group 5	Group 6	Group 7
Day 3 - online research as a group	12	12	12	12	12	6
Day 4 - online research as a group	12	12	10	12	11	8
Day 5 - online research as a group	12	12	12	11	12	12
Day 8 - Analyzing Public Poll as a group	12	12	12	12	9	5
Day 9 - Google Presentation (worked separately)	12	12	12	12	12	12
Day 10 - Google Presentation (worked separately)	12	12	12	12	12	12
Day 11 - Google Presentation (worked separately)	12	12	12	12	12	11
Day 12 - Google Presentation (worked separately)	12	12	12	12	6	10
Day 13 - Google Presentation (worked together)	12	12	12	12	8	12

According to Table 13, Group #7 struggled the most staying on task and engaged in the project when they were working in a group environment. The students became much more engaged in the "Mythbusting" PBL when they entered the invidual portion of the lesson. Prior to entering the individual portion of the PBL, the team leader for each group had to assign tasks and jobs to every member of the group so each member understood which slides they were responsible for. The team leaders were given a Google Presentation Outline Handout so the students know how many slides were expected and the topic of every slide (Appendix E). Once Group #7 entered this stage of the intervention, they performed better. Hence in a good collaborative classroom, the students know what their role is for a project (Vogel, 2009).

As for the student reflection survey, only one student in each group was chosen, by the group (Bell, 2010; Lee & Lim, 2012; Vogel, 2009) was chosen to write a daily reflection

documenting what the student did every day in the classroom (Appendix Q). The chosen student

from each group also documented how many minutes they spent individually working on the

assignment. This gave the student a chance to discuss how they felt about the PBL experience

throughout the project. A few excerpts were documented in Table 14 from the three students

who represent low (student #8), medium (student #4), and high (student #5) level students in the

class.

Table 14: Excerpts from Student Daily Reflection Journals
Student #8: i feel like i can't find proof that fairies are not real
Student #8: i couldn't talk to my group face to face we talked over the phone
Student #4: I felt that this project is a good thing for us so we could discover new things.I think that we are learning a lot in this project.
Student #4: We are not finish but were some changes to the slides.I felt tired that day because my group wasn't lisening.
Student #5: We went outside to give people a survey to see if friday the 3th was bad luck.
Student #5: We sat separately and we started a powerpoint. We talked to each other by comments on the powerpoint.
Student #5: We finshed and I am bored.

From the information in Table 14, it showed that students who finished the project early

do enter into a sense of boredom as they must now wait for the other groups to finish. This

factor might also be the cause why motivation decreased when the students took the post

baseline survey for School J.

Teacher-observation checklist and student reflection survey for Teacher-researcher

H. Students were asked to report daily (Appendix P) how they spent their time working on the

project both on computer lab days and the days in between when they were working on their own

time. Although ten of the students allowed me to remind them about this task using the Remind

App, there was a considerable lack of data collected from this survey due to the lack of

responses. The students with the most complete sequence of responses were used for comparision and analysis over the time period of the intervention and were charted for the time they spent working each day as reported (Appendix P). This first question asked only about the total time spent working on the project regardless of how the work was being done or with whom. For those students consistently reporting the data shows an erratic pattern of engagement with the assignment, not necessarily increasing or decreasing over time but varying from day to day. Two students maintained a steady pace of work for much of the intervention.

Students were also surveyed regarding the amount of time they spent collaborating with their partner. This was to help determine if Google Drive acted to motivate and engage the students over time. Similar to the Teacher Observation Checklist, this data indicates a high degree of variability between individual students and individual days. There is no definitive trend showing an increase in time spent collaborating over the course of the study but neither is their a trend showing a decrease in time spent collaborating. For some of the students they would vacillate from one reporting day to the next having spent large amounts of time collaborating and then spending none. Two students indicated they spent large amounts of time collaborating right at the beginning and at the end of the intervention with very little collaboration between the two. This is not the pattern that I would have expected from the research of Bell (2010) and Vogel (2009).

The students' reflections suggest overall satisfaction using Google Drive for collaboration. This does not mean they changed their views over the course of the study as one student stated; "My feelings have stayed the same and I believe Google Drive is the perfect way to collaborate with lab partners." Several others expressed similar views while another

expressed a consistently contrary view in different ways; "I prefer collaborating in person" and "I do not like working through Google drive". (Appendix R).

While responding to the question: "How successful did you feel today about your work? Explain and give an example if you can", the students did not express great depth of thought but simply stated what they were doing rather than feeling such as "I researched and worked on the adaptation of humans on climate change". This suggests either a lack of enthusiasm for the project itself or preoccupation with the task rather than the reflection. Early in the intervention one student did suggest the latter because they stated "I only did a lot of research because the information about climate change was interesting", though this same student did not make any additional comments regarding how they felt.

Teacher Observations

Teacher-researcher J. For three weeks Teacher-researcher J observed the students on task behavior daily. Observations were made regarding whether the students were talking or looking at the computer and if these activities were engaged in the assignment or represented distractive behavior. These observations were throughout the period. Although this proved to be somewhat complicated as Teacher-researcher J had other responsibilities to the class as well. Teacher-researcher J attempted to remain dis-engaged from the students except for required administrative tasks and providing assistance when solicited thus allowing the students choice in determining the use of time and allowing the project and Google Drive to be the main motivating and engaging factor (Bell, 2010; Vogel, 2009).

On Day 1 of Intervention, the lesson began with an entry event in the form of a YouTube video "25 Popular Myths Debunked" (BIE, 2014). Teacher-researcher J paused the video whenever the video asked if a certain myth was true or false. Teacher-researcher J asked the

class to vote by raising their hands; then played the video to show the students the answer. The students were very engaged in this question and answers format. By giving the students a chance to voice their opinions in a low-stakes class discussion format, more and more students participated as the video progressed. By the tenth myth that was asked by the video, the majority, if not all students were raising their hand to be engaged in this process.

Students were then asked to visit the class Google Drive folder and find a new document titled "Myths vs. Legends". All students were engaged in this process as they all logged into their Google Drive accounts and read the new document and all participants wrote three items on the lined paper that was passed out to them.

Afterwards, students were given 5 minutes to walk around the room talking to other students about the items written on their lined paper (Bell, 2010; Lee & Lim, 2012; Vogel, 2009). About half the students were walking around the room because they completed filling out their research on the lined paper. All students were actively engaged at this time in the project because they were motivated from the entry event video and they did not want to be miss out on an opportunity to join a group.

On Day 2, Teacher-researcher J went around to every group leader and helped all groups to create a Google Document to share amongst their group members to compile their references list (Bell, 2010; Vogel, 2009). Many group members hovered over Teacher-researcher J and their team leader to overhear what was being discussed. The curiosity of the other group members to essentially eavesdrop on the conversation is a sign of student motivation in the project. Once the Google Doc was set up and the students show they can essentially type at the same time as other students, many squealed with delight and made positive comments towards this collaborative Google Drive feature. Every group Teacher-researcher J assisted, the at least

one member said "Cool", "Wow", "Sweet", "I can do that?", "OMG", or some other positive comment that demonstrated student engagement and excitement. Overall the project has been a great success. The students are all actively engaged in the process.

On Day 3 of the intervention, a total of four students were absent from the class. This affected Project Group #3 because their group only had 2 students instead of 4. The two students who were absent in Group #3 were responsible for finding the websites to prove their myth true. This left the remaining two students not knowing what to do. The intervention started out strong but reality set in as some groups realized how much reading was required. Some groups resorted to looking at Google images and videos to help them with their research. Some groups approached Teacher-researcher J to proudly announce they finished their research and wanted to know what was next in the action-research study, even though their research was incomplete. The ability of the students to read and decipher information became the main determinant in the speed at which the students were conducting their research. For example, Group #7 was observed socializing and relying on their group leader to do the majority of the work.

On Day 4 of the intervention, the students continued their research online on their chosen topic and Group #7 proclaimed they were done with their research and wanted to proceed with creating the public survey. Teacher-researcher J went to observe their list of references and realized the group did not do any research, they simply wrote websites such as "sparknotes.com" and "Wikipedia.org" as their references. No article was read and no research was done.

By Day 5 there were still 4 teams that did not complete their work. Teacher-researcher J focused on those teams to help them finish. Two of the four teams finished their research in the 30 minutes while the other two teams said that they will work on it over the weekend. At the end of the day, the students said they were very excited about the Bring Your Own Device (BYOD)

of the intervention (Vojtek, 2015). A few did not believe the school's principal would allow them to use their digital devices on campus. Teacher-researcher J thus made a decision to email the entire staff the next day to calm the students' fears about the BYOD portion of the project.

For Day 6, Teacher-researcher J sent an email to the staff notifying the staff of the BOYD for the class (Appendix E). Prior to the students exiting the classroom, Teacher-researcher J showed only the team leaders how to copy the sample Google Form Survey (Appendix E). As usual, many team members hovered over Teacher-researcher J to overhear what was being said to their team leader. The fact the other team members chose to actively listen to such information was evident how engaged and motivated the students were in this PBL lesson. Many team members did not want to wait for the team leader to inform them on their next activity, they wanted to know now! Once the groups were set up to use their BYOD (see Figure 3), Teacher-researcher J allowed the students to leave the classroom. The students were beaming with smiles and excitement as they left the room with their digital devices.

Figure 3 – BYOD Device with Google Form
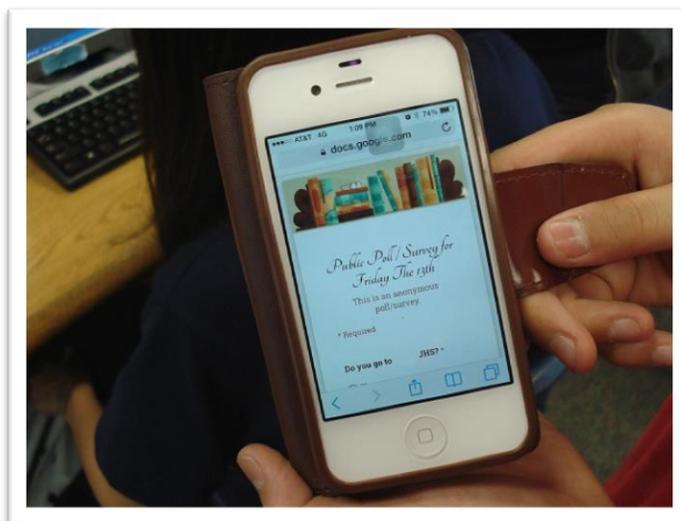
Day 7 began with all students quickly typing in the bit.ly link on their BYOD yesterday (Appendix E). Students today stayed in their groups of 4. The previous day, many groups of 4 split up into pairs and to conduct their survey. Today it was the opposite. The majority of the groups stayed together as they approached other students and adults. Some of them did their homework and approached people outside the school to take their surveys. The requested minimum was 20 entries in their Google Form. Students were excited over the intervention as more students brought their digital devices to school on Day 7 than Day 6. Many collected over 40+ opinions from various students and adults (see Figure 4).

Figure 4 – Sample Google Form Results
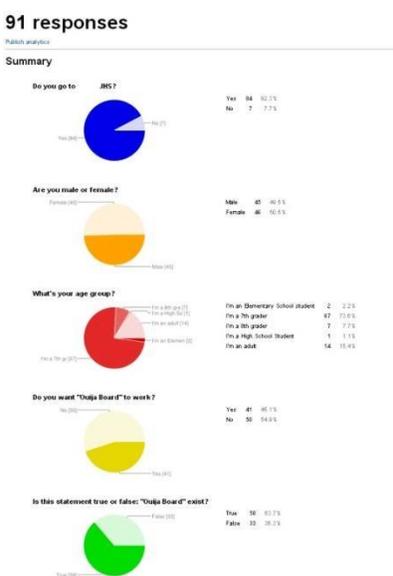
Day 8 of the intervention began with two students absent. This affected Group #3 greatly because both of them were from Group #3 and only the Group #3's leader had access to the Google Form results. So Group #3 did not have access to their poll results and they also had to quickly choose an interim leader to receive instructions from Teacher-researcher J regarding the Group Google Presentation.

Group #7 was only able to find 15 students in 2 days to take their survey. The group also never took the time outside of the classroom to ask family members to take the poll. Group #7 has been performing very poorly and has placed the blame on the team leader for not doing all their work. Meanwhile Teacher-researcher J witnessed the girls in Group #7 socializing with each other and with other groups. Teacher-researcher J had to talk with Group #7 on many occasions today and asked them to start taking on their own personal responsibilities or they will be graded accordingly.

The group that polled the most people was Group #4 with 91 entries on their Google Form. Other groups polled around 49, 43, and 32 people. The students enjoyed receiving the results in color and Teacher-researcher J witnessed many students going to other groups comparing and contrasting their pie charts results (see Figure 5) (Bell, 2010; Vogel, 2009).

Figure 5 - Student analyzing Google Form Response
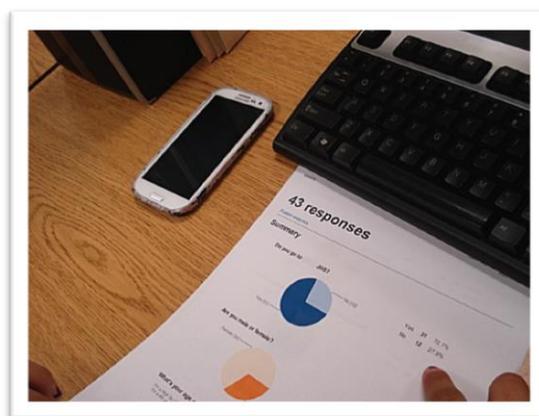
Teacher-Researcher J called up all team leaders and gave them the Google Presentation Outline handout of their 10 slide Google Presentation (Appendix E). Teacher-Researcher J showed only the team leaders how to fill out the handout and asked them to split the Google Presentation up with all team members (Vogel, 2009). As usual, other team members tried to

overhear this event too. Teacher-researcher J had to ask non-team leaders to sit in their seats to await instructions from their team-leaders.

Teacher-Researcher J warned the class the next phase of the PBL will be to separate all group members from each other.   The students were shocked this is expected of them. Teacher-Researcher J recommended the students to get creative with their communication skills. Majority of students stared at each other with disbelief and the classroom was silent for a few seconds. Then whispering started amongst the groups and then hand signals and soon full discussions were happening between the teams on how they were going to tackle the situation.

Some of the groups enjoyed this challenged and have already devised a way to work together (Vogel, 2009). Other groups who did not communicate well to begin with simply stared at each other trying to figure out what they should do.

Starting on Day 9, the students were no longer allowed to sit next to their group members. Each student worked individually at their own computers and used the collaborative functions within Google Presentation to create their group presentation (see Figure 6) (Miller, 2013).

Figure 6 – Student collaborating using Comments Feature on Google Presentation
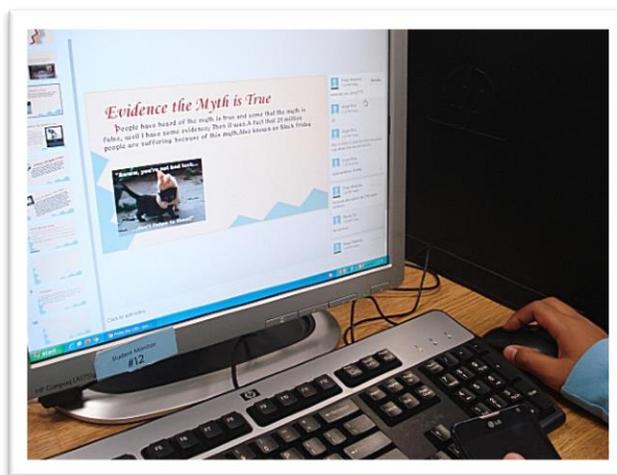
Some team leaders oversaw this Presentations Outline handout to ensure each member was doing their share of the group work (Bell, 2010; BIE, 2014; Liu et al., 2010; Vogel, 2009). Other team leaders were witnessed tossing the Presentations Outline handout on their desks and telling their groups to figure it out.

It was a very quiet day since students could not verbally communicate with their peers. Several students attempted eye contact and hand gestures to communicate, but Teacher-researcher J had to tell them that it has to be via a digital media form of communication (see Figure 7).

Figure 7 – Student using BYOD to collaborate
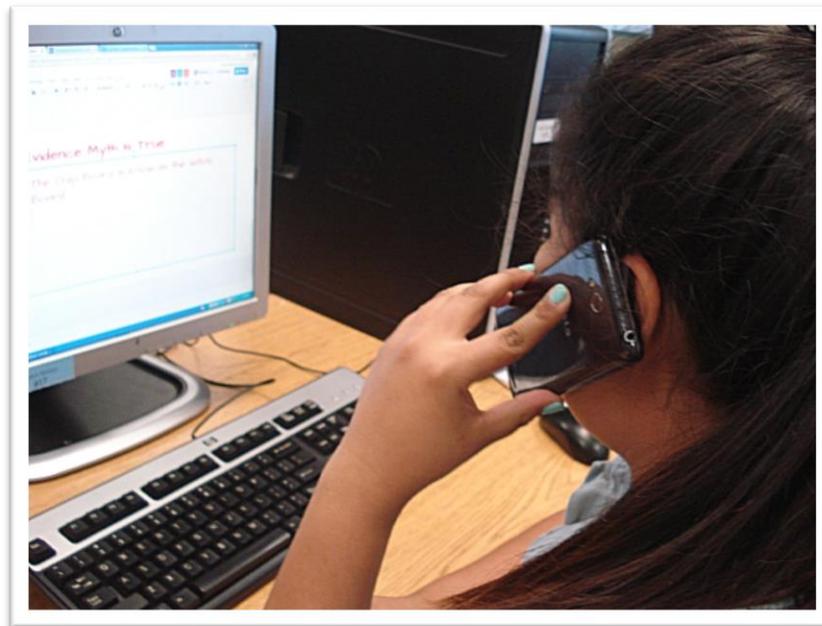
Only two groups asked to use their emergency meeting option to meet outside the classroom. Other students in the classroom were seen texting, calling each other, and messaging each other inside Google Presentations (see Figure 7) (Vojtek, 2015).

Day 10 started with Group #3 informing Teacher-researcher J they were done with the assignment because they collaborated so well. Teacher-researcher J looked at their work and

offered some suggestions to help Group #3 improve their Google Presentation. But it looked really good.

Teacher-researcher J offered all groups the opportunity to hold an emergency meeting. None of the groups took that offer. Based on Teacher-researcher J's observations, the students were much more organized and understood their roles better on Day 10. Having the students work on this section individually has increased student accountability and motivation (Vogel, 2009). All students were seen busy typing on their computer, texting on their phones, or calling their partners. Teacher-researcher J did allow the students to talk with their shoulder partner as long as they were not in the same group.

Day 11 of the intervention started one week after Day 10. Day 11 was the first day back from Spring Break. Students did very well and immediately broke into their groups after roll was taken. Only Team 6 and Team 7 requested the use their 5 minute emergency meeting passes (See Figure 8).

Figure 8 - Students holding an Emergency Team Meeting

On Day 12, teams were given the option to start presenting Wednesday or Thursday. The majority of the class voted for Thursday (Bell, 2010). Team 5 and 6 requested to use their emergency team meeting opportunity to meet today (Figure 8). At this point in the PBL lesson, it was very noticeable which teams were struggling and which teams were on task. It was also very noticeable who was pulling the majority of the weight of the team. For example, three students were discovered surfing the web and playing games because they no longer felt like working on the group presentations. Two of the students are #11 and #26. It might have been a miscommunication amongst their team but they thought they were done and thus Student #11 and #26 sat together and played games together. This disappointed the other members of the team. They were not mad at them but they were saddened by the team not staying united. Team #7 struggled with the color scheme of their presentation. Other than that, the majority of the teams are ready to finish up the project.

Day 13 of the intervention was the last day before teams presented their Google Presentation in front of the class. No teams had questions for the Teacher-researcher J regarding their project. All teams claimed they knew what to do despite the fact that Teacher-researcher J reviewed some of their work and offered revisions and assistance.

Day 14 and Day 15 were the days of the group presentations (BIE, 2014). All groups presented their "Mythbusting" Google Presentation. There was a lot of anxiety from the groups as they were awaiting their turn. Group #3 was the first to present and had the best presentation. All groups after Group #3 struggled in either their presentation skills or their research skills. Comments such as: "I just want to get this over with" or "When are we done?" could be overheard by Teacher-researcher J. At this point in the PBL, majority of the teams simply wanted to present to end the project.

Teacher-researcher H. For four weeks Teacher-researcher H observed the students on task behavior for each of the eight days in the computer lab (Appendix T). Observations were made regarding whether the students were talking or looking at the computer and if these activities were engaged in the assignment or represented distractive behavior. These observations were made approximately every ten minutes though this proved to be somewhat complicated as Teacher-researcher H had other responsibilities to the class as well. Teacher-researcher H attempted to remain dis-engaged from the students except for required administrative tasks and providing assistance when solicited thus allowing the students choice in determining the use of time and allowing the project and Google drive to be the main motivating and engaging factor (Bell, 2010; Vogel, 2009).   During this time period the school day was interrupted repeatedly for various school required activities including testing, assemblies, Open House schedule, and student meetings. On occasion scheduled computer time was cancelled by the administration and had to be re-scheduled. The initial observations found the students deeply engaged in pursuing the required research. As time went on the students appropriately divided up the tasks (Lim & Lam, 2013; Vogel, 2009), as needed, with a common choice being for one student to focus on the presentation while the other focused on the paper.

On Day 1, the students appeared to be 100 % engaged as demonstrated by the intensity with which they looked at the computer screen (see Figure 9). Teacher-researcher H only needed to follow and assist a few students in demonstrating how to access Google Drive and share documents which demonstrated their motivation and engagement to accomplish the task. After this introduction the students proceeded to be intensely engaged in doing research for the project based on their continued focus on the computer screen and the observed appropriate websites.

There appeared to be little conversation or distractive behavior for the entire period. There was not a lot of evidence of collaboration at this time.

Figure 9: Sample of students engaged in research for Teacher-researcher H

On Day 2, there were shortened periods today due to a school activity. Three of the study students were absent this day though the remaining students appeared to again be highly engaged. At this point the students were observed to be still involved in finding background information. Students were observed visiting a variety of websites to gain perspective on climate change and their voices indicated enthusiastic motivation at their discoveries regarding climate change.

On Day 3, students appeared to be in a transition day both in behavior and activities. 67% of the students spent at least part of the time writing either in Google Doc or Google Presentation. Some of the groups had clearly divided up the task between the Google Doc and the presentation with one partner observed engaged working on the Google Doc and the other on the presentation part. 28% of the students were also observed spending at least some of the time

disengaged and working on tasks unrelated to the activity. Most of these distractive activities appeared to be related to college application status and applications for financial aid. 22% of students were also observed engaged in off task conversations. 89% of the students were observed spending at least some of the time continuing to find more information from the internet.

On Day 4, the students were observed continuing to transition from researching to writing in Google Drive but there was also a substantial increase in off task behavior or disengagement. The impulse to review their status regarding college applications, scholarships, and financial aid seems to have become the dominant factor for distractive behavior. 94% of the students were engaged at least some of the time writing using Google Drive while 75% of the students were also observed continuing to be engaged with gathering research information part of the time. Off task behavior has increased with 31% of the students engaged in of task behavior a least some of the time though never beyond one observation per student. Equal numbers of students were observed engaging in on and off task conversations with 13% for each group observed during one observation.

On Day 5, the students were demonstrating a higher level of creative 21st century collaboration using ear buds and video chat or phone conversations to communicate with their partners but were engaged with the task. This behavior was demonstrated by 33% of the students. There was more distractive behavior on this day with 47% of the students observed in off task conversations at least once and 12% of the students observed multiple times engaged in off task conversations. One student was observed repeatedly visiting web sites unrelated to the project. Only 41% of the students were observed engaged in writing with Google Docs at least some of the time. Research continued to occupy a significant portion of the time for 47%

percent of the students while a disappointing 24% of the students were observed off task 100% of the time either viewing off task web sites or off task conversations, sometimes both.

On Day 6, 57% of the students were observed engaged in on-task writing using Google Drive at least during one observation, while 86% of the students were observed engaged in off-task behavior at least some of the time and one student 100% of the time. Additionally, 43% of the students were observed engaged in research at least some of the time.

On Day 7, 94% of the students were observed engaged using Google Drive to write the Google Doc or work on the Google Presentation at least once. Several students were observed spending at least 50% or even as much as 100% of the time engaged in the activities. There was evidence of off-task behavior with 41% of the students observed during one observation looking at web sites unrelated to the task. Research did not occupy a large amount of the total time but 47% of the students continued to spend at least some time on this activity.

On Day 8, the final session, 18% of the students were engaged with Google Drive to write the Google Doc or Google Presentation 100% of the time while 53% of the students also spent some time continuing with the research. Vocal discussion was more common during this session with 24% of the students engaged in on task discussion with students other than their partners. There was a minimal amount of off-task behavior observed as well with 24% of the students observed disengaged while visiting off task web sites once during the session.

On Day 9, students were almost 100 % engaged with completing the post baseline survey using iPads.

After Spring Break, presentations were given by the students. One of the presenting groups demonstrated considerable motivation and engagement by going to the effort to create their own interview questions and videoed both teachers and students regarding views on climate

change while another presenting group was observed to be clearly engaged and very passionate

with their concern for the climate and the environment in general as demonstrated by their tone

of voice and active gesturing (see Figure 10).

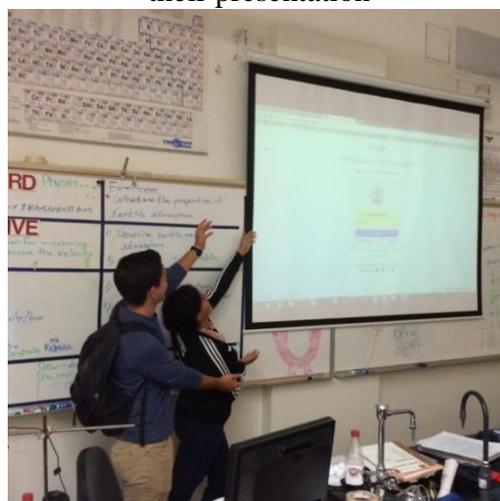**Figure 10: Students presenting with Google Presentation**
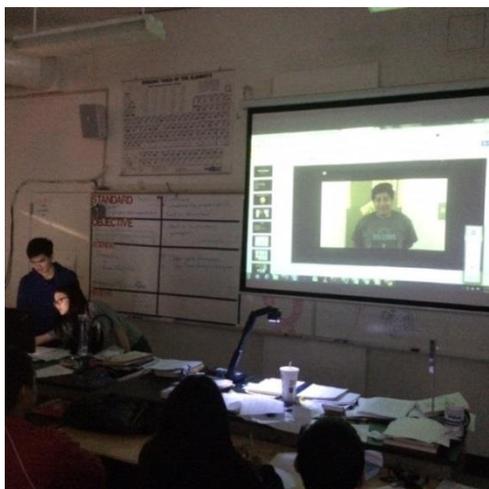
Two students setting up Google Presentation
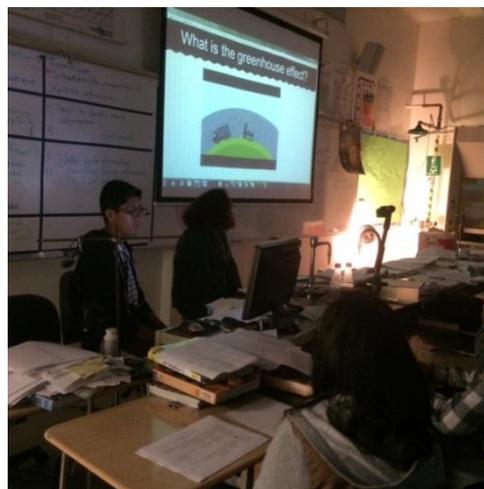
Two students demonstrating enthusiasm in their presentation

Class actively engaged in listening to student presentations

Student presenters showcasing teamwork and enthusiasm during presentation

The presentations were peer graded according to the presentation rubric (Appendix H)

and the students seemed to take the task very seriously when evaluating whether all elements of

the rubric were met or not. The students were attentive to the presentation and actively discussed the presentation with their group prior to giving a score.

Comparison of Teacher-researcher J and Teacher-researcher H

The technology skills of Teacher-researcher J students and Teacher-researcher H students showed very similar improvement in skills in the overall rating (Table 1, Figures 1 and 4). Both groups of students rated themselves as having improved slightly in almost every category with three exceptions in Teacher-researcher J's class. This result should be anticipated after the students were working with the computer and Google Drive for several weeks. What is more difficult to explain is the decline in technology skills reported for Teacher-researcher J in some categories. This may be a personal reassessment of the students own skills after they discovered they were not as proficient as they had believed prior to working on the project but there is no data to support this hypothesis.

Changes in learner motivation were slight for both Teacher-researcher J and Teacher-researcher H. Students in both groups showed a slight increase on some motivation questions and a slight decrease on others though not necessarily the same for each group (Table 1, Figures 2 and 5). Ultimately, Teacher-researcher J's students showed a decline in overall motivation while for Teacher-researcher H, a very small increase in motivation occurred.

Learner satisfaction again showed mixed results for both groups with some questions showing an increased rating and others showing a decrease (Table 1, Figures 3 and 6). Teacher-researcher J's students showed an overall slight increase in learner satisfaction while Teacher-researcher H's students showed a larger decrease in learner satisfaction.

Comparing the results of the motivation and learner satisfaction for Teacher-researcher J and Teacher-researcher H is interesting in that for Teacher-researcher J, the motivation

decreased, while the learner satisfaction increased. Conversely, for Teacher-researcher H the reverse was true and the students scored an increase in motivation and a decrease in learner satisfaction (see Table 1). This discrepancy in itself is worthy of future studies.

Conclusion

Our primary research questions were:

1. What effect does online collaboration via Google Drive amongst students and their peers have on student engagement and motivation in the classroom?

2. In what way does collaborating with Google Drive impact the students' overall learning experience?

The validity of our study was increased through the use of multiple measures (triangulation) whereby each data source could be used to support the results of the other or contradict those results. Since Teacher-researchers J and H measured teacher observations, student reflections, and the pre and post surveys to evaluate the students motivation and engagement the Teacher-researchers could better ascertain which conclusions could be supported by the data.

The results of this intervention revealed slight improvement in engagement and learner satisfaction for Teacher-researcher J. For Teacher-researcher H, the students showed a slight improvement in motivation. The only drastic increase was in the students' self-evaluation of their own technology skills for both Teacher-researchers.

For both groups of students, the Teacher-researchers observed other factors that could have been potentially more significant in influencing the students focus on the project and masked any impact from the collaboration done with Google Drive. These results do not reflect the drastic improvements in student motivation and engagement that were expected based on the

research we gathered from Bell (2010), Cotugno (2014), Lee and Lim (2012), Miller (2013), Round (2011), and Vogel (2009).

For example, Teacher-researcher H observed the impact of student concern with the anticipation of college acceptance letters and applications for scholarships. There were also multiple disruptions to the study due to numerous changes in the school schedule due to testing, assemblies, and meetings. When students were found not engaged in the PBL assignment, they were most often observed to be engaged in other academic endeavors. Although students did show an increase in concern over school work in the post survey, this was not observed to increase their effort.

For Teacher-researcher J, it was observed that students' lack of reading, writing, and technology skills, as well as working in groups to produce a product may be a greater influence than the design of the PBL project itself. Other factors regarding personal issues out of the classroom were also observed to interfere with the students' engagement and motivation, such as changes in the school schedule and student absences. Such factors were out of the realm of control for this PBL project but are still issues that all teachers must deal with on a daily basis.

Overall, at the junior high level, the students showed a positive learning experience using Google Drive in a PBL project. At the high school level, it also showed a positive learning result for the students in several categories, even though the overall learner satisfaction decreased from the pre to post baseline survey. From Teacher-researcher H's observation, the high school students were still academically engaged but not in the PBL project itself. They were focused on college acceptances, scholarships, and other school activities.

Recommendations for Further Research

We recommend further investigations on how Google Drive and Project-Based Learning will affect students' motivation, engagement, and learner satisfaction in an environment with fewer interruptions and fewer student absences. More research is needed to further explore whether the length of a PBL lesson might have an inverse impact on student motivation.

It appears that this PBL project helped students to discover that they prefer to work alone as opposed to working with partners. This could be an interesting point for further study. Was the size of the group an issue for division of skills? Was the consistent absence of some partners due to school activities a factor?

Our final recommendation is to administer another PBL Google Drive lesson with the same group of students and evaluate if the students performed the same or with more or less engagement and motivation now that they have prior experience working with a PBL and Google Drive.