BLENDED LEARNING IN THE SCIENCE CLASSROOM

by

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ABSTRACT

This investigation utilized a blended learning environment with technologically enhanced curriculum via G Suite for Education, Schoology, and GradeSpeed to enhance classroom instruction and analyzed their effects on student communication and academic success. Students were provided individual accounts for G Suite and those accounts were enrolled in Schoology Learning Management System. These platforms allowed 103 students to discuss the class content with their peers, turn in assignments online, and have access to online textbooks, test preparation material, videos, and supplemental science information. In addition, students participated in technology enhanced and non-technology enhanced lessons to compare engagement behaviors and academic accomplishment in both settings. At the conclusion of the research, student academic performance improved with the blended learning environment.

INTRODUCTION AND BACKGROUND

Military Community

Netzaberg Middle School (NMS) is part of a rural community approximately 60 miles northeast of Nuremberg, Germany. NMS is part of the Netzaberg Community Complex, one of several small gated and guarded military enclosures attached to United States Army Garrison Bavaria. NMS is located at the northern end of the 223 square kilometers military training area and is the only American middle school in the region.

NMS students face a few unique challenges due to the nature of the military dependent lifestyle. Since USAG Bavaria is a military community, at any time a third of our students have one or both parents deployed to the Middle East or Africa. Many students experience difficulty focusing on school while a parent is deployed. They may also have extended absences of two to three weeks each time the parent prepares to deploy, is home on Rest and Relaxation, or returns from deployment. Many of our students, traveling from the furthest reaches of our community, have an hour commute each way. This distance also deters many parents from coming to school for conferences, meetings, or events. As the only middle school servicing USAG Bavaria, we are constantly looking for ways to better reach out, assist, and encourage students and their families. Effective communication is essential and only one of many reasons our school district has invested in individual student accounts for both the G Suite for Education (formerly Google Apps for Education) and Schoology Learning Management System.

School Demographics

NMS is a sixth through eighth grade middle school with a student population of approximately 570 students made up of two fifths male and three fifths female. According to the NMS Annual School Report Card (2016), the demographic of our school is composed of 59% Caucasian, 18% African-American, 1% Hispanic, 1% Pacific Islander, 4% Asian, 9% multi-ethnic or other varied ethnicities. Our military community is made up of approximately 9,000 members. This population includes 2,350 local nationals, 3,300 contractors, 1,800 military troops, and 400 retirees. Currently, the school has 67 faculty and staff members, and a Behavior Health Specialist. Of our faculty and staff, 80% are Caucasian, 10% are Hispanic, 7% are African-American, and 3% are of other backgrounds. Our female students make up 57% of the population and male students 43%. Of our 570 students, 49% are eligible for free or reduced-cost lunch. According to parent surveys, the mean income is $30,000, which is below average for the United States.

Focus Question

The seventh-grade class is comprised of 205 students who are split into two "teams," the Dark Knights and the Super Knights. In seventh grade science, the curricular focus is life science. A secondary focus is technology integrated in the scientific curriculum throughout the year. Curriculum and grading for science is mandated by Department of Defense Education Activity to include a 30% lab component. The rest of the grade is comprised of 30% summative assessments in the form of unit tests and 40% formative assessments in the form of class work, homework, and notebook

checks. Students are given the opportunity to see teachers during seminar for make-up work. In my classes, students have a problem catching up after prolonged absences. Many students will not turn in or fully complete their missed homework or classwork. Due to these factors, I was led to the focus of this action research-based classroom project: "*what are the effects of a blended learning environment on student learning and academic success, using Google's G Suite for Education, Schoology Learning Management System, and online communication with GradeSpeed web based gradebook*?"

CONCEPTUAL FRAMEWORK

With a particular focus on G Suite for Education and Schoology Learning Management System, the literature outlines the efficacy of a blended learning environment with integration of technology in education. Google Apps was renamed and rebranded as G Suite in September 2016 (Google, 2017). Google created the platform to help people everywhere work and innovate together, so they can achieve more. The Google Apps for Education (GAFE) platform is tried and true technology with its launch in October of 2006 (Page & Brin, n.d.). Schoology is slightly newer with its commercial release in August of 2009 (Moran, 2010). Features of both programs allow for collaborative study anytime, anywhere. De Bonis and De Bonis (2011) define hybrid classes, also referred to as blended learning, as involving meeting in a traditional classroom setting with the enhancement of technology. Blended learning incorporates components of both the traditional and online approaches to education (De Bonis & De Bonis, 2011). The use of face-to-face classes, one-to-one computing with semi self-

paced learning, and portability of web enhanced learning are a means to develop student ownership and proactivity. The research looks at the use of technology in the classroom as it applies to effective communication, platform compatibility, portability of learning, collaboration, and developing proactive learners.

Effective Communication

GradeSpeed, GAFE, and Schoology are all useful platforms for communication and learning, each with its own benefits. DoDEA adopted the GradeSpeed web-based grade book in 2009, as a continuous school improvement initiative. GradeSpeed allows students and parents to access a calendar of assignments, assignment rubrics, individual assignments scores, and average grade calculations anytime and anywhere, including deployed locations. Additionally, GradeSpeed allows teachers to push information and progress reports to parents' email addresses. Parents get timely communication and stay involved in the learning process of their student, ensuring student academic achievement (DoDEA, 2009). Covili (2012) indicates effective communication with parents and students can be established using the calendar, website, Gmail, and other GAFE applications. Nevin (2009) outlines the importance of calendars in communicating important class assignments and extracurricular events with students. GAFE allows teachers to convert their calendars to web pages and share access links with parents. This alleviates the flood of information via email or the absence of information due to teacher time constraints. This simple use of GAFE creates a significant decrease in parent-teacher conferences (Nevin, 2009). According to Covili (2012), a wide array of Google tools is available to promote communication and learning in and out of the classroom.

Platform Compatibility

Many of the problems caused by differing operating systems and processing platforms from home to school are alleviated by the use of GAFE and Schoology. Schoology converts third-party resources for easy inclusion in existing curriculum (Manning et al., 2011). Nevin (2009) states, the GAFE platform is compatible with most computer devices, including smart-phones. Students just need a browser and internet access to use GAFE tools. This is even more beneficial due to the availability of numerous document development and collaborative editing applications. In particular, presentation and spreadsheet applications are available through Google Apps. Lack of these types of software on home computers is often challenging for students (Nevin, 2009).

Portability of Learning

Portability allows education to move from place to place and is a major benefit of web based technology. Learners are able to access course content twenty-four hours a day, seven days a week, from anywhere in the world via the internet (De Bonis & De Bonis, 2011). GradeSpeed is accessible from anywhere, including a parent's deployed location, allowing students and parents to stay up to date and informed, regardless of location (DoDEA, 2009). According to Nevin (2009), GAFE and Schoology programs support learning through cloud computing and portability, two of the most important trends in new educational technology. A digital locker in the cloud alleviates the problem of lost or forgotten homework and or memory devices. Lost documents are a thing of the past with GAFE. Documents are automatically saved along with every

revision and the identity of each user that contributed the revision. As far as the student is concerned, the server could be anywhere in the world; the cloud location does not matter (Nevin, 2009). Weldon (2013) affirms teachers across the country have their "heads in the cloud," and cloud computing is getting the job done in education. Schneckenberg, Ehlers, and Adelsberger (2011) point out learning has evolved with technology. Education takes place at home, at leisure, and in classrooms; it is no longer limited to formal classroom instruction (Schneckenberg, Ehlers, and Adelsberger, 2011). GAFE provides the ability to collaborate without the need to be in the same place at the same time (Statucki, 2012).

Collaboration

As well as portability, GAFE and Schoology programs support collaboration through document sharing. Nevin (2009) indicates many useful document development and collaborative editing capabilities including word processing, spreadsheets, and presentation software are available through GAFE. Document sharing in the cloud allows students and teachers to create documents, web pages, videos, and more together. Collaboration has a significant effect on improving learning and student engagement (Nevin, 2009). GAFE tools develop 21st century skills in technology, collaboration, and critical thinking (Covili, 2012). Technological advancements in communication allow teachers and students to relay information and collaborate more productively. Students can even ask for input on projects before they are due, increasing the opportunity for formative assessment before final grading (Nevin, 2009).

With movements in education toward project-based learning, student collaboration is essential (Statucki, 2012). Shinsky and Stevens (2011) discuss how Web 2.0 tools are successful in engaging students in technology-based learning. These tools make collaborative learning, critical thinking, problem solving, and communication more effective (Shinsky and Stevens, 2011). Google apps allow students to use technology to produce and publish work while collaborating with other students, to master Common Core State Standards (CCSS) like conducting short research projects based on focus questions (Cohen, 2012). Students can easily work on cooperative group projects in and out of school (Cohen, 2012). Teachers can monitor student progress on projects while they are being created, including a review of the document's revision history to determine group participation (Nevin, 2009). Individual contribution can be seen by the teacher and encourages students to keep up with their fair share of the work (Nevin, 2009). Cohen (2012) outlines GAFE's ability to help students not only meet CCSS but also to achieve great things. Today's students need to be competent in communication as well as subject matter to face challenges of future employment (Schneckenberg, Ehlers, & Adelsberger, 2011).

Kist (2013) declares social networking is becoming more prevalent in today's classrooms. Social media provides the opportunity for parental involvement in the classroom without a physical presence. It can be used in collaborative communication, sharing calendars, and group chatting (Kist, 2013). GAFE format can be adapted to fit social forms of communication for use with parents and students (Covili, 2012). Schoology allows for communication much like the popular social network format called

Facebook (Manning et al., 2011). Social networking allows teachers, students, and parents to converse, send messages, update status, and share media within a whole class network (Manning et al., 2011).

Proactive Learners

According to Leese (2009), before beginning the transition to a GAFE enhanced classroom, three things must be considered: (a) prior knowledge, (b) the process, and (c) the product. Assessing prior knowledge involves students self-identifying strengths and weaknesses of their personal skill level with technology. The students should be assigned to collaborative learning groups according to their own assessment of skill level. The process incorporates heterogeneous group collaboration on tasks designed to develop key skills, such as the use of technology, ability to compromise, cooperate, and present. The product demonstrates the group's ability to peer-teach and share prior knowledge and course content on their objective. The focus should encourage peer support within groups, and garner feedback from group leaders (Leese, 2009).

Leese (2009) suggests the teachers' role is to assign learning objectives, share instructional information and provide guidance. Students approach learning proactively from a social perspective, in which they use Web 2.0 tools to accomplish the assigned objectives. They collaborate, create personalized learning environments, and not only incorporate assigned materials but expand their learning to open content from the internet (Leese, 2009). Hunt (1999) conveys the main focus of education should be the move from reactive educators to proactive learners with the added advantage of increased use of technology in the classroom. Schneckenberg, Ehlers, and Adelsberger (2011) suggest

Web 2.0 technologies are changing the face of classroom education from teacher directed to teacher facilitated learning. It is most practical to incorporate both the traditional and technological approaches to bring students to a new level of technological competency (Manning et al., 2011).

METHODOLOGY

Treatment

My classroom research project on the effects of a blended learning environment on student learning and academic success, using G Suite platform, Schoology LMS, and online communication with GradeSpeed web based gradebook was conducted over a seven-month period. Students were randomly divided into the two teams previously mentioned with five different seventh grade science classes for each team. Classes ran on a block schedule, 90 minute periods, with alternating A and B days. Periods one through four met on A day and five through eight met on B day. Three science class periods were assigned to A day (*N=59*). Two science class periods were assigned to B day (*N=44*). This division resulted in the random sample population used for treatment and nontreatment phases.

In order to determine effectiveness of a blended learning environment on student learning and academic success in science, G Suite for Education, Schoology Learning Management System, and GradeSpeed web based gradebook were incorporated widely in daily classroom operations for the treatment groups. G Suite and Schoology technology involved online review quizzes, video links, an online digital notebook in Google Slides format, and heterogeneous collaborative work groups. Internet based communication

was essential to the research. A useful feature of GradeSpeed was the assignment calendar accessible by all students and parents. The calendar contained unit outlines with due dates. A digital notebook was maintained using the Google Slides Platform, which contained class notes, topic extension videos, links to daily assignments, and technologically enhanced learning materials. Schoology provided the added bonus of automated notification emails for video worksheet and practice quiz assignments for the treatment groups. The research methodology for this project received an exemption by Montana State University's Institutional Review Board and compliance for working with human subjects was maintained (Appendix A).

Data Collection Methods

The treatment involved four phases, each approximately six weeks long. Prior to Phase 1, qualitative data were collected for the project via the Cornett Technology Critique Pretreatment Student Survey to establish baseline data (Appendix B). Information was collected on students' skill level, knowledge, familiarity, and comfort with blended learning and technologically enhanced curriculum. The data were analyzed for all of my seventh grade science students who completed a Google Forms copy of the survey in class (*N=83*). Descriptive statistics were calculated and analyzed to identify significant trends for each question. Parents were asked to complete the Cornett Technology Critique Pretreatment Parent Survey to confirm student baseline data (Appendix C). The parent survey was distributed as a Google Form link through e-mail. The data were analyzed for the parent surveys returned and responses were examined to identify trends for each question (*N=43*). Student and parent responses were compared to

verify the data validity. The surveys utilized a Likert response system where respondents could *strongly agree, agree,* be *neutral, disagree, or strongly disagree* to each statement.

During Phase 1, blended learning was not yet implemented. Students were not provided access to technologically enhanced learning resources. This provided a baseline of student academic performance based on average 1st quarter grades. For Phase 2 A day classes were provided with technologically enhanced lessons while B day classes were not. During Phase 3 the treatment group was switched from A day to B day classes. Phase 4 incorporated blended learning with technological enhancements for all classes and continued throughout the rest of the year with special attention to select projects. During the fourth phase, students also completed a research report on a disease of their choice. G Suite allowed students to collaborate with each other both in and out of the classroom. Students were assigned to a collaboration group of three to five students with a heterogeneous mixture of academic ability. Phases and treatment groups are listed in the following table (Table 1).

Table 1
Phase Treatment Group Matrix

Phase/Group	A Day Group	B Day Group
Phase 1	Nontreatment	Nontreatment
Phase 2	Treatment	Nontreatment
Phase 3	Nontreatment	Treatment
Phase 4	Treatment	Treatment

Following Phase 4, after all students had progressed through the treatment, students and parents were surveyed again for self-perceived changes in skill level, knowledge, familiarity, and comfort with blended learning and technologically enhanced curriculum. Cornett Technology Critique, Posttreatment surveys were used to identify

changes in trends and perceived benefit of blended learning to academic success and communication skills (Appendices D & E). The surveys again utilized a Likert response system where respondents could *strongly agree, agree,* be *neutral, disagree, or strongly disagree* to the statement given. The survey response data were analyzed for the 93 students and eight parents. The descriptive data for the posttreatment survey results were compared to the pretreatment survey results. The surveys were administered through Google Forms and were evaluated by comparing the pre and post survey results, looking for themes related to change in self-identified level of ability in computer and communication skills as well as self-identified change in academic progress due to blended learning. For the open-ended portion of the survey, the response information was organized into specific themes and sub-themes. In order to answer the research questions, these themes were analyzed as they related to the different technology methods implemented such as online textbooks, GradeSpeed calendar, Schoology assignments, digital notebook, and collaboration features of G Suite.

In each phase, quantitative data was collected through comparison and analysis of the treatment and non-treatment groups' academic achievement using student quarterly average science grades and unit test scores. Students completed pre- and post-tests for each unit in phases 2-4. The resulting data for pre- and post-tests in each phase were compared and descriptive statistics were analyzed for averages including mean, median, and mode. The resulting normalized gain <g> were calculated from each set of scores. Average normalized gain <g> was calculated from the individual gains and compared for

significant differences between treatment and nontreatment groups as well as between phases.

In each phase, qualitative data was collected through comparison and analysis of the treatment and non-treatment groups' engagement with technologically enhanced activities as compared to traditional activities. Students in the treatment group had access to G Suite and Schoology enhanced curricular content. They were required to access the content, view a video, and complete a practice quiz using Schoology, while being observed during class, to determine the extent of student engagement with technologically enhanced curriculum in a blended learning environment as compared to without. An observation checklist was used to determine engagement and compare treatment group behavior to nontreatment group behavior (Appendix F). During phase 4 students were assigned to collaborative groups and selected diseases to research. Each student researched a different disease. All students had access to G Suite, Google Docs with chat, comment, and edit tools. After completing the research paper and peer review based on a checklist style rubric, students were given the opportunity to rate their experience in collaborative groups (Appendix G). Teacher observation and field notes were used throughout the treatment for qualitative data collection. A triangulation matrix was included to show the variety of data collection instruments that were used throughout the study. Additionally, the focus questions were listed and paired with the data collection techniques (Table 2).

Table 2
Data Triangulation Matrix

Research Focus Question	Data Source 1	Data Source 2	Data Source 3
Does use of G Suite and Schoology enhanced curriculum help increase students' academic achievement in science?	Student Quarterly Average Grades	Pretreatment and Posttreatment Student and Parent Technology Surveys	Teacher Observation
Does use of G Suite and Schoology enhanced curriculum increase students' communication skills in science?	Google Doc Collaboration Group Disease Research Rubric Peer Review	Pretreatment and Posttreatment Student and Parent Technology Surveys	Teacher Observation
Do students remain on task and engaged during Google Apps and Schoology enhanced lessons?	Schoology - Video and Practice Quiz Scores	Student Engagement Checklist	Teacher Observation

DATA AND ANALYSIS

For the treatment period, 103 seventh grade students were introduced to a blended learning environment. These students were provided with increased opportunities to use various forms of technologically enhanced curriculum and communication tools via G Suite and Schoology programs. Results from data collection were separated into three categories: Student Academic Performance, Student Communication Skills, and Student Engagement.

Student Academic Performance

Baseline data indicates first quarter B day students earned a 9% higher mean grade, 10% higher median grade, and a 13% higher mode grade compared to those earned by A day students (Table 3). Upon further inspection and statistical analysis using a two-tailed student's t-test, with alpha level 0.05, it was determined that the two groups were not as different as a first glance at descriptive statistics indicated. For comparison of the

two groups' mean Quarter 1 grades, the P value returned is 0.00, and the null hypothesis that there is no statistically significant difference between these two sets of data is not rejected. On mean Terra Nova grades, the P value returned is 0.02, and the null hypothesis is again not rejected. Therefore, the difference between the two groups is not statistically significant, and they can be assumed to be part of the same population for the purpose of this investigation.

Table 3
Baseline Academic Data Descriptive Statistics

	Terra Nova Test						SRI		Average Science Grade			
	R	L	M	Sci	SS	Mean	Fall	Spring	Q1	Q2	Q3	Q4
Descriptive Statistics (All Students)												
Mean	68	62	60	62	69	64	1076	1122	77	73	70	72
Median	71	64	62	68	72	66	1077	1138	80	77	74	77
Mode	94	87	60	73	94	58	909	1268	82	93	86	100
Descriptive Statistics A Day (Students 1-59)												
Mean	64	56	55	59	64	60	1051	1093	73	70	68	68
Median	66	59	60	61	66	60	1069	1095	75	74	70	77
Mode	50	59	60	76	55	58	909	1277	82	77	79	77
Descriptive Statistics B Day (Students 60-103)												
Mean	73	69	65	65	74	70	1110	1162	82	77	73	77
Median	76	71	69	69	76	72	1125	1169	85	83	80	85
Mode	53	93	80	73	94	81	1226	1319	95	93	86	100

Note. R=Reading, L=Language Arts, M=Math, Sci=Science, SS=Social Studies, SRI=Scholastic Reading Inventory, Q1=First Quarter, Q2=Second Quarter, Q3=Third Quarter, and Q4=Fourth Quarter.

The ranges of all student pre- and post-test scores, for Phases 2-4, are broken down by unit and quartile in the following box and whisker plots (Figure 1). Boxes represent the inter-quartile range (25th to 75th percentile), and whiskers indicate the minimum and maximum values. The statistical median is represented by the vertical line

within each box. The statistical mean is represented by the x within each box with the numerical value labeled below the box. Comparison of the pre- and post-test box and whisker plots shows moderate improvement in test scores for each quartile.

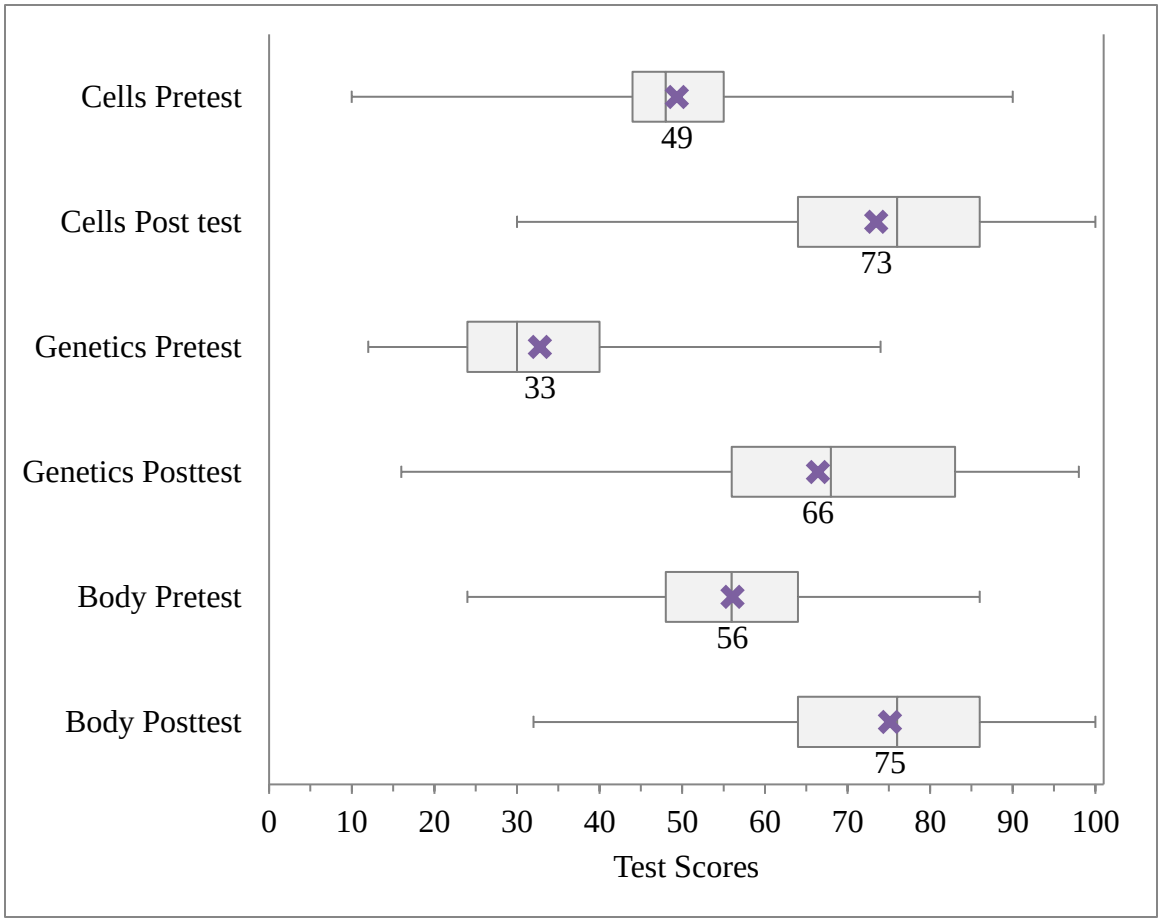

Figure 1. Box and Whisker plot showing quartiles of raw score from Phase 2 (Cells Unit) pre-test and post-test, (N = 83), Phase 3 (Genetics Unit) pre-test and post-test, (N = 83), and Phase 4 (Body Unit) pre-test and post-test, (N = 83).

For each phase of the switched methodology descriptive summary data of students' pre- and post-test scores were calculated and used to compare treatment and nontreatment groups (Table 4). This data was analyzed for differences from each phase and quartile. Average test scores showed an overall improvement of 24% throughout all groups and phases.

Table 4
Group Pre- and Post-Test Score Descriptive Statistics

	Cells Unit Test		Genetics Unit Test		Body Unit Test	
Student #	Pre	Post	Pre	Post	Pre	Post
Descriptive Statistics All Students						
Mean	49	73	33	66	56	75
Median	48	76	30	68	56	76
Mode	48	78	30	68	54	86
Descriptive Statistics A Day Students						
Mean	48	72	32	67	58	72
Median	46	76	28	66	56	72
Mode	44	78	30	68	54	86
Descriptive Statistics B Day Students						
Mean	51	76	34	66	54	80
Median	48	76	32	70	54	82
Mode	48	76	32	70	54	100

The descriptive statistics for all student pre- and post-test scores, for Phases 2-4, were broken down by phase and group in the following bar graphs (Figures 1-3). The green entries represented *mode*. The red entries represented *median*. The blue entries represented *mean*. Comparison of the pre- and post-test descriptive statistics showed only slight variations between mean, median, and mode for each group and each test.

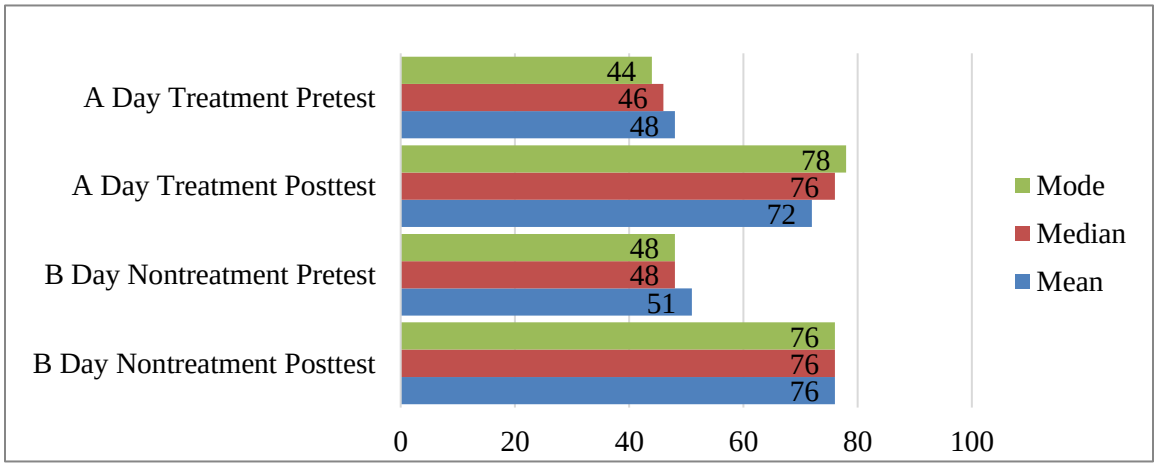

Figure 2. Phase 2 Cells Unit Test Descriptive Statistics

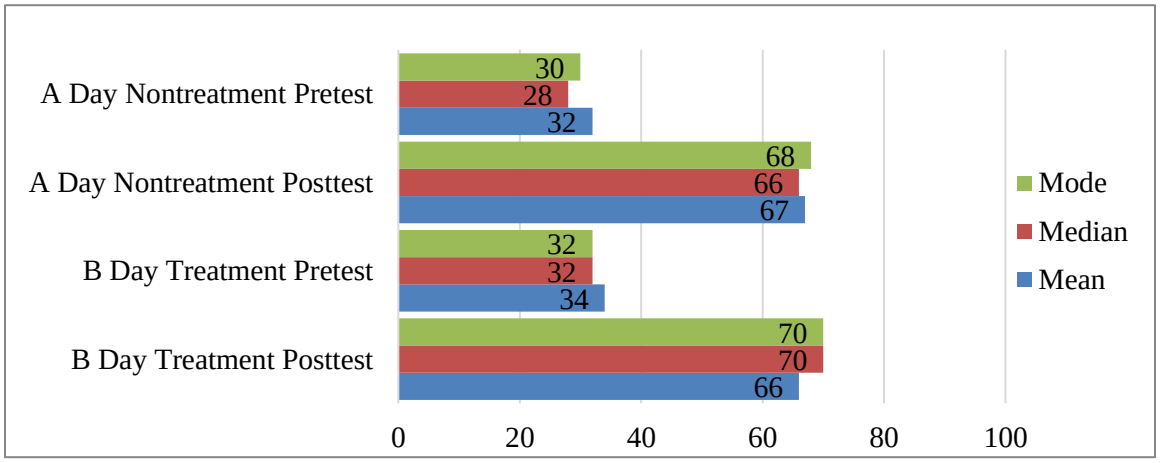

Figure 3. Phase 3 Genetics Unit Test Descriptive Statistics

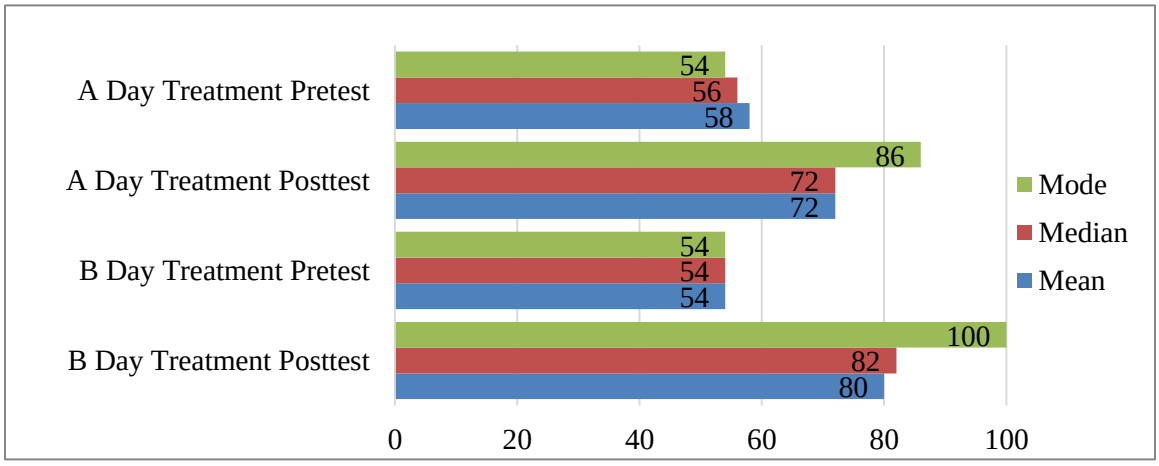

Figure 4. Phase 4 Body Unit Test Descriptive Statistics

For each phase of the switched methodology individual normalized gain <g> were calculated and used to compare treatment and nontreatment groups. Descriptive statistics for normalized gain were calculated from the set of individual normalized gain <g> (Table 5). The resulting average normalized gain <g> for all phases fell between 0.3 and 0.6. According to Hake (1998), these values indicated moderate overall improvement. This was true for both treatment and nontreatment groups, with or without technological enhancement. The slight difference between treatment and nontreatment groups indicated a weak correlation of improvement associated with the blended learning environment, but a correlation none the less. This was supported by a student who said, "I think using Schoology and Google Apps helps me on my assignments and if I need more help I can use Gmail."

Table 5
Phase Group Normalized Gain <g> Descriptive Statistics

Phase	A Day			B Day		
Phase 2 Cells Test	Treatment Normalized Gain <g>	Mean Median Mode	0.45 0.54 0.00	Nontreatment Normalized Gain <g>	Mean Median Mode	0.55 0.55 0.50
Phase 3 Genetics Test	Nontreatment Normalized Gain <g>	Mean Median Mode	0.49 0.51 0.00	Treatment Normalized Gain <g>	Mean Median Mode	0.42 0.46 0.00
Phase 4 Body Test	Treatment Normalized Gain <g>	Mean Median Mode	0.34 0.31 0.00	Treatment Normalized Gain <g>	Mean Median Mode	0.48 0.54 0.00

The range of all students' normalized gain, for Phases 2-4, is broken down by unit and quartile in the following box and whisker plots (Figure 5). The range of normalized gain as indicated by the box and whisker plot is fairly evenly distributed, with a wide

margin from low gains beginning at <g> = -0.2 to high gains at <g> =1. The chart shows the majority of the students above the moderate gain threshold of <g> = 0.3. Average normalized gain has been proven as a rough measure of the effectiveness of a course in promoting conceptual learning. The average normalized gain from these tests were calculated at <g>= 0.5 for Phase 2 (Cells Unit), <g>= 0.5 for Phase 3 (Genetics Unit), and <g>= 0.4 for Phase 4 (Body Unit). This signifies a medium range of gain and supports overall effectiveness of instructing students in the selected science concepts.

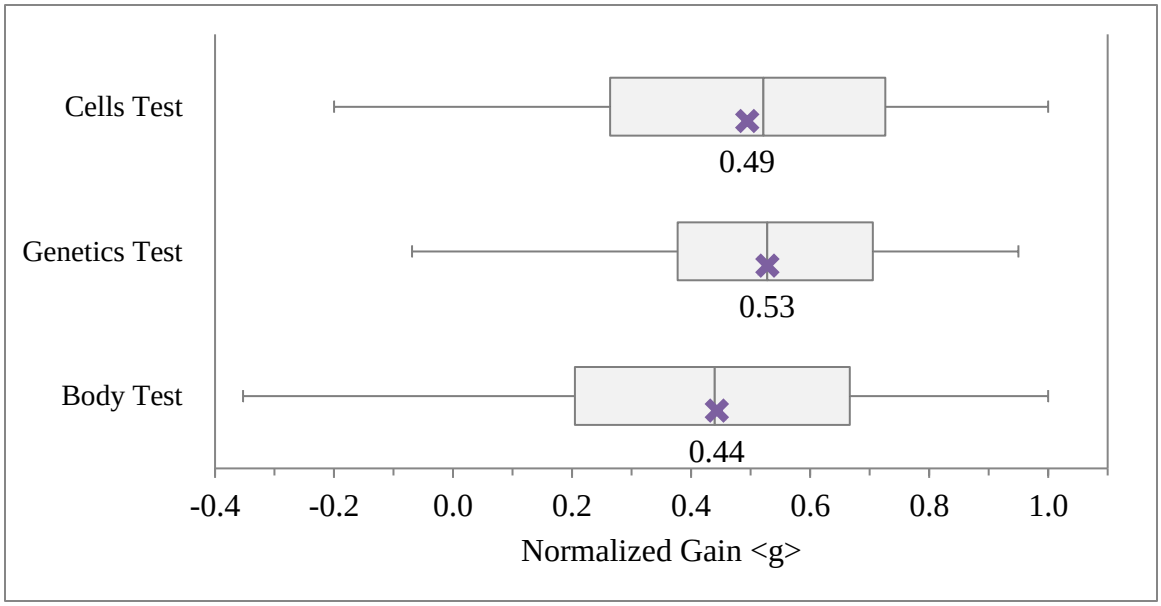

Figure 5. Box and whisker plot showing quartiles of normalized gain <g> calculated using all student scores from Phase 2 (Cells Unit) pre-test and post-test, (*N* = 83), Phase 3 (Genetics Unit) pre-test and post-test, (*N* = 83), and Phase 4 (Body Unit) pre-test and post-test, (*N* = 83).

The range of A day compared to B day average normalized gain, for Phases 2-4, was broken down by unit, group, and quartile in the following box and whisker plots (Figure 6). The average normalized gain from both the treatment and nontreatment groups for all phases also fell within the medium range of gain.

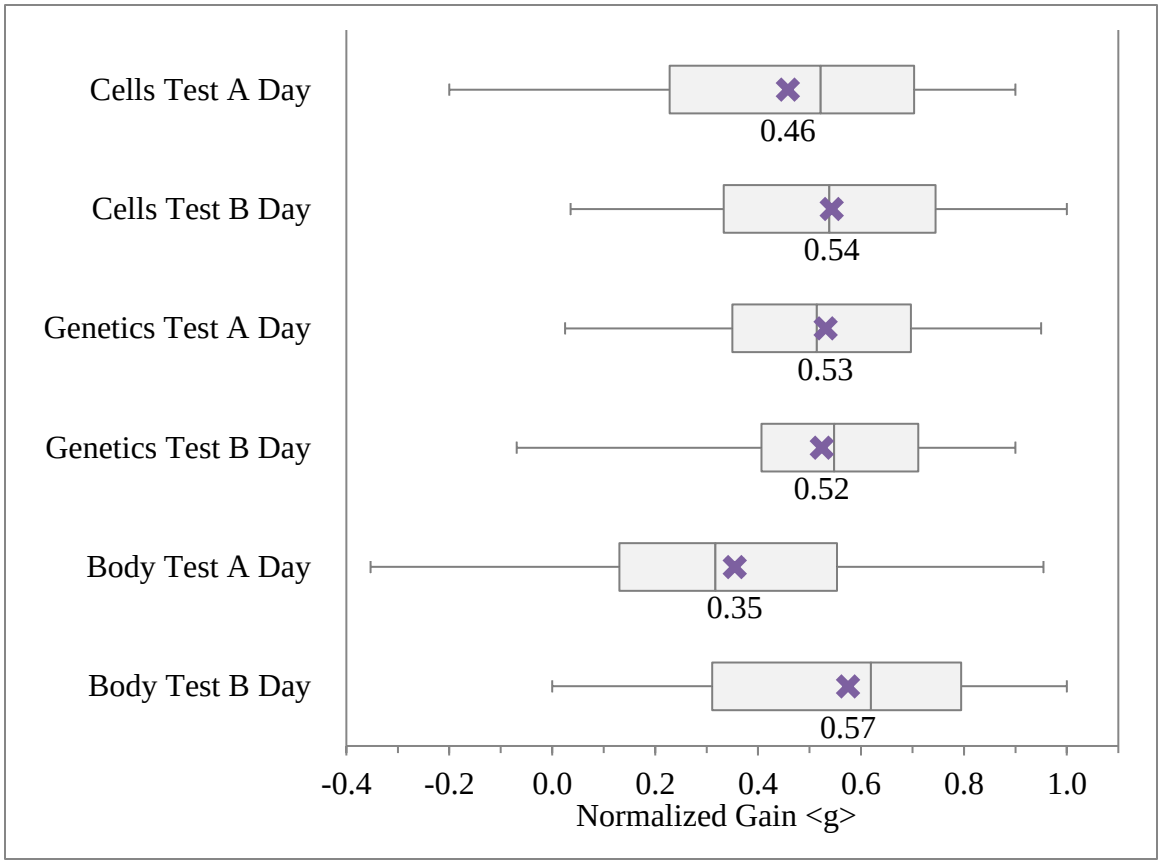

Figure 6. Box and whisker plots showing quartiles of normalized gain calculated using student scores from Phase 2 A day (Cells Unit) pre-test and post-test, (N = 49), Phase 2 B day (Cells Unit) pre-test and post-test, (N = 34), Phase 3 A day (Genetics Unit) pre-test and post-test, (N = 49), Phase 3 B day (Genetics Unit) pre-test and post-test, (N = 34), Phase 4 A day (Body Unit) pre-test and post-test, (N = 49), Phase 4 B day (Body Unit) pre-test and post-test, (N = 34).

The range of A day compared to B day pre- and post-test scores, for Phases 2-4, was broken down by unit and quartile in the following box and whisker plots (Figures 7-9). Comparison of the pre- and post-test box and whisker plots showed moderate improvement for each quartile and each group.

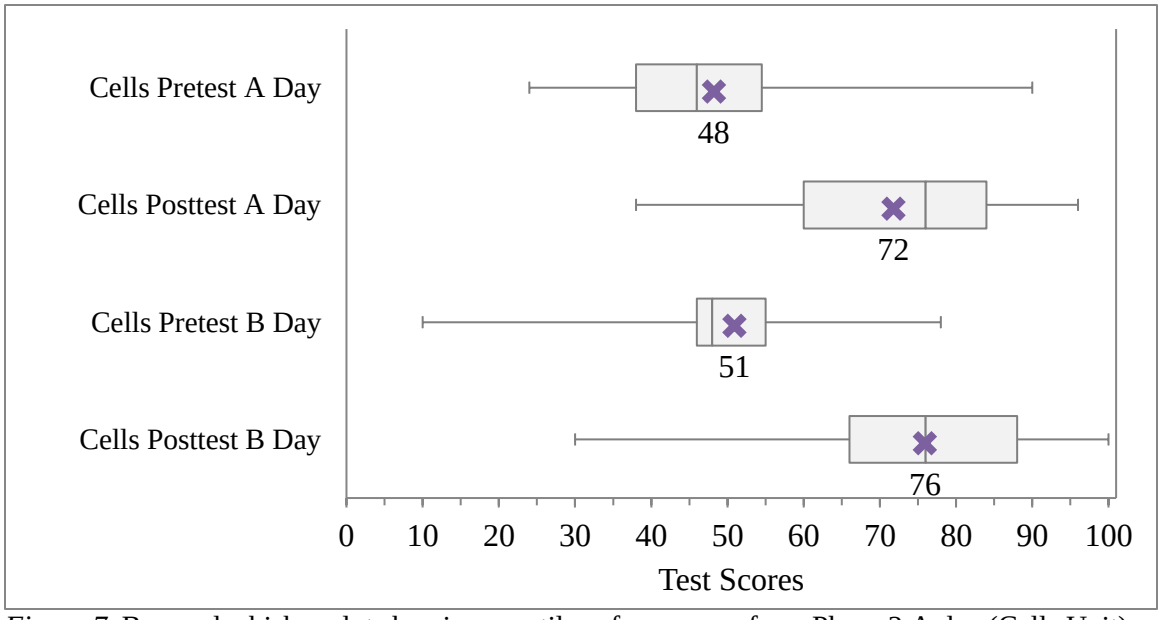

Figure 7. Box and whisker plot showing quartiles of raw score from Phase 2 A day (Cells Unit) pre-test and post-test, (N = 49), Phase 2 B day (Cells Unit) pre-test and post-test, (N = 34).

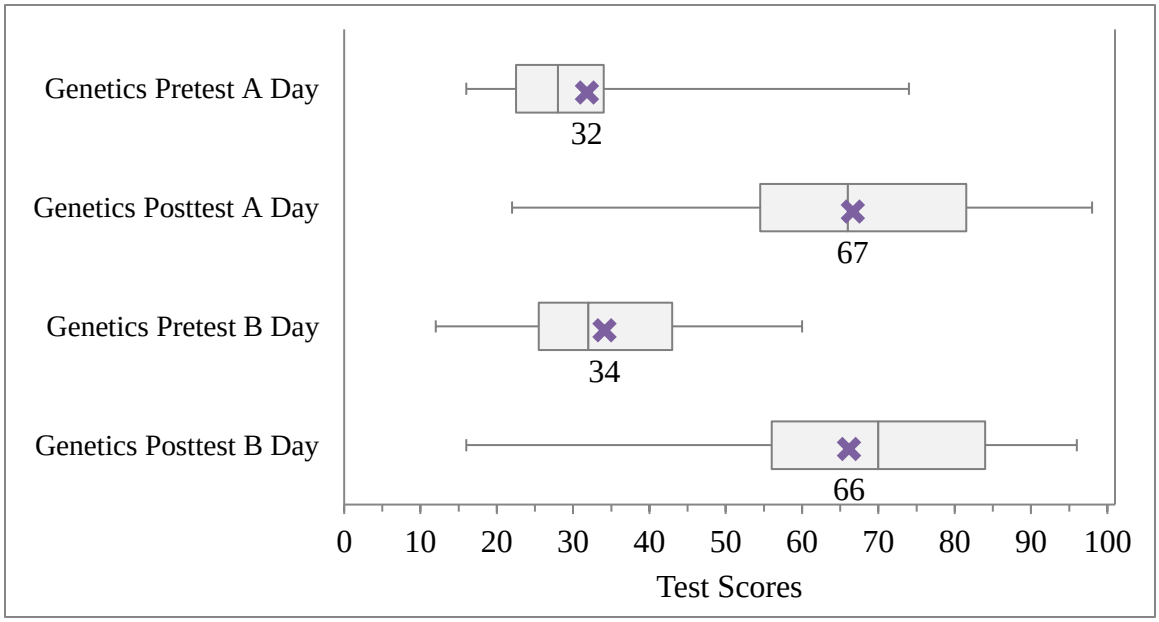

Figure 8. Box and whisker plot showing quartiles of raw score from Phase 3 A day (Genetics Unit) pre-test and post-test, (N = 49), Phase 3 B day (Genetics Unit) pre-test and post-test, (N = 34).

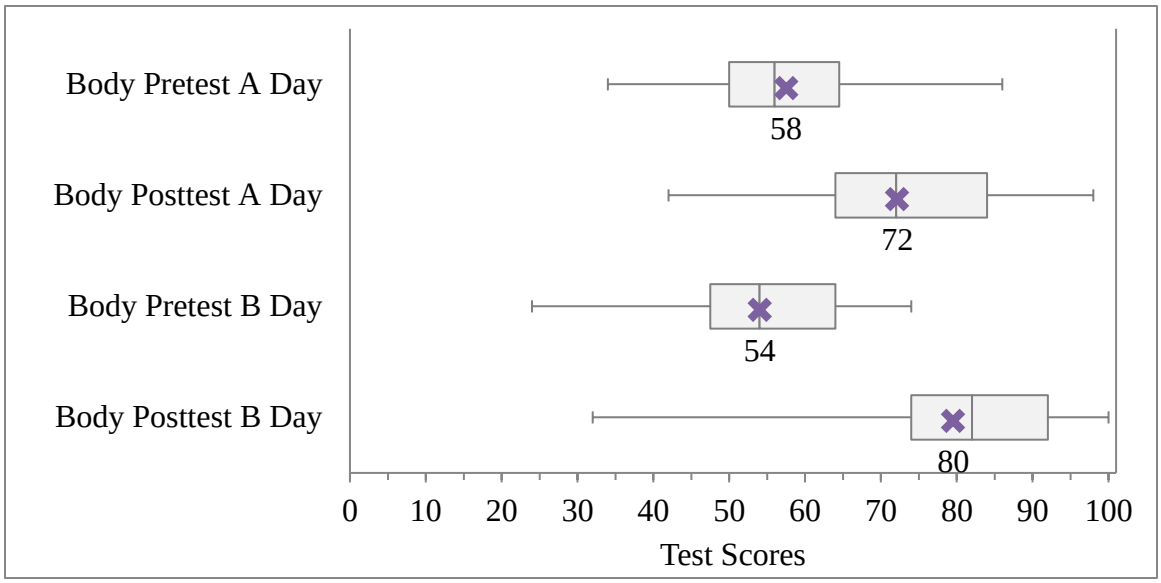

Figure 9. Box and whisker plot showing quartiles of raw score from Phase 4 A day (Body Unit) pre-test and post-test, (N = 49), Phase 4 B day (Body Unit) pre-test and post-test, (N = 34).

The data seemed fairly similar upon visual inspection and comparison of descriptive statistics. However, statistical analysis tells us a different story. A two-tailed student's t-test, with an alpha level of 0.05, on post-test scores and average normalized gain indicated the null hypothesis could be rejected for comparison during Phase 2 and Phase 3 in which the switched methodology was applied. The same statistical analysis on post-test scores and average normalized gain indicated the null hypothesis could not be rejected for comparison of Phase 4 results in which the treatment was applied to both groups. For Phase 2 post-test scores, comparing A day scores to B day scores, the P value returned was 0.23. For Phase 2 normalized gain, comparing A day individual students' gains to B day individual students' gains, the P value returned was 0.14. During Phase 2 the treatment of technologically enhanced curriculum was applied to only A day classes. For Phase 2 the null hypothesis that there is no statistically significant

difference between these two sets of data was rejected. For Phase 3 post-test scores, comparing A day scores to B day scores, the P value returned was 0.90. For Phase 3 normalized gain, comparing A day individual students' gains to B day individual students' gains, the P value returned was 0.28. During Phase 3 the treatment of technologically enhanced curriculum was applied to only B day classes. For Phase 3 the null hypothesis that there is no statistically significant difference between these two sets of data was rejected. For Phase 4 post-test scores, comparing A day individual students' gains to B day individual students' gains, the P value returned was 0.02. For Phase 4 normalized gain, comparing A day gains to B day gains, the P value returned was 0.03. During Phase 4 the treatment of technologically enhanced curriculum was applied to both A day and B day classes. For Phase 4 the null hypothesis that there is no statistically significant difference between these two sets of data was not rejected.

The survey data for each of the presurveys were tallied and displayed in the following stacked bar graphs (Figures 10 & 11). The blue and light blue entries represented some degree of *agreement*. The purple entries represented *neutral*. The pink and red entries represented some degree of *disagreement*.

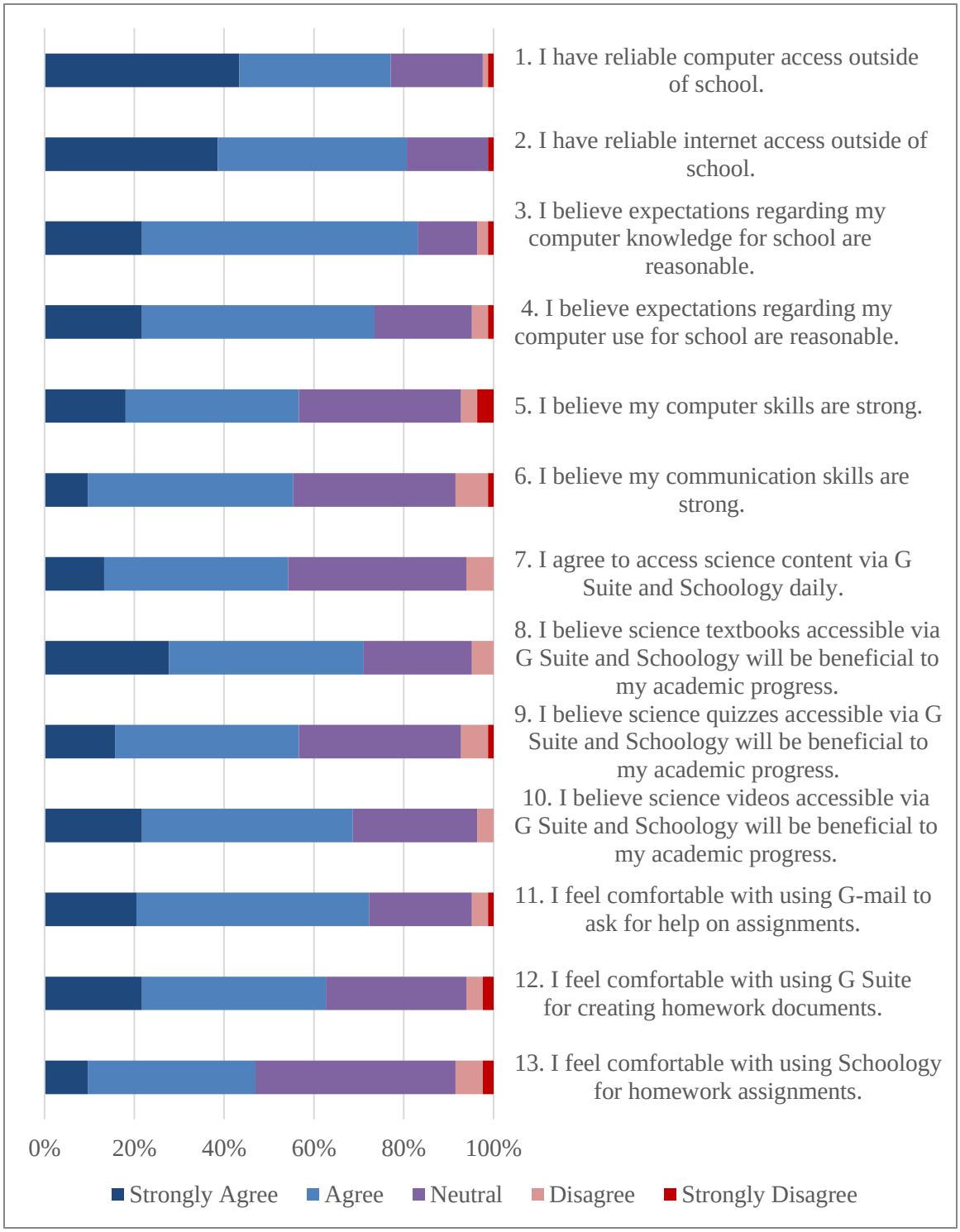

Figure 10. Cornett Technology Critique, pretreatment student survey results, (*N*=83).

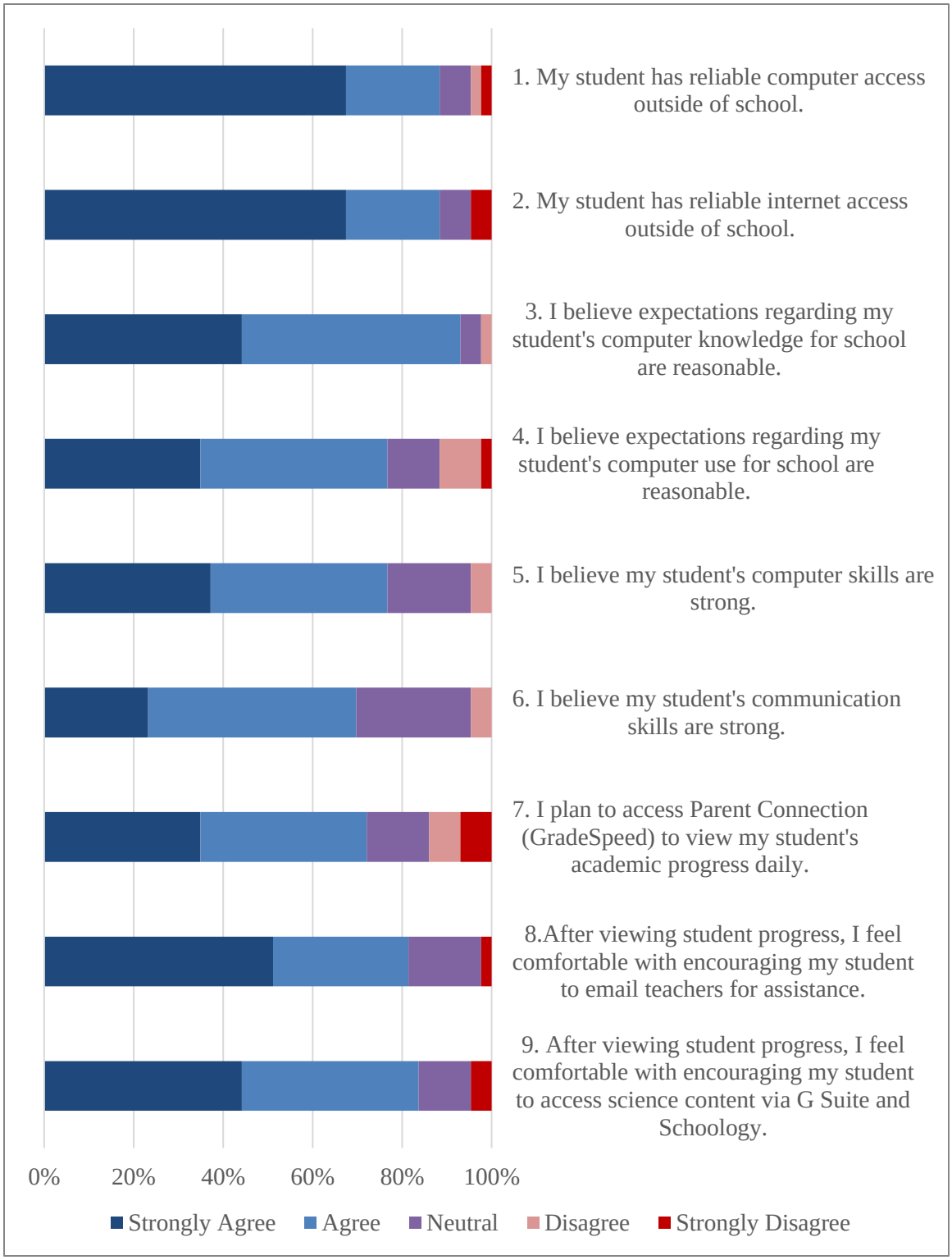

Figure 11. Cornett Technology Critique, pretreatment parent survey results, (*N*=43).

The survey data for each of the post surveys were tallied and displayed in the following stacked bar graphs (Figures 12 & 13). The blue and light blue entries represented some degree of *agreement*. The purple entries represented *neutral*. The pink and red entries represented some degree of *disagreement*. The results of the Cornett Technology Critique, Posttreatment Student Survey indicated more than 65% of students agreed that their academic achievement in science benefited from the technological enhancements of the blended learning environment. This was supported by a student who commented, "Working at my own pace has helped me because it makes me feel like I have more time." The textbook available through G Suite was the category most students indicated as beneficial, at 76% agreement. One student stated, "I believe the online text books were very helpful." Although, the Schoology videos and practice quizzes categories also showed a moderately high response of agreement to their benefits. One student even remarked, "I like using Schoology to take quizzes." In the survey comments, a significant number of students indicated the digital science notebook, available through Google Slides, was the most helpful feature. Student remarks specified the links to all the other materials and notes were very helpful. One student remarked, "I find the notebook helpful because it is easier to catch up on notes and get to Schoology."

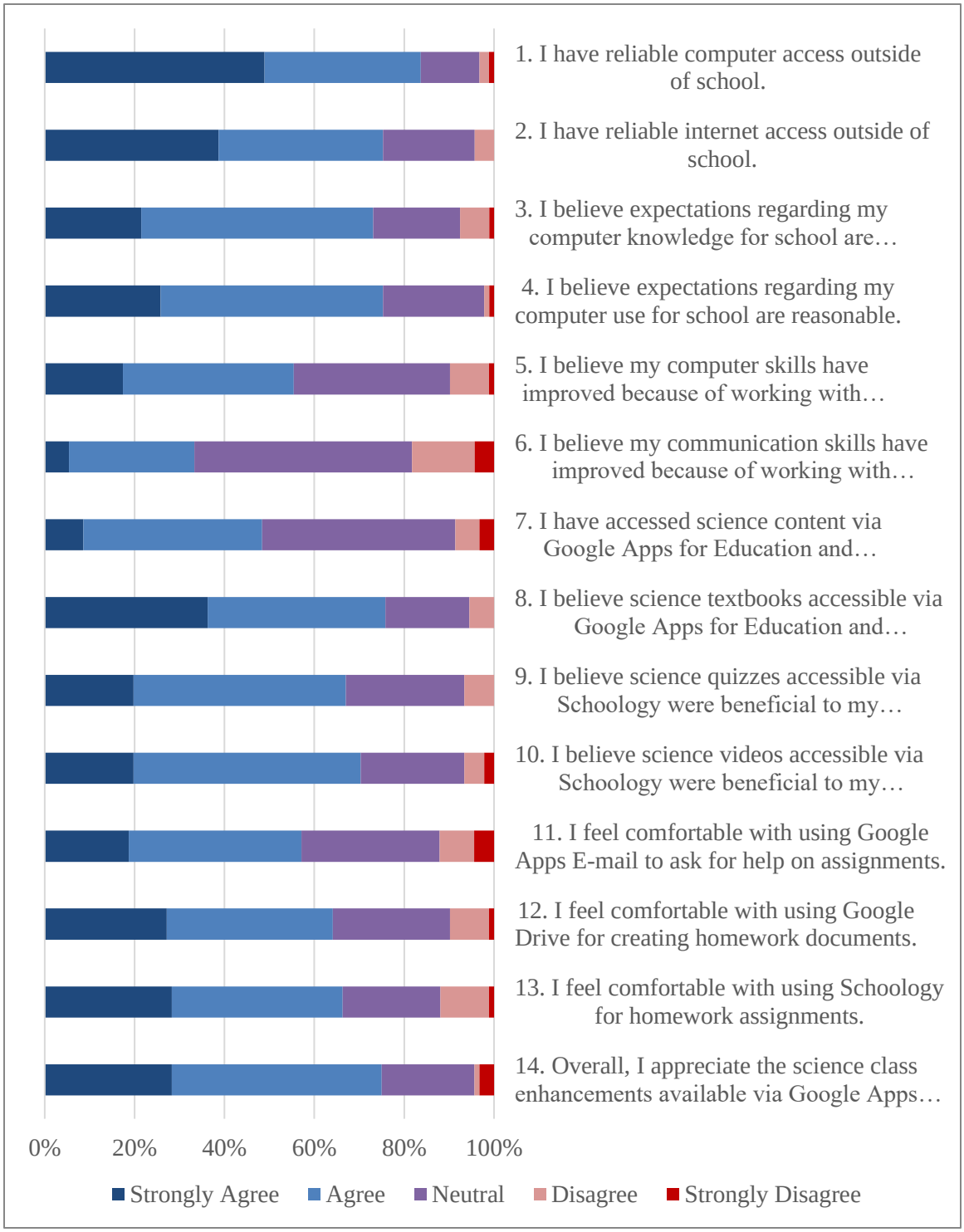

Figure 12. Cornett Technology Critique, posttreatment student survey results, (*N*=83).

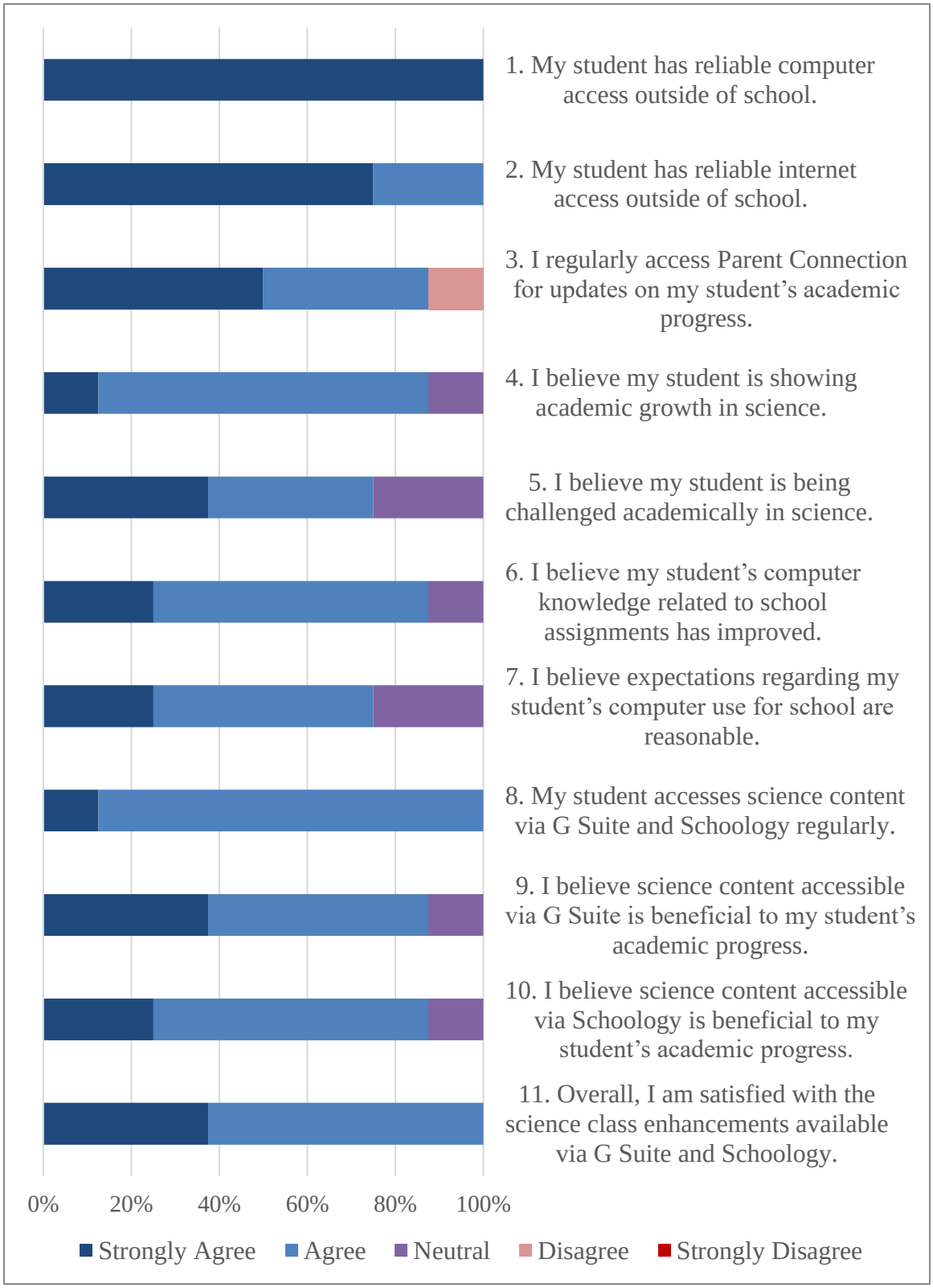

Figure 13. Cornett Technology Critique, posttreatment parent survey results, (*N*=8).

Student Communication Skills

Survey results showed 55% of students agreed that their computer skills increased. More than 30% of students self-identified as having improved communication skills due to technological enhancements. Based on teacher observation and scores using the Disease Research Rubric and Peer Review, collaborative groups made vast improvements to students' abilities to communicate research in writing. After completing peer grading based on a checklist style rubric, students were given the opportunity to rate their experience in collaborative groups (Appendix G). Students were asked, "Using a scale from 1-5 with 1 being poor, and 5 being excellent, how well did your group work together?" Overall responses were positive; 98% of students selected values between 3 and 5 which indicated good to excellent experience with collaborative groups (Figure 14). No students selected *poor* to rate their experience.

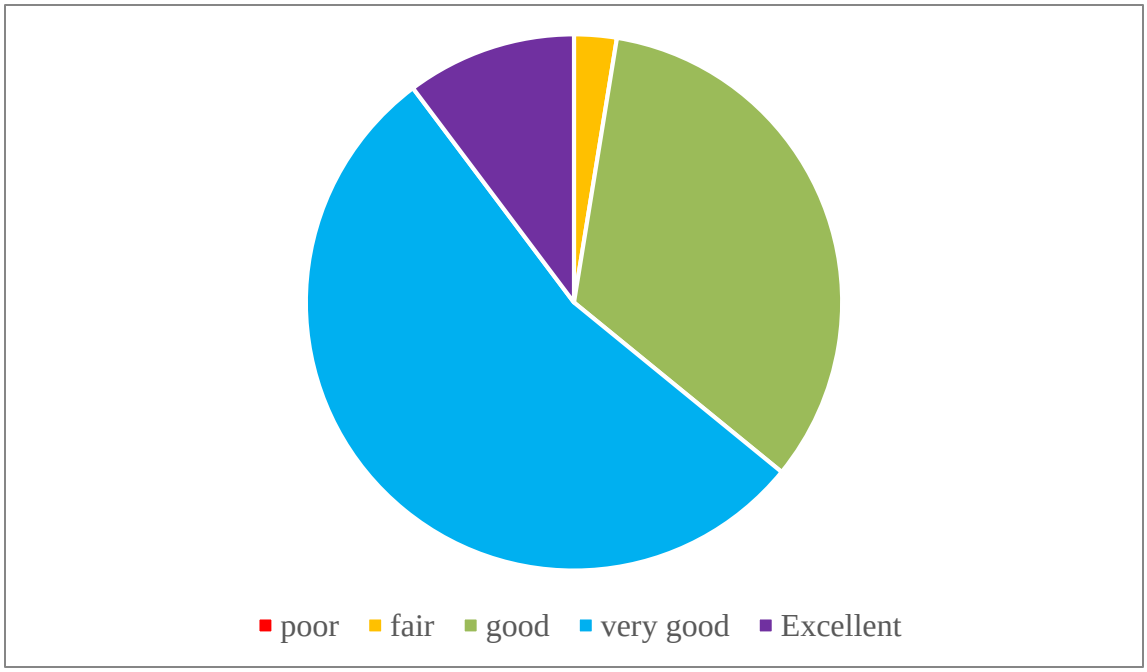

Figure 14. Disease Research Rubric and Peer Review collaborative group experience rating, (*N*=39).

One student commented this about their group, “They gave me very helpful feedback that probably brought up my grade a lot.” Another student commented, “Everyone has different strengths and it’s best to use them to their ability.” Another student even remarked on how this would help them succeed far into the future, “I learned that being in a group lets people work together and improve on explaining things. It will apply to future activities by being a benefit to jobs.”

Student Engagement

The Student Engagement Checklist results were tallied and organized in the following data table (Table 6). The data were also displayed in the following bar graphs (Figures 15-18). Results showed no significant difference in the overall engagement of treatment group compared to nontreatment group during traditional video quiz activities compared to the Schoology version of the assignment. Based on teacher observation, there were several individual students that were able to focus on the video more with the Schoology version. The headphones and personal screen seemed to minimize distractions. This was supported by a student who said, “Working at my own pace has helped me because it makes me feel like I have more time.” Another student stated, “Working at my own pace definitely gave me low stress levels.” There were just as many students that seemed to think being provided a computer meant this was an opportunity to explore the internet. This was supported by one student’s remark on the disease research peer review, “they got distracted a lot by the computer.” The same applies to the traditional viewing of videos in class. There were several students that were able to focus on the video more without the distractions of the computer and

internet at their fingertips. It was significant to note that these were two different sets of students that were disengaged for each type of learning activity. It was a different set of students who were better able to focus with the Schoology and online assignments than it was who were better able to focus with the traditional methods of learning.

During Phase 4 students were given more flexibility in use of time for Schoology assignments and book work. Unfortunately, the increased freedom seemed to result in less work completed during the class period which meant more homework for students.

Table 6
Student Engagement Checklist Results

	Eyes on assigned task or speaker.	Appropriate posture.	On topic and on task	Completes work thoroughly and well.	Interferes with peer's work.	Doesn't seem to know what is going on in class.	Cells Video Quiz Score	Life Cycles Video Quiz Score	Eyes on assigned task or speaker.	Appropriate posture.	On topic and on task	Completes work thoroughly and well.	Interferes with peer's work.	Doesn't seem to know what is going on in class.	Genes Video Quiz Score	GD Genetics Video Quiz Score
	Cells Unit								Genetics Unit							
	A Day Treatment								A Day Nontreatment							
	A Day Frequency						Mean		A Day Frequency						Mean	
1=Never	4	4	4	3	30	23	74	60	3	3	3	2	32	26	75	78
2=Almost Never	2	1	2	3	11	9			5	4	6	6	12	9		
3=Sometimes	6	3	10	8	3	8			6	4	9	7	3	8		
4=Almost Always	12	13	8	11	1	3			14	14	10	15	3	6		
5=Always	23	26	23	22	2	4			25	28	25	23	3	4		
	B Day Nontreatment								B Day Treatment							
	B Day Frequency						Mean		A Day Frequency						Mean	
1=Never	1	1	1	1	23	21	81	89	1	1	1	1	24	24	76	79
2=Almost Never	1	1	1	1	7	9			1	1	1	1	7	7		
3=Sometimes	7	7	7	7	4	4			5	5	5	5	3	3		
4=Almost Always	7	7	7	8	1	1			5	5	5	6	1	1		
5=Always	20	20	20	19	1	1			24	24	24	23	1	1		

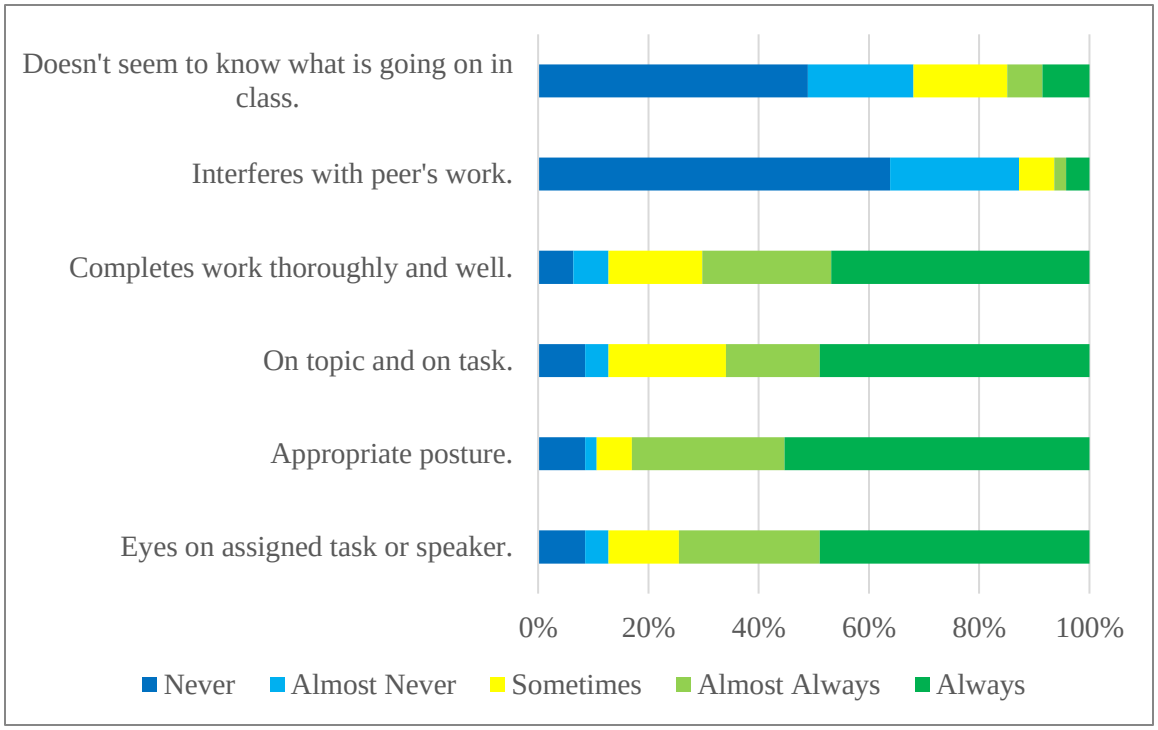

Figure 15. Engagement checklist A day treatment group results, (*N*=53).

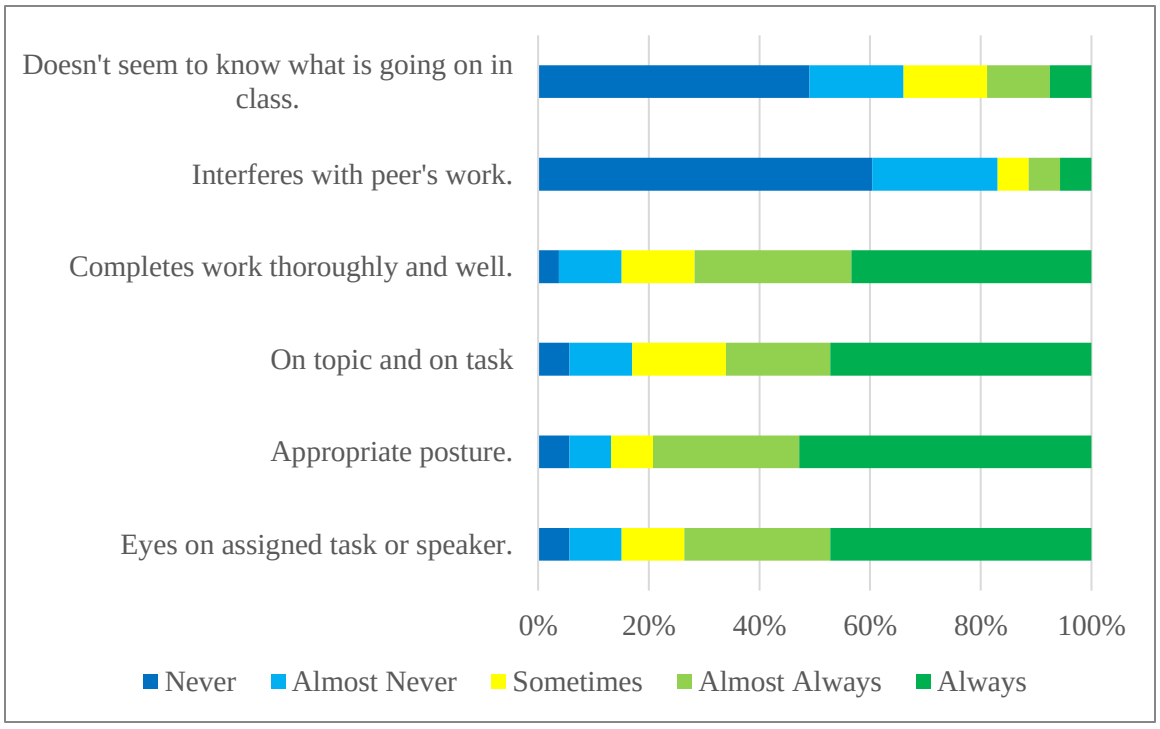

Figure 16. Engagement checklist A day nontreatment group results, (*N*=53).

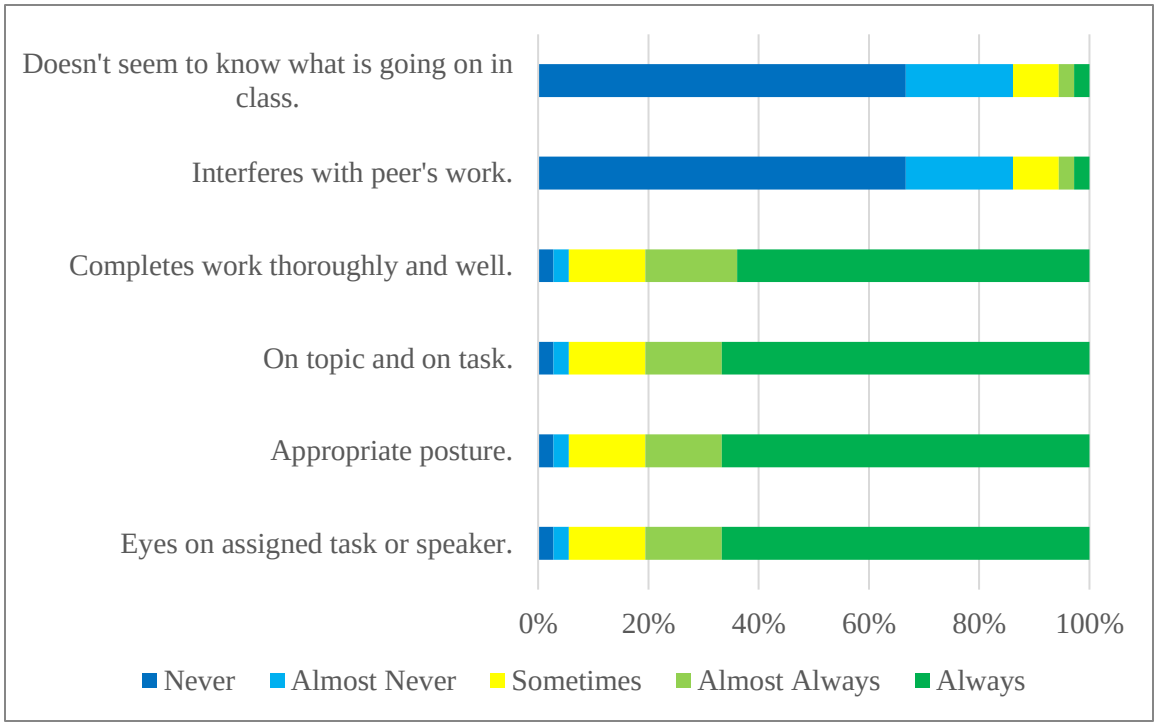

Figure 17. Engagement checklist B day treatment group results, (*N*=36).

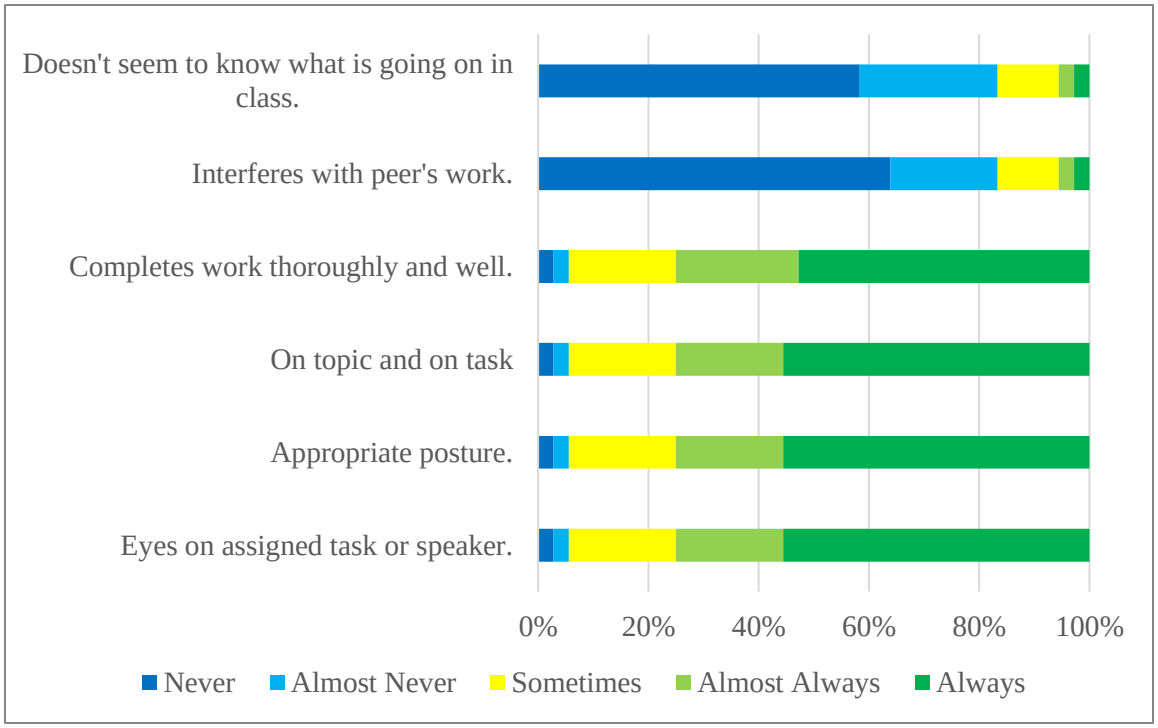

Figure 18. Engagement checklist B day nontreatment group results, (*N*=36).

INTERPRETATION AND CONCLUSION

This study indicated that a blended learning environment could improve or at least maintain academic grades in science, increase the communication skills of the students, and keep students engaged as much as the classic learning environment. It also provided the students with a less stressful method of learning.

Student Academic Performance

As for my main research topic on whether or not a blended learning environment affects student learning and academic success, students' average quarter grades did not show marked improvement when fourth quarter science grades were compared to first quarter science grades. Using a student's t-test to compare the two quarters resulted in no statistically significant difference from first quarter average science grade to fourth quarter average science grade. Although traditionally, student engagement, motivation, and average science grade saw a decrease in fourth quarter. We tend to blame this on better weather in the Bavaria region and family vacations to European destinations that are more easily accessible and affordable while living in Europe. This year's stabilization of average grades from quarter to quarter was actually an improvement over previous years' fourth quarter drop. Therefore, in regards to my first sub-question, whether or not the use of G Suite and Schoology enhanced curriculum helped increase students' academic achievement in science, findings supported the claim when compared to previous years' trends. Less than 10% of students disagreed with the posttreatment survey statements in regards to academic benefit of the online textbook, quizzes, and videos accessible through G Suite and Schoology. This was supported by a student who

said, “I think using Schoology and Google Apps helps me on my assignments.” Another student stated, “I would like it if we were given a class to show how all assignments using Google Docs are formatted.”

Despite being issued a standardized daily agenda by the school to keep track of classwork and homework, students did say that they rely heavily on the GradeSpeed calendar and Schoology notices to stay on top of assignments. In the comments section of the survey, one student even remarked, “Being able to check GradeSpeed to see upcoming assignments was helpful to me.” Another student indicated that these features were helpful for absent students as well with the comment, “When I missed a day, I could just check on the online science notebook to see the work we did in class.”

Student Communication Skills

My second focus question posited use of G Suite enhanced curriculum increased students’ communication skills in science. According to the data, the students did write a better research report when provided a group support structure and the use of comment, chat, and edit features of Google Docs. The number of students that engaged in outright plagiarism decreased to zero this year, compared to 20 percent in previous years. I frequently heard students use comments similar to the student that said, “that doesn’t sound like you wrote it.” The paperless format allowed more time for the editing process. Sharing papers digitally within collaboration groups provided support and the assistance many students needed in and out of school. Students seemed to enjoy reading about and engaging in discussion on the different diseases assigned. They asked why we didn’t “do that” with the previous two short research projects on elements and genetics.

Students seemed to find the most value from peer to peer interactions and group discussions as opposed to the individual Schoology assignments. This study provided evidence that a blended learning environment has its benefits even if not the best solution for middle school students.

Student Engagement

My third focus question related to whether students remain on task and engaged during Google Apps and Schoology enhanced lessons. I have noticed when placed in front of a computer, as I like to phrase it, students tend to "get lost in Google Land." I felt it was important to look into this because often unlimited resources of the internet become a distraction and inhibit assignment completion. Student engagement was measured using an observation checklist. Of note, many of my socially distracted students were more focused when the headphones were put on and better able to complete the task at hand. Whereas many of my more successful students were off task with the computer and its vast font of knowledge. Unfortunately, the Spider-Man comic books got it right, that "*with great power there must also come–great responsibility!"* The on task behavior in the classroom had to be managed very closely. As noted before, student engagement was assessed as fairly even when traditional learning was compared to blended learning environment. Different students are engaged in different ways by different methods of learning. One student even remarked in the survey comments, "we should take a vote on who should do Schoology and who should work on a work sheet." Another student remarked, "Working at my own pace definitely gave me low stress levels." Seventh grade students may be too immature to stay on task with a completely

flipped class. However, the semi self-paced component of a blended learning environment proved beneficial for students.

A significant number of student remarks on the posttreatment survey were positive toward the use of Schoology for work missed due to absence. The total number of missing assignments showed a decreasing trend with each new quarter as access to technological enhancements increased. For total missing assignments from all possible assignments, the trend progressed as follows: 233 or 11% first quarter, 210 or 10% second quarter, 177 or 9% third quarter, and 107 or 7% fourth quarter. A cursory review of the frequency of missing assignments related to absence for each quarter indicated a decreased percentage from 33% of assignments related to absence remaining missing for both first and second quarter, to only 25% of assignments related to absence remaining missing for both third and fourth quarter. This indicates students were getting more of the daily work completed due to online access of assignments.

VALUE

Being involved in this project opened my eyes to the worth of group interaction and discussion. Students actually valued the guided discussion component of my classes. This made me feel appreciated in my role as an instructor. This also brought me to the realization, no matter how much technology we incorporate into education, the role of a teacher truly is irreplaceable. As a teacher, I was even more transparent than usual with my students about my procedures and the purpose behind them. I shared my educational goals and the reason for my research. I discovered a couple of things through sharing the process with my students each step of the way. My students became my partners in this

process. They were truly interested in my research and their realization that I was as much a learner as they were made the process more meaningful for them. Feedback from students provided a wealth of data, but peer and self-evaluation also instilled confidence in the students' abilities as learners. They provided constructive, thoughtful, insightful remarks about their own learning process. Through the use of blended learning strategies, students gained more empowerment and responsibility over their own education. I expected the students to get a little side tracked by the technology on occasion, and although they took the occasional opportunity to get off task, they truly valued the advantages that GradeSpeed, G Suite, and Schoology provided, especially as an organizational tool. Everything they needed was online and accessible at any time allowing them to take control of their learning. They were fully capable of maintaining focus and enjoyed helping each other. Digital tools really did improve the writing process and student communication. I was able to provide feedback through the digital editing and comment features quickly and easily for all students in a timely manner. Students gained more confidence in their communication skills with this process. Students used the Gmail feature of G Suite frequently for simple inquiries to the teacher as well as their collaborative group members. This simple application of technology left valuable seminar time free for use with students in need of more in-depth assistance.

Schoology was an extremely useful tool from the teacher point of view. It eliminated some of the more simplistic yet time consuming grading tasks with the automated grading feature. This eradicated the need for the often used, and unfortunately often abused by less honest students, method of swapping papers and checking each other

for a grade. However, the intent of the Schoology assignments was not just less grading on my part. It took students a while to really understand and take advantage of the added benefit of being able to rewind and review segments of video and retake quizzes for a better grade. Students were able to learn more from the videos with this feature. One student remarked that they "still miss the group discussion after the video." Other students chimed in their agreement. Schoology did work well for absent students to catch up on videos outside of school instead of valuable Seminar time. This was supported by the student who said, "I think being able to access the videos on Schoology is a good way to be able to catch up on my assignments and work at my own pace." I have looked into clickers for future video quiz activities in order to take a mixed approach to activities. This will maintain the automated grading feature that was extremely helpful for me, and instantaneous feedback for students, all while still maintaining the group focus, discussion, and review that many students valued most.

College and Career Ready Standards are being implemented by all Department of Defense schools over the next few years. With our new standards, students will be using literacy strategies in every subject. They will be working in collaborative group settings in all of their core classes. I plan on using the Google chat, comment, and edit features available through G Suite for all three of the science research projects that I assign with future classes. Collaborative grouping and peer review will also be used with those projects. Students seemed to engage more with the research materials when they were expected to defend and or edit their writing based on comments and suggestions of peers. I will also start the year out with the option to redo the less subjective assignments using

Schoology in order to offer students the option to improve their grade. If all I have done is introduce students to a new way of learning and prepared them for the next wave in education, then I count the blended learning environment as a success. It is semi-chaotic, yet with a modicum of structure it could provide just the right amount of flexibility needed by our community of military families.

REFERENCES CITED

Cohen, S. (2012). Apps meet the common core state standards in writing. *Teacher Librarian, 40(2*), 32-39.

Covili, J. J. (2012). *Going Google: Powerful tools for 21st century*. Thousand Oaks, CA: Corwin.

De Bonis, S., & De Bonis, N. (2011). Going green: Managing a paperless classroom. *Online Submission, US-China Education Review A*(1), 83-87.

DoDEA. (2015-2016). Annual School Report Card: Netzaberg Middle School [Data file]. Retrieved June 11, 2017, from https://webapps.dodea.edu/SRC/src.cfm?Type=school&SY=2015-2016&School_Code=46302&selAREA=Europe&selDISTRICT=Bavaria

DoDEA. (2009). GradeSpeed Web-Based Progam. Retrieved June 11, 2017, from http://www.dodea.edu/gradespeed/

Google. (2017). About the name change from Google Apps to G Suite - G Suite Administrator Help. (n.d.). Retrieved June 11, 2017, from https://support.google.com/a/answer/7126147?hl=en

Hake, R. R. (1998). Interactive-engagement versus traditional methods: A six-thousand-student survey of mechanics test data for introductory physics courses. *American Journal of Physics*, *66*(1), 64-74.

Kist, W. (2013). Class get ready to tweet: Social media in the classroom. *Our Children: The National PTA Magazine, 38*(3), 10-11.

Leese, M. (2009). Out of class — out of mind? The use of a virtual learning environment to encourage student engagement in out of class activities. *British Journal of Educational Technology*, *40*(1), 70–77.

Manning, C., Brooks, W., Crotteau, V., Diedrich, A., Moser, A., & Zwiefelhofer, A. (2011). Tech tools for teachers, by teachers: Bridging teachers and students. *Wisconsin English Journal*, *53*(1), 24–28.

Moran, G. (2010). The rise of the virtual classroom. *Entrepreneur Magazine, 38*(10), 112.

Nevin, R. (2009). Supporting 21st century learning through Google Apps. *Teacher Librarian, 37*(2), 35-38.

Page, L. & Brin, S. (n.d.). *Our history in depth*. Retrieved February 26, 2014, from https://www.google.com/about/company/history/

Schneckenberg, D., Ehlers, U., & Adelsberger, H. (2011). Web 2.0 and competence-oriented design of learning-Potentials and implications for higher education. *British Journal of Educational Technology*. *42*(5), 747-762.

Shinsky, E. J., & Stevens, H. A. (2011). Teaching in educational leadership using Web 2.0 applications: Perspectives on what works. *Journal of Research on Leadership Education, 6*(5), 195-215.

Statucki, C. (2012). There's an app for that Google Apps for Education**.** *Techniques: Connecting Education & Careers, 87*(5), 8-9.

Weldon, D. (2013). Choosing a cloud: Entire counties and states are moving away from locally hosted e-mail and document-sharing software. The big question they have to answer: Google Apps or Microsoft 365?. *T H E Journal (Technological Horizons in Education),* 40(3), 36-40.

APPENDICES

APPENDIX A

IRB APPROVAL LETTER

MONTANA
STATE UNIVERSITY

INSTITUTIONAL REVIEW BOARD
For the Protection of Human Subjects
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Administrator:
Cheryl Johnson
406-994-6783
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MEMORANDUM

TO: Johnnie Lynn Cornett and John Graves

FROM: Mark Quinn Mark Quinn cmj

DATE: January 26, 2015

RE: *"Technologically Enhanced Learning via Google Apps for Education and Schoology" [JC012615-EX]*

The above research, described in your submission of **January 20, 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.

APPENDIX B

CORNETT TECHNOLOGY CRITIQUE PRETREATMENT STUDENT SURVEY

Cornett Technology Critique Pretreatment Student Survey

Thank you for taking the time to fill out the survey; we need the information for curriculum improvement planning. For each statement, please check the appropriate box. Participation or non-participation in this survey will in no way affect your progress or grade in the class.

1. I have reliable computer access outside of school.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
2. I have reliable internet access outside of school.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
3. I believe expectations regarding my computer knowledge for school are reasonable.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
4. I believe expectations regarding my computer use for school are reasonable.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
5. I believe my computer skills are strong.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
6. I believe my communication skills are strong.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
7. I agree to access science content via G Suite and Schoology daily.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
8. I believe science textbooks accessible via G Suite and Schoology will be beneficial to my academic progress.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
9. I believe science quizzes accessible via Schoology will be beneficial to my academic progress.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
10. I believe science videos accessible via Schoology will be beneficial to my academic progress.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
11. I feel comfortable with using G-mail to ask for help on assignments.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
12. I feel comfortable with using G Suite for creating homework documents.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
13. I feel comfortable with using Schoology for homework assignments.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

Comments: _____

APPENDIX C

CORNETT TECHNOLOGY CRITIQUE PRETREATMENT PARENT SURVEY

Cornett Technology Critique Pretreatment Parent Survey

Thank you for taking the time to fill out the survey; we need the information for curriculum improvement planning. For each statement, please check the appropriate box. Participation or non-participation in this survey will in no way affect your child's progress or grade in the class.

1. My student has reliable computer access outside of school.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
2. My student has reliable internet access outside of school.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
3. I believe expectations regarding my student's computer knowledge for school are reasonable.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
4. I believe expectations regarding my student's computer use for school are reasonable.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
5. I believe my student's computer skills are strong.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
5. I believe my student's communication skills are strong.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
6. I plan to access Parent Connection (GradeSpeed) to view my student's academic progress daily.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
7. After viewing student progress, I feel comfortable with encouraging my student to email teachers for assistance.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
9. After viewing student progress, I feel comfortable with encouraging my student to access science content via G Suite and Schoology.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
11. I would like to receive communication from my student's science teacher about:	Behavior	Upcoming work	Late or missing work	Upcoming Projects or tests	Other (specify in comments)
12. The following are effective means of communication for me:	Student Agenda	Email	Phone	Parent Connection	Other (specify in comments)

Comments: _____

APPENDIX D

CORNETT TECHNOLOGY CRITIQUE POSTTREATMENT STUDENT SURVEY

Cornett Technology Critique Posttreatment Student Survey

Thank you for taking the time to fill out the survey; we need the information for curriculum improvement planning. For each statement, please check the appropriate box. Participation or non-participation in this survey will in no way affect your progress or grade in the class.

1. I have reliable computer access outside of school.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
2. I have reliable internet access outside of school.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
3. I believe expectations regarding my computer knowledge for school are reasonable.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
4. I believe expectations regarding my computer use for school are reasonable.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
5. I believe my computer skills have improved because of working with Google Apps for Education and Schoology in science.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
6. I believe my communication skills have improved because of working with Google Apps for Education and Schoology in science.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
7. I have accessed science content via Google Apps for Education and Schoology daily.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
8. I believe science textbooks accessible via Google Apps for Education and Schoology were beneficial to my academic progress.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
9. I believe science quizzes accessible via Schoology were beneficial to my academic progress.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
10. I believe science videos accessible via Schoology were beneficial to my academic progress.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
11. I feel comfortable with using Google Apps E-mail to ask for help on assignments.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
12. I feel comfortable with using Google Drive for creating homework documents.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
13. I feel comfortable with using Schoology for homework assignments.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
14. Overall, I appreciate the science class enhancements available via Google Apps for Education and Schoology.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

Comments: _____

APPENDIX E

CORNETT TECHNOLOGY CRITIQUE POSTTREATMENT PARENT SURVEY

Cornett Technology Critique Posttreatment Parent Survey

Thank you for taking the time to fill out the survey; we need the information for curriculum improvement planning. For each statement, please check the appropriate box. Participation or non-participation in this survey will in no way affect your child's progress or grade in the class.

1. My student has reliable computer access outside of school.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
2. My student has reliable internet access outside of school.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
3. I regularly access Parent Connection for updates on my student's academic progress.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
4. I believe my student is showing academic growth in science.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
5. I believe my student is being challenged academically in science.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
6. I believe my student's computer knowledge related to school assignments has improved.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
7. I believe expectations regarding my student's computer use for school are reasonable.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
8. My student accesses science content via G Suite and Schoology regularly.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
9. I believe science content accessible via G Suite is beneficial to my student's academic progress.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
10. I believe science content accessible via Schoology is beneficial to my student's academic progress.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
11. Overall, I am satisfied with the science class enhancements available via G Suite and Schoology.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

Comments: _____

APPENDIX F

STUDENT ENGAGEMENT CHECKLIST

Student Engagement Checklist

1st Observation	Never	Almost Never	Sometimes	Almost Always	Always
Eyes on assigned task or speaker.					
Appropriate posture.					
On topic and on task					
Completes work thoroughly and well.					
Interferes with peer's work.					
Doesn't seem to know what is going on in class.					
Cells Video Quiz Score					
Life Cycles Video Quiz Score					
2nd Observation	Never	Almost Never	Sometimes	Almost Always	Always
Eyes on assigned task or speaker.					
Appropriate posture.					
On topic and on task					
Completes work thoroughly and well.					
Interferes with peer's work.					
Doesn't seem to know what is going on in class.					
Genes Video Quiz Score					
Greatest Discoveries Genetics Video Quiz Score					

APPENDIX G

DISEASE RESEARCH RUBRIC AND PEER REVIEW

DISEASE RESEARCH RUBRIC AND PEER REVIEW

INTRODUCTION
__Interest Piece/Hook (Famous person/shocking information)

HISTORY
__Who discovered this disease
__How this disease was discovered
__When this disease was discovered
__Current levels (number of people)
__Where prevalent (occurs most often)
__Where Outbreak, Epidemic, or Pandemic (pathogenic)
__When Outbreak, Epidemic, or Pandemic (pathogenic)
__Region, Culture, or Race of origin (genetic)

CAUSE IF GENETIC
__How disorder is inherited (mutation/ dominant/recessive/sex-linked)
__Chromosome associated
__Gene associated
__Environmental/Chemical Trigger

CAUSE IF PATHOGENIC
__Type of pathogen (virus/bacteria/ protist/fungi/other parasite)
__Scientific name of pathogen
__Natural Environment of pathogen (climate/water/soil/animal)
__How disease is transmitted to human (STD/airborne/casual contact/ vector)

SYMPTOMS
__Progression in order and length
__Organ System(s) Affected and How
__How your body reacts (fever/pain/rash /open sores/tumors)
__Prevention (vaccination/ avoid trigger)
__Treatment (Medicine/Cure/Surgical intervention/Special Diet/Therapy)

PROGNOSIS
__Life or Death (Mortality rate, % chance of survival)
__Length of time disease takes to run its course
__Lasting after effect or permanent damage
__Special care (assistance/education/ prosthetic/mechanical device)

CONCLUSION
__Summary
__Point to the future

RESOURCES
__Book (print or digital)
__Database (Scientific Journal Article)
__CDC.gov/WHO.int/genome.gov
__Foundation Website
__Any other reputable resource

PEER REVIEW
On a scale of 1-5, how well did your group work together? _____
1=poor 2=fair 3=good 4=very good 5=excellent
List the behaviors of your peers that were particularly helpful to your progress. _____
List the behaviors of your peers that were particularly obstructive to your progress. _____
What did you learn about working with a group from this project that you will apply to your future group activities? _____