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Effects of Collaborative Action Research and Biology Journaling Notebooks on High School Student Achievement

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EFFECTS OF COLLABORATIVE ACTION RESEARCH AND BIOLOGY JOURNALING NOTEBOOKS ON HIGH SCHOOL STUDENT ACHIEVEMENT

By

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THESIS

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ABSTRACT

EFFECTS OF COLLABORATIVE ACTION RESEARCH AND BIOLOGY JOURNALING NOTEBOOKS ON HIGH SCHOOL STUDENT ACHIEVEMENT

By

Elsa Joan Clark Clement

This thesis is based on two teachers' collaborative action research project implemented to increase student learning in their high school biology classes. This objective was accomplished by utilizing a biology notebook to increase organizational skills. While working on this project, the researchers became convinced of the value of the action research (AR) methodology for educational improvement and witnessed the benefits of collaboration during the procedure. The flexibility of this particular action research project resulted in significant grade improvements in both classrooms. While taking on more responsibility for their daily assignments, 61 % of my students improved their term grades, 78% improved their multiple-choice scores and 70% raised their essay scores. The substantial increase in essay scores went from a pre-intervention average of 63.7% to a post-intervention average 84.1%. The students' writing improvement was attributed to journaling activities' for the biology notebook. My classroom had many students who had been struggling academically and had a history of attendance and discipline problems, yet by the end of this project all of my students had only positive comments regarding the course and this action research project.

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This thesis follows the format prescribed by the APA Publication Manual and the Department of Education.

PREFACE

EFFECTS OF COLLABORATIVE ACTION RESEARCH AND BIOLOGY JOURNALING NOTEBOOKS ON HIGH SCHOOL STUDENT ACHIEVEMENT

By

Elsa Joan Clark Clement

in recognition of the collaboration of

Wendy Hill Manson

This thesis is based on two teachers' collaborative action research project implemented in their high school biology classes. While working on this project, we became convinced of the value of the action research (AR) methodology for educational improvement and were strongly encouraged to expand this into a thesis paper. Collaboration is promoted in AR because, although it can be very time consuming, it has many benefits, which lead to an improved product. After our tedious joint work it was at first difficult to divide our work while recognizing the preliminary work of both teachers. It would be impossible to separate the early stages where ideas were shared so freely that we found each other completing the other's sentences. From here, we focused on the unique characteristics of our very distinct classrooms. We established priorities for our divergent classes and proceeded independently to implement journals stressing the components that would best fit the needs of our individual students. After separate analysis of our students' resulting assessments and survey responses and with our individual conclusions in hand, we joined together to consider the increased database and to add collaboration to our conclusions.

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Chapter 1: Introduction

In recognition of Galileo's work, Newton asserted, "If I have seen far, it is because I have stood on the shoulders of giants" (Gonick & Huffman, 1990, p. 21). His foundational laws of physics eventually lifted mankind to the moon, but this process requires yet another amazing force that Newton recognized. This force can assist the first uncertain steps of a young child or make possible the bouncy lunar steps of an astronaut. It is the force of collaboration, without which progress is slow and uncertain. Action research, an emerging methodology for intervention, development, and change in many professions, utilizes and stresses teamwork to achieve this progress. By focusing on shared problems, action research encourages collaboration and recognizes its important role in the quest to solve problems. "Teachers, like other professionals, perform more effectively-even exponentially so-if they collaborate" (Schmoker, 1999, p. 7). This thesis is based on an action research project born out of frustration associated with current educational trends. Action research collaboration was the fire that lifted two researchers' spirits and focused them on their educational goals rather than educational frustrations. In the field of science education, educators are considering the "less is more" strategy of teaching because rushing through many ideas does not allow students the time to master these ideas and doesn't bode well for retaining information (Benton-Kupper, 1999; Olsen, 1995). Science is an example of a discipline where United States schools have two to three times as much the content to cover than other countries (U.S. Department of Education 1998). The idea behind the "less is more" philosophy is teaching fewer concepts would allow more detail so greater understanding of science should develop; the

concern is fewer ideas will be addressed. The researchers in this project have no plans to debate the pros and cons of this on-going science education dilemma other than to suggest the debate has expanded in intensity because of the many demands placed upon the educational system. They focused instead on current “less AND more” trends of education. As teacher researchers, they realized the profession of education has fewer of the things all educators know truly matter for a quality education and more of the things that hinder educational progress. Examples of less and more include shorter classroom teaching periods and larger classes, fewer support personal and more higher needs students in difficult classes, and less preparation time and more subjects to teach.

With higher demands and less resources, this project was undertaken with a high frustration level. These researchers were determined to minimize the negative effect these educational realities were having on their students. With caring eyes the researchers simply asked, “What can teachers do to help their students succeed?” The answer for this situation does not rest in settling for a “less is more” strategy, as simply teaching fewer concepts is not a satisfactory solution. Instead, these teacher-researchers looked into the many challenges facing students and sought specific ways to support them throughout their learning process. The cornerstone of this project was the implementation of a biology notebook designed to address shared concerns and this was expanded to include a blend of many educational theories. The researchers found action research to be a practical tool to analyze and adjust their teaching methods.

Action research (AR) is a type of research done while actually teaching and provides teachers the opportunity to test out educational ideas through collaborative efforts while incorporating practical and relevant change within their own classroom

(Mertler 2006). Researchers in this project isolated and focused on shared immediate concerns: instructional time, student organization and student motivation, (TOM). The methods employed were simple, inexpensive, and relatively easy to incorporate into the curriculum. The project's flexibility allowed each teacher to address the concerns of their drastically different student populations with the common tool of an organized biology notebook. The method design established classroom procedures to allow the teachers more time for instruction in their content areas. The spirit of collaboration and the realization that the methods employed in this project are readily adaptable to other courses led the researcher to create a problem-solving table to be used by teachers interested in incorporate these techniques for their own classes (Table 1).

Table 1

Problem Solving Table

PROBLEM	HOW THE PROBLEM WAS ADDRESSED IN THIS PROJECT
Disorganized student	Daily logs Numbered assignments attached in notebook
Frustrated student	Mastery quizzes with retakes on content later needed for tests
Low motivation	Journaling and discussions Time now available for interesting demonstrations
Absenteeism	Neighbor's help by sharing their log entries for makeup information
Time to Teach	Organization including daily logs and notebooks allowed additional time for teaching
Low test scores	Notebook for study materials Mastery quizzes offered Study methods taught
Poor writing skills	Journaling for confidence Test essays to demonstrate improvement
Unaware of how to study	Modeling study skills within the notebook
Forgetting to study	Notebook with reminders in daily log Parental sign-off on some assignments Journal entry regarding test

Note. This table contains common educational problems needing to be addressed within my classroom.

In developing this notebook plan, the researchers worked closely together. “Most of the current major educational reforms call for extensive, meaningful teacher collaboration” (Inger, 1993). The teacher-researchers involved in this project were on a mission to help students improve through biology notebooks, and they capitalized on the talents of both teachers. This collaboration became an integral way to improve this study. The researchers pulled successful ideas from each teacher’s class, combining and extending them to create this biology notebook as teaching tool structured to meet their students’ needs. The collaboration continued through the action research process with frequent meetings as the process was modified. The unforeseen bonuses of this collaboration included sharing of ideas, in-depth curriculum discussion, presentation comparisons, and the development of topic specific laboratory activities. The researchers had found in each other a collaboration ally to help foster and support their individual efforts. Perez-Katz (2007) in “*Teacher Support Systems: a Collaboration Model*” recognized the pressing need teachers have for time to allow for collaboration and how, when given this time, they can develop professionally.

Chapter 2: Research Literature Review

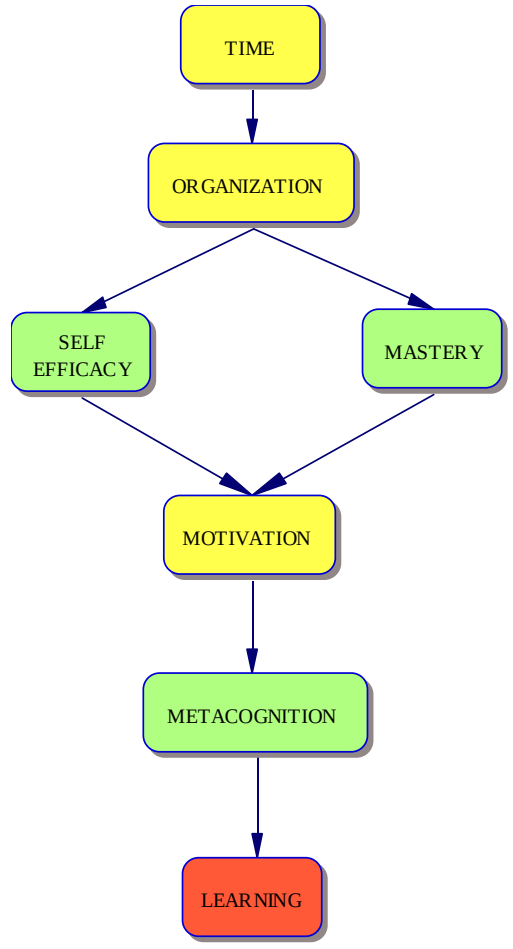


Figure 1. Concept Map of Project

Several theories supported the researchers' contention that time is an important component of the teaching process. According to Berlinger (1990), "The fact is that instructional time has the same scientific status as the concept of homeostasis in biology, reinforcement in psychology, or gravity in physics" (p. 1). This very strong statement is demanding teachers make the best use of time within their classrooms. Berlinger assured educators in "What is All the Fuss about Instructional Time?" changes in time management could improve classroom functioning rather rapidly. Making the most of each moment in the shortened periods without causing undue stress to students would be an important challenge. The importance of time within the educational setting was established earlier in *A Model for School Learning*, by John Carroll (1963) who proposed comparing time spent to the time needed to learn. Carroll stressed a majority of students can achieve some specific criterion level of

performance given a reasonable ratio of time. His model of school learning refers to opportunity as the amount of time available for learning. As put forth by Bloom (1976), virtually all students could achieve mastery when quality instructional time is allotted for them to progress to the next level in the learning hierarchy. By implication, mastery learning and its need for teacher feedback to students as they digest small chucks of learning require time for corrective feedback. To avoid the "less is more" scenario where fewer concepts are taught, improved organization would be needed to provide the time for the mastery lessons suggested by Bloom (1976).

This researcher understood she needed to make the most of the limited time available for teaching and planned to maximize time by establishing an organized notebook with a daily log for assignments. Absent students would be able to learn what was missed by checking their neighbor's log without interrupting the rest of the class. Notebooks would include assignments attached by number and be available for studying for tests and quizzes thereby assisting all students.

In developing the steps for increased student organization and improved test scores, the researchers followed the learning theory of self-efficacy (Bandura, 1994). Self-efficacy is the belief in one's ability, the belief that success is attainable. Albert Bandura of Stanford University realized a relationship between mastery and self-efficacy, which the researchers applied to develop a mindset in our students that difficult tasks are seen as challenges to overcome instead of personal threats. Hanlon and Schneider (1999) study found students who participated in self-efficacy training outperformed students who were not involved. This paper suggested improving student scores through self-efficacy interventions of allowing occasional retakes of quizzes and homework

assignments. With their personal belief instilled that they can perform well, students should perceive biology success as something attainable.

The research was clear that the level of expectations while attainable must be reasonably challenging to their students. Higher-level thinking would need to occur and journaling activities were seen as a means to accomplish reflective thought. Paris (1983) described a metacognitive theory of thinking about learning. Later, Marzano, Brandt, Hughes, Jones, Presseisen, and Rankin (1998) expanded the theory to include knowledge, control of self, and control of process. Metacognitive skills include the ability to access one's own cognition and manage cognitive development. Based on the research by Paris (1983) and Marzano (1998), a thoughtfully developed biology notebook aimed at increasing student organization and reflection should produce more successful student outcomes. The use of journaling activities to encourage metacognition was evaluated. Journaling can improve student outcomes by allowing students to see value in what they were learning by connecting with "real life" situations. Penn, Shelley, and Zaininger (1998) found student journaling was the most effective way to increase the transfer of learning to real life applications. An action research study by Vojnovich (1997) used reflective journal entries and cooperative learning techniques to increase processing skills, student motivation, and participation. Participation in reflective journaling improved metacognition and reflection. With the addition of reflective entries, the idea of thinking about thinking was incorporated into the biology notebook along with daily notebook organization and use of study materials.

While developing an action research project to assist our struggling students, our team uncovered a substantial amount of literature supporting the importance of

educational time, the benefits of keeping an organized biology notebook for daily work and journal entries, and the need for student motivation in the learning process. The original concerns, time, organization and motivation, had increased to include theories of mastery, self-efficacy and metacognition (Figure 1). Through their collaborative efforts to design methods for organization, the researchers hoped to see a positive effect on learning as demonstrated by increased success in school.

Chapter 3: Methods

Background

Marquette Senior High School serves approximately 1300 student, grades 9 to 12 and is faced with a declining enrollment. The community is composed of a small university town surrounded by rural areas. The population of our school is largely white with the largest minority being Native American. Consistent with my Biology class, the numbers of male and female students are approximately equal. At the start of our study, the general composition of my class of 26 students had recently changed with creation of additional classes to alleviate the overcrowding in the higher math classes. The new semester redistribution of students caused four of the top academic students to be rescheduled into different biology classes and to be replaced by students with academic difficulties. The result was this course had no highly motivated freshmen choosing to take a sophomore biology class one year before typical scheduling for this science class. Instead, three juniors were taking the course due to failure the previous year or putting off the course for one year. The rest of the class consisted of sophomores, two of which were concurrently enrolled in a failed freshman science course in order to get this needed credit. With this general background knowledge, I looked into information available within our grading program on previous grades, discipline referrals, health and learning disabilities. One student had missed the second semester of his freshman year, one was recovering from a brain injury, several had a history of fighting, attendance was a reoccurring problem; several had inappropriate possession listed under discipline history, learning disabilities, and health issues included panic disorder. Many students' academic

histories showed failed classes. Obviously, this group of students had ability, organization, attendance, motivation, and learning challenges to address.

The motivation of other students suffered when time was spent at the start of the periods trying to get the struggling students on track. The high needs of enrolled students and shortened class periods (seven minutes less per period) instituted this year were reducing the time for interesting and motivational additions to my daily lesson plans. Students clearly indicated their low motivational level when responding to test essays. Even students with higher abilities simply replied, “I just don’t care”; another wrote one-word answers unrelated to the question such as “bananas” or “apple”, perhaps indicating more thought about the upcoming lunch period than the essay question. I truly believed if I simply had the time to work with my students I could make them all successful. Our action research project offered the hope that increased organization could free time for me to address the individual needs of my students and allow me to work on specific areas of motivation and learning.

Procedure

The steps for implementing the biology notebook were established to address the needs of the individual classrooms. A detailed procedure is available in the appendix and broken into four stages: existing information is gathered, project is gradually implemented, project is extended because results are encouraging, and resulting data is analyzed (Appendix E). A general list of the procedural steps is listed below.

1) A pre and post survey was developed, approved by the school district and submitted for university approval. The survey included questions on level of organization, metacognition, self-efficacy, homework habits, motivation, and

current grade. All surveys were completed with a code name to remain anonymous (Appendix F).

2) Tallies were recorded for days where the time to catch up absent students was greater than three minutes. Data were also gathered for grades (quizzes, essays, tests, and terms) throughout this project.

3) The notebook was gradually implemented starting with the daily log (Figure 2) while waiting for university approval for giving the survey. The students were to enter the date, assignment description and a ranking of the assignments based on difficulty and meaningfulness. The meaningful choice indicated that they saw meaning that extended beyond the classroom applications. Students who had been absent the day before would be expected to check with their neighbor to get information for catching up. Assignments useful as a guide to studying for tests and quizzes were numbered and attached in the biology notebook.

Date	Assignment	Difficulty	Meaningfulness
3/14/08	Evolution solution	H	M

Note: Letters indicate difficulty and meaningfulness (relevancy) of assignments. For the difficulty ranking, H = hard, N = normal and E = easy. For the meaningfulness ranking, M = meaningful, R= related to class work and U = useless.

Figure 2. Daily log.

4) The pre-survey was given as soon as university approval was granted and the post-survey followed two weeks later, the end of the original study. By this

time, students were already demonstrating improved organization in their notebooks and the tallies of days needing more than three minutes of teacher time to help previously absent students get on track had dropped to zero.

5) Mastery quizzes with retakes on content were given to build confidence. Following quizzes were based on specific notebook pages without the option of retakes. (Specific grades are available in Appendix G.)
6) Notebook implementation continued with the introduction of journal entries.
7) The post-survey was given and analyzed. Results indicated a need for improving metacognitive skills. Students were forced to think about what they were learning by thought provoking journal questions. Tables 2 and 3 have writing activities designed to address metacognition and motivation, respectively.

Table 2

Metacognition Journaling Activities

1. What did you learn today? How does this compare to what your neighbor learned?
2. List some real life examples of what we learned today.
3. List how the information you learned is used in careers.
4. List a current event or political position that relates to what you learned today.
5. How do you feel about what you learned today?
6. What prior knowledge did you need to learn today's lesson?
7. What new thing did you learn today?
8. What was important in today's lesson?
9. Research this topic more on the internet. Write down the site and what you found.

Table 3

Motivational Discussion Questions

1. Suppose you could teleport back in time, which era would you choose and what life forms might you find?
2. Should all species be preserved? Why or why not?
3. If you could stop all future mutations, would you? Why or why not?
4. If you had unlimited funds how could you improve today's lab?
5. Create a good journaling question for today and show how you would answer it.
6. If you could ask a famous scientist any question, which scientist would you choose and what would you ask?
7. How could you use genetic engineering to make the world better?
8. You are to debate whether bacteria are "good" or "bad". Prepare to defend either position with specific examples.

8) Because of concerns about the short time between the pre- and post-surveys a stand-alone exit survey was designed to gauge student perceptions of their improvements in the four cognates, metacognition, self-efficacy, mastery and motivation (Appendix H).

9) Researchers determined student progress by comparing changes in the pre and post surveys responses, exit survey results, data from tests, essays, and quizzes, notebook improvements, journal entries, end of year teacher evaluations and teacher observations.

10) Statistical methods of reporting data were researched and utilized.

Chapter 4: Results

A variety of data sources were used during this action research project, necessitating the use of several statistical methods. The essays, quizzes and multiple choice tests were separate independent student assessments each with pre and post intervention data. Graphs based on means and modes were created to provide a visual description of these results. The term grades, on the other hand were a composite of all student assessments. The term assessments were analyzed using paired samples t-tests for pre and post grades. For the exit survey the ordinal data retrieved was reported in median and modes. Correlation between the constructs was investigated. The inclusion of specific breakdown of responses to each survey question allowed for contemplation of individual items and comparison with qualitative observations, such as journal entries and class evaluations. Qualitative data was used to determine if it supported the data analysis results.

Quantitative Information

The pre-test and post-test items were matched and an analysis was performed on time (pre- or post-intervention) and assessment type (essays, quizzes, and multiple-choice) for student assessment. Table 4 has the descriptive data by assessment type. Care was taken to match the difficulty level for the multiple choice questions. The rubric for scoring the essay questions had become more demanding.

Table 4

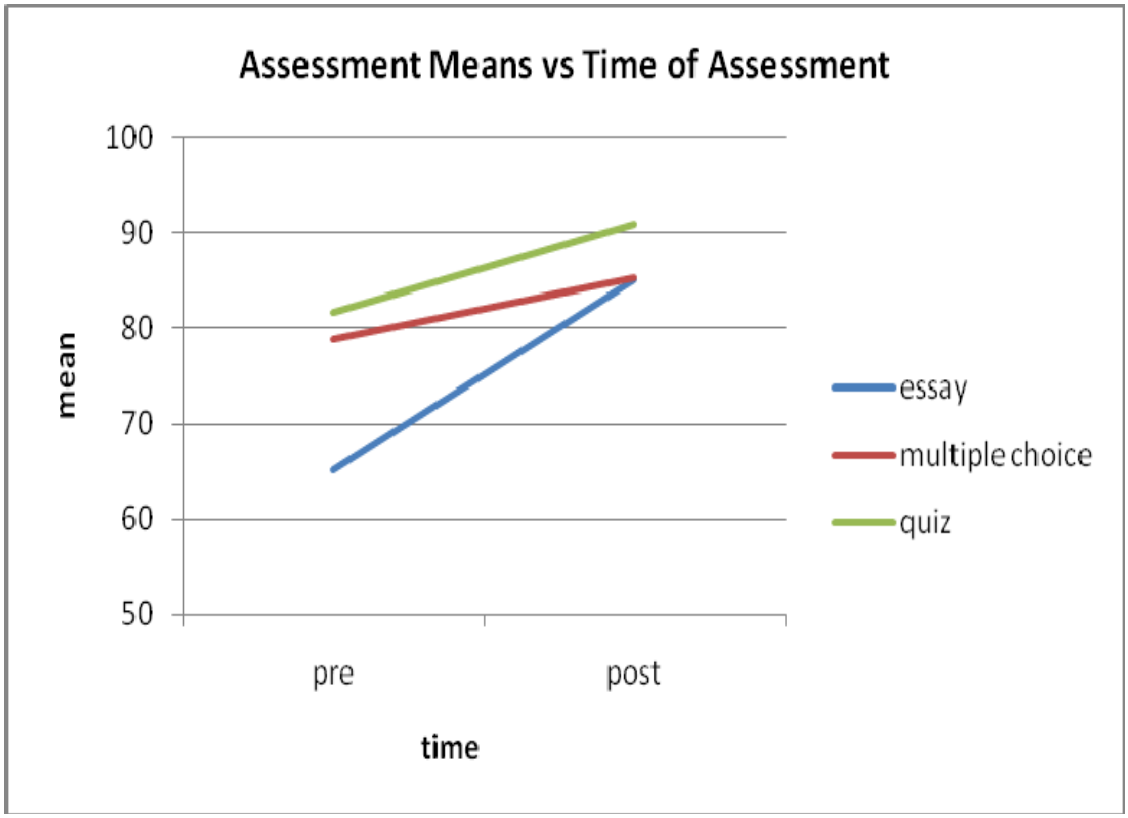
Means and Standard Deviations on Pre and Post Assessments Grades

Assessment Type		Pre-Project Grade		Post-Project Grade
	n	Means (SD)	n	Means (SD)
Multiple Choice	23	76.7% (9.32)	23	84.4% (7.23)
Essay	23	63.73% (30.05)	23	84.1% (19.46)
Quiz	22	82.05% (16.01)	22	89.77% (9.32)
Term	26	79.72% (12.24)	26	83.10% (11.60)

For interval data, I used repeated measures analysis of variance (ANOVA) on the widely accepted statistical program, SPSS. In order to run repeated measures ANOVA, the distribution of data needed to be verified by performing a Mauchly Test of Sphericity. If a significance level is less than 0.05, then a random distribution, sphericity, cannot be assumed as was the case for my results (Appendix P). Departures from the assumption of sphericity require corrections for bias, such as Greenhouse-Geiseer, which alters the degrees of freedom. For my data, the Mauchly's Test of Sphericity for the pre-post data was less than 0.05. Therefore, using the Greenhouse-Geiseer adjustment, the pre-post intervention achieved statistical significance of $F(1,18) = 13.510$, $p = 0.002$. The Mauchly's Test of Sphericity for the assessment type data also was less than 0.05. Once again, using the Greenhouse-Geiseer adjustment, the assessment type achieved statistical significance of $F(1, 24) = 5.497$, $p = 0.019$ (Leech, p151). Both time and assessment type

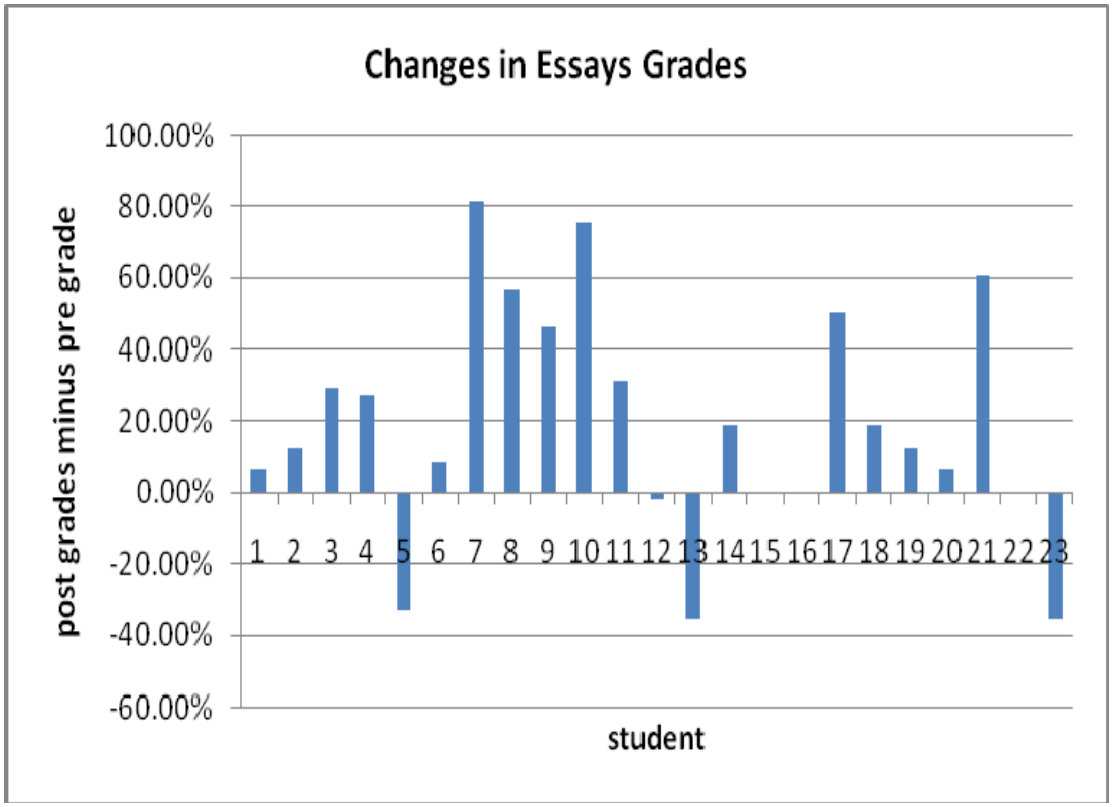
indicated a significant difference. The time (pre-post) and assessment type (essay, multiple-choice, quiz) showed no interaction ($p > 0.05$).

Since assessment type achieved statistical significance, a conservative post hoc Bonferroni analysis was done. The essay and quiz assessment differences were statistically significant ($p = .014$), as presented in the graph in Figure 3.



Note: Assessments given before (pre) and after (post) the implementation of notebooks.

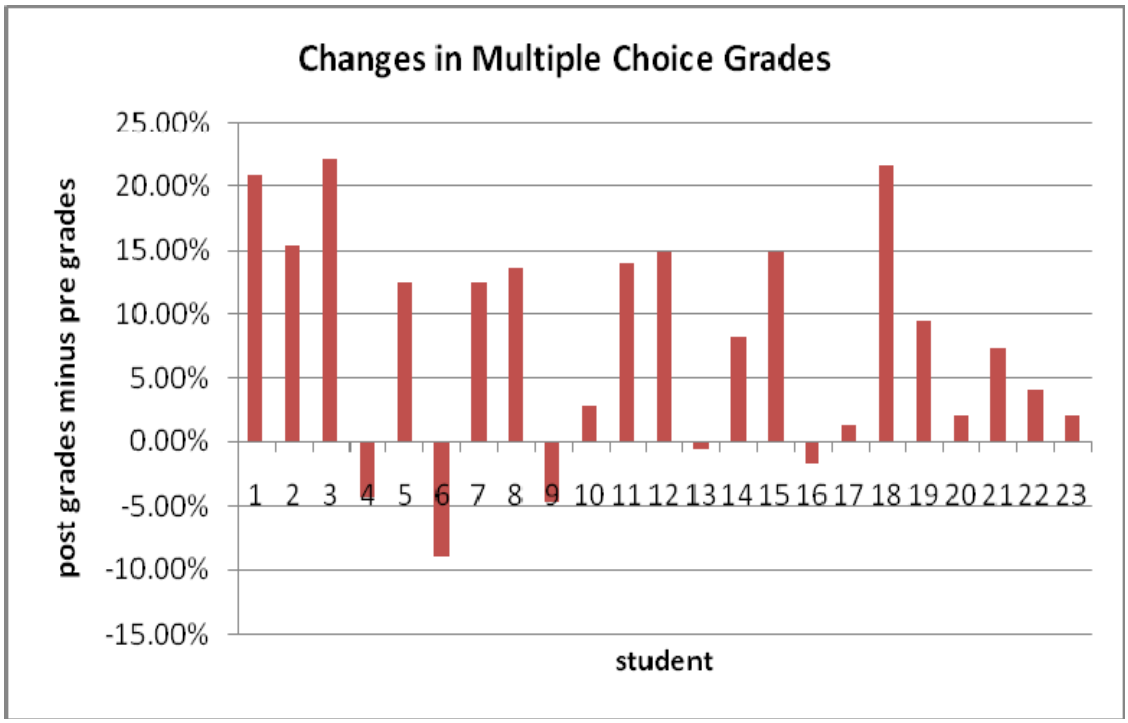
Figure 3. Evaluation of student learning through independent assessments.



Note: To determine changes in essay grades, the pre-notebook grade was subtracted from the post-notebook grade.

Figure 4. Pre- and post-essay assessment comparison for each student.

Although assessment types were statistically different, students showed substantial improvement on all three assessments during the intervention, as shown in Figure 3. The essay comparison graph showed 16 scores improved, 4 scores declined, and the 3 were unchanged (Figure 4). Likewise, improvement on multiple-choice could be seen in the pre- and post-intervention scores for students. Eighteen students' post multiple-choice scores showed improvement and five students' scores showed a decline (Figure 5).

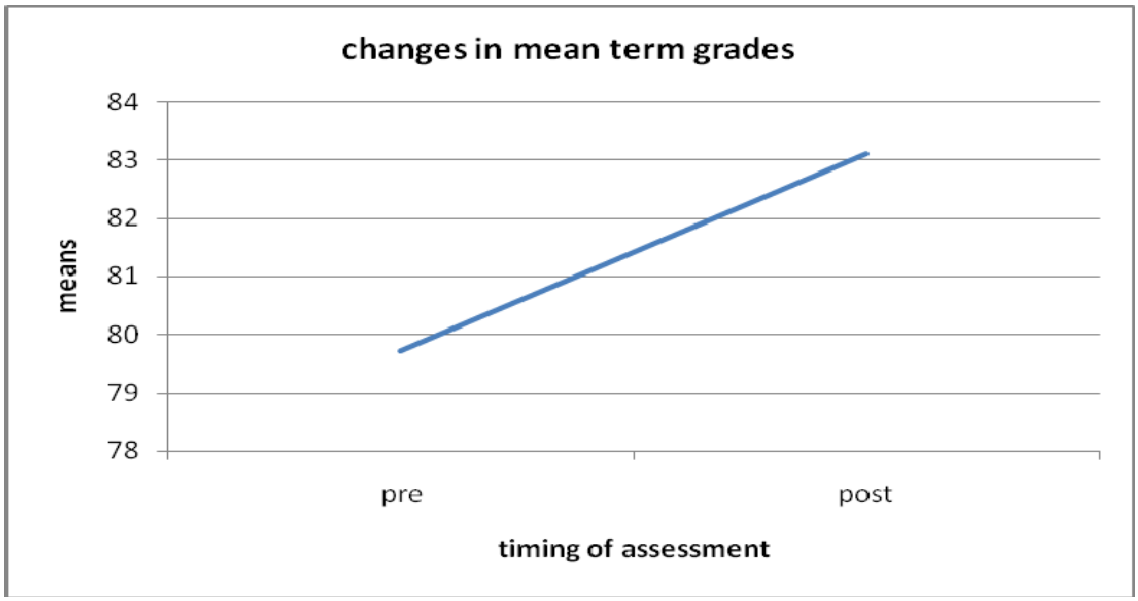


Note: To determine changes in the multiple choice test grades, the pre-notebook grade was subtracted from the post-notebook grade.

Figure 5. Pre- and post-multiple choice comparison for each student.

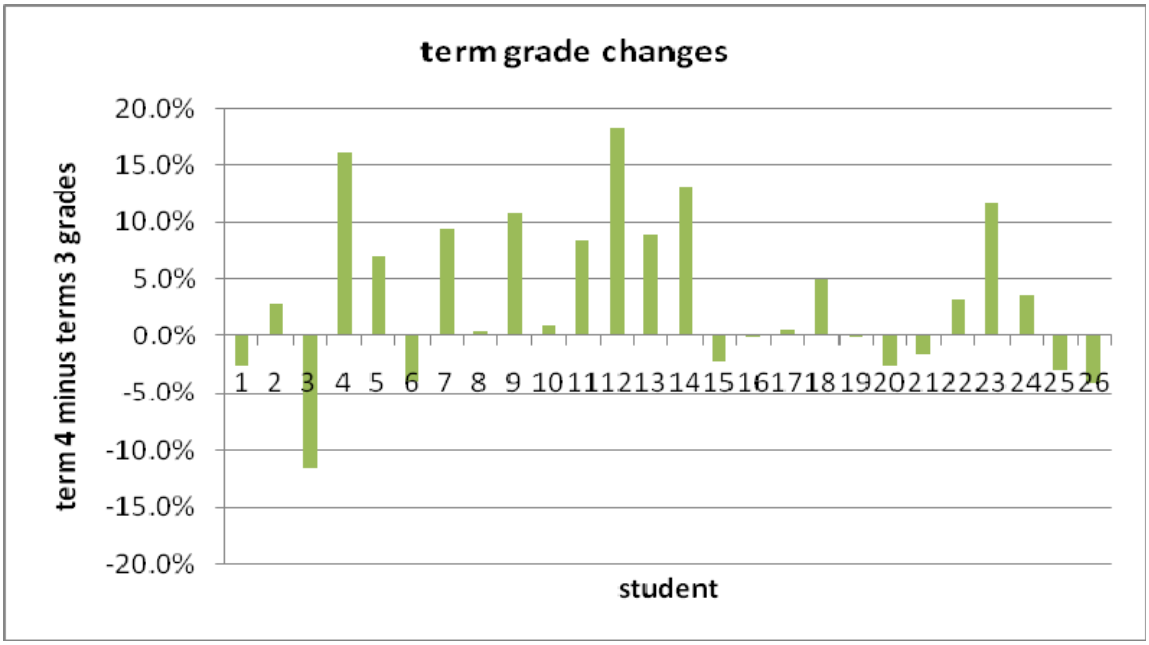
Term grades lacked independence from essay, multiple-choice or quiz scores because the grades included these assessments and other scores, such as homework and labs. Figure 6 shows intervention grade comparisons, which showed statistically significant gains in term grades, $t_{(25)} = 2.429$, $p = 0.023$ (Appendix O,). Figure 7 has pre- and post-term grade difference scores for each student.

To summarize, the assessments (the class averages for essays, quizzes, multiple-choice tests, and term grades) showed an overall improvement for the class.



Note: Term grades given before (pre) and after (post) the implementation of notebooks.

Figure 6. Evaluation of student learning through compiled assessments.



Note: To determine the changes in term grades, the pre-notebook grade was subtracted from the post-notebook grade.

Figure 7. Pre and post term grade comparison.

The surveys did not fit into pre- and post-interventions categories. The first survey was not conducted until university approval was granted. The notebook intervention needed to be started immediately because my students' needs were simply too great to delay efforts to help them improve. The daily log and assignment organization were already underway before administering the pre-survey.

Analysis of students' pre and post-survey results used the Wilcoxon Signed Ranking. Taken together, both Clement and Hill-Manson biology classes appeared to reveal improvement in organization (Appendix J), but separating the classes showed no significant improvements for my class (Appendix K).

To address our concern about the short interval between the other surveys, we designed a third survey called the exit survey (Appendix H). Table 5 has the exit survey items for each construct. Students utilized the full range of the Likert scale options by choosing answers from *Never* to *Always* (Appendix Q).

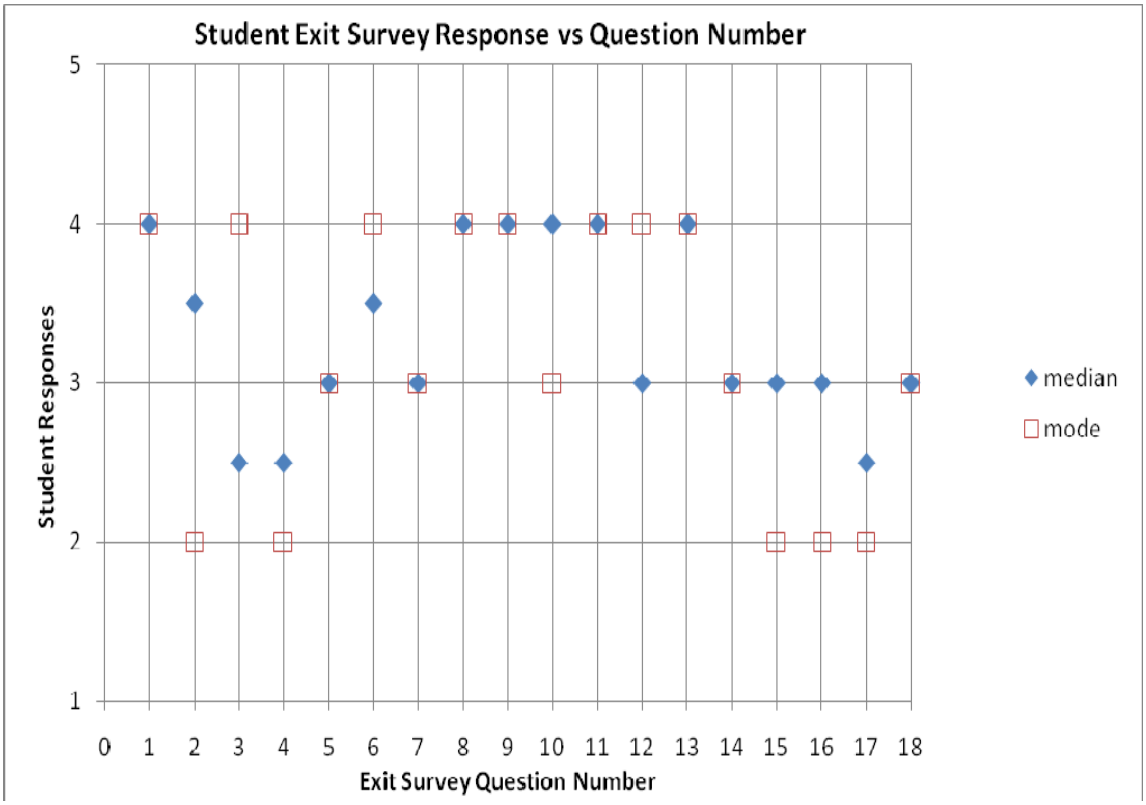
Table 5

Survey Questions by Construct

Construct	**Survey Questions**
Organization	1, 4, 13, 17
Mastery	2, 16, 18
Metacognition	3, 5, 14
Motivation	6, 8, 15
Self-efficacy	7, 9, 10, 11, 12

Figure 8 has medians and modes for items 1–18 of the exit survey. The mode is the most common response for an item. The median, a central value in the data set, is found by arranging the values in order and then selecting the one in the middle. If the

total number of the sample is even, then the median is the mean of the two middle numbers.



Note: The information in this figure was used to identify if the median response to each question matched the mode for specific items of the exit survey. The Item 2 mode, for example, indicated the notebook "rarely" affected study skills, but the median was between "sometimes" or "always" for the notebook affecting study skills.

Figure 8. Exit survey responses for median and mode.

Correlation coefficients between the five constructs from the exit survey are in Table 6. High correlations ($p > .8$) were found for mastery and motivation constructs and self-efficacy and motivation constructs. Marked correlations existed between the other constructs, so students strong in one construct tended to be strong in another.

Table 6

Nonparametric Correlations Coefficients between Subscales for Students' Exit Survey

Subscale		1 Organization	2 Mastery	3 Motivation	4 Self-Efficacy	5 Metacognition
1.	Organization	-----	.679**	.725**	.628**	.737**
2.	Mastery		-----	.801**	.755**	630**
3.	Motivation			-----	.819**	.609**
4.	Self-efficacy				-----	.610**
5.	Metacognition					-----

Note. ** $p < .01$

Qualitative Information

I used a variety of sources for corroborating the data from students' exit survey answers. These sources included tallies, notebook logs, journaling activities, teacher observations, and students' end of the year course evaluations. Multiple data sources can be used to support the ultimate findings of a survey or identify contradictions (Mertler, 2006). For example, the exit survey (Appendix H) had two items on recording assignments: #4. "Has keeping a log of assignments helped you to be more organized?" and #17. "Now that you have a log of assignments are you more likely to record your assignments?" These items had a low mode (value = 2), indicating most students had chosen *rarely* for their answer to these exit questions (Figure 8). Yet the students had recently submitted high quality notebooks and every day I observed students updating each other on days students were absent. The reality was students were recording

assignments daily without being prodded by the teacher, even though students' responses to these exit survey items did not reflect their behaviors, which showed improvement in organizational skills. The students' perceived notion of their organizational skills did not match their improved performance, leaving me to wonder whether the survey should have specified that answers be based exclusively on this class or whether the students were holding themselves to a higher standard with an incomplete entry viewed as a personal failure to record their assignment. .

Perhaps the easiest qualitative analysis was the recording of tally marks for days in which the time required by the teacher to help absent students get caught up exceeded three minutes. In the pre-intervention days, taking time to catch up was a daily occurrence. Within two weeks of starting the daily log, no more tally marks were required. Time could now be spent in learning activities. The notebooks also provided a chance for students to rank assignments and express their thoughts through journaling activities.

Chapter 5: Discussion

This section is a discussion of results presented in the previous chapter. This includes a variety of data sources used during this action research project, assessments, surveys, and qualitative findings.

Quantitative Information

The most obvious positive result of this notebook intervention was the increase in assessment scores. The increase in writing scores was especially encouraging as the grading rubric for the essays was getting much more demanding and yet 70% (16 of 23) of students showed improvement. Students who originally had not written well were now including all major points when answering essays and were required to answer all essays instead of being able to choose from a list of concepts. I attributed this improvement to the journaling activities. With my tougher standards, four students had a decline in their essay grades yet the quality of their writing had improved because they were being held to a higher standard. The first quiz was a mastery quiz with an improved grade included in the pre-quiz grade. The second quiz did not have a retake but the students seemed to have grown in confidence as they learned study skills, and this grade was even higher.

Fourth quarter grades compared to third quarter grades improved significantly, with many students improving a full grade (Appendix O). The extra class time made possible from the notebook organization also allowed me to get to know my students better. For example, one student previously had missed the entire second semester. This student showed obvious improvement by completing his notebook, study materials, and exam review materials. He even took the lead in organizing our stream field trip. His

grade would have improved even more if he had handed in his notebook, which he completed.

I looked over the lower grades for my class to identify students who continued to struggle. One of these students was recovering from a brain injury. Another student, who passed the course with a D- , previously had failed her freshman science class, so she will be repeating that science course for the third time next year. The grade of D- was actually an improvement in her biology grade and her science grade point average. This additional information made me view the term results with increased enthusiasm for this project because even struggling students were doing better.

Surveys were developed to gauge students' opinions regarding the implementation of the notebooks. The lengthy HSRC process delayed approval for the pre-survey, while the high needs of my students required timely intervention. Therefore, the implementation notebook had already begun before the survey could be administered. This delay allowed my students to trouble shoot the notebook implementation and my class was able to pioneer methods later implemented in my collaborative researcher's classroom. Despite my concern about the short time between the two surveys, a general upward trend was detected for our students' progress, but the gains were insignificant.

When I analyzed the exit survey modes and medians, I noticed the mode for item #2 was *rarely*, yet the median was between *sometimes* and *usually*. Had I only looked at the mode, I would have been very discouraged by the largely negative *rarely* response to this item, "Has keeping a notebook helped you improve your study skills?" By looking at both the mode and median, I more fully understood the sentiments of my students and would recommend using both in any survey analysis. Figure 9 is an apt caricature of the

mode, as a favorite fishing spot, but the inclusion of the median considers other student choices, just as we know there are other fish in the sea.

Note: In this cartoon's introduction to surveys, we see that the most common choice is the mode. For the fishing analogy, it is the location most fish prefer (their location mode) which is a good place to catch fish. In the study an exit survey's mode helped identify constructs needing improvement.
(Permission granted to use by William Houle, Marquette artist.)

Figure 9. "Meaning of Mode" cartoon.

Items with high mode and means responses showed students were more organized, were more likely to complete assignments, were confident about what was going to be on a test, and enjoyed giving input on the meaningfulness of assignments. They also recognized that organization helped the average student (Appendix R). An analysis of the metacognition construct revealed students thought that journaling had not caused them to think about what they had learned. I decided to step up the journaling activities to increase their metacognition (Figure 3). Additional journaling activities were designed to get students to connect biology concepts to real life experiences. Other activities were developed to show study techniques beyond reading and writing, which

incorporated diagrams and concept maps into the journals. The end of year student evaluations of the course specifically cited these techniques as being beneficial.

Qualitative Information

Besides the quantitative data, I was also able to use qualitative information from the biology notebook, journal entries, students' evaluations of the class (Appendix I), and teacher observations. A typical student's class evaluation had, "I thought that this class went really smooth. I learned a lot & notebooks helped a ton for organization & studying. Even though the log of it took forever, I could look back & remember what we've done. The homework wasn't too bad & I thought that you reviewed really well. You offered a lot of help & explained everything thoroughly." Another student mentioned the learning techniques we covered in class, "U showed many ways of learning and that was good." Appendices B-D have examples of study methods mentioned by this student. Despite past difficulties experienced by many of my students, all class evaluations were upbeat and positive.

The repeated measure ANOVA showed significant improvements after the biology notebook intervention. Post hoc analyses with Bonferroni revealed significant differences between the quizzes and the essays. Quizzes were designed to cover small pieces of information, breaking difficult concepts into digestible chunks. Essays were more demanding and required higher level thinking as students constructed responses to this inquiry. Student grades on multiple-choice tests were not significantly different from quizzes or essays and may have represented an intermediate difficulty level (Appendix P).

The high correlations between constructs on the Exit Survey (Appendix L) suggested validation research be used to determine why the constructs were so highly connected. Some items for mastery, for example, may have had overlap with self-efficacy, and other constructs. The overlap of these constructs was expected, as indicated earlier in my concept map for the project (Figure 1). Bandura (1994) had established a relationship between mastery and self-efficacy and developed a self-efficacy scale which could be applied to an analysis of construct connectivity for an extended project.

Chapter 6: Reflection

Summary

Because of the urgency of my students' needs, I started to incorporate the biology notebook shortly after the start of the new term while awaiting university approval for administering a student survey. I began by creating a table for the students to log each day's lessons and assignments (Figure 2). My expectation was for students to complete notebook additions each day. In their log, students ranked each assignment by difficulty and perceived usefulness thereby providing valuable feedback. For example, the lab on flight was listed by some students as "useless". With input from the students, I subsequently improved the lab and the students were empowered by this process as they created an excellent lab on the evolution of flight. The entry on the difficulty was used to adjust the level of the assignments. The original reason for me to incorporate the daily log into their notebook was to help previously absent students. Rather than requiring teaching time at the start of each period to help absent students catch up, previously absent students could check with a neighbor. Knowing what papers were needed, students could pick up the papers and schedule make up times for labs and tests. I wanted students to develop a sense of responsibility and identify their neighbors as comrades in the learning process who would likewise help them after an absence. I viewed this process as a positive way to work on time management and to raise the responsibility level of my students. (See Appendix A for examples of student daily log entries.) My second priority for the biology notebook was organization. Notebook assignments were numbered and attached in order; only items useful for studying were included in the folder. Students

knew exactly where to find their study materials. Quizzes were based on one or two specific pages, which established background mastery for tests and exams. I had successfully used similar methods when preparing students for physics tests and was confident this method would help struggling biology students.

The addition of journal entries allowed me to force my students to think about biology concepts in more depth. Students learned these entries could be helpful for the next day's discussions. My specific goal for the journal entries was to improve students' writing skills since previously completed test essays had been quite dismal. I also anticipated improving self-efficacy and metacognition skills. The first step needed to increase competence was to create journaling activities geared to encourage hesitant students to write about concepts (Figure 3). One of the more complicated journaling activities designed to get students thinking was based on an article about the deadly Hantavirus. Students were assigned the detective's role of investigating the disease's cause or implementing ways to prevent the disease from spreading. Students were to write about their specific job in their journals. The next day I called on random students to share their entries. Students who hadn't done their assignment could see their role was an essential component for solving the mysterious cause of this disease and determining the logical steps to control or limit spread of disease; experts from many disciplines are needed to research medical problems. This discussion/journaling question became one of their test essay questions. We developed a variety of journal activities to engage students in thinking about concepts outside of the classroom and in expressing their ideas though writings and discussions. Tying some journaling assignments to test essays allowed me to

create progressively more complex and demanding essays as I strove for improvement in this area (Figure 4).

Since the biology notebooks were to be used to study, I went to the next step and incorporated specific study techniques within the folder. For example in the unit on immunology, students outlined, highlighted, completed concept maps, created diagrams, inserted modified flashcards and demonstrated journaling essays. Student examples are in Appendix B-D. Besides traditional study techniques, we did a short five-minute play with many parts based on their diagram of the functioning of the immune system. The macrophage ("hum hum") and helper T-cells ("boss"), for example, had starring roles. Mimicking the immune system's response to a pathogen in this fashion was suggested by my collaboration research partner. The approach reduced student anxiety about this complicated system and increased their understanding of the process. I knew the students had made the connection when our class traveled to a nearby stream for the following unit on the environment. Students were able to identify comparable roles in the macro invertebrates they collected. Neither of these activities would have been possible without extra time made possible by using biology notebooks. By increasing student organization and utilizing many types of study skills, I hoped to lessen their testing frustration by honing skills for tackling higher-level courses; I hoped to empower them to succeed.

My motivation for undertaking this action research project was a desire to make the most of every minute in our shortened class periods, thereby allowing me to do the additional things that can increase interest in the subject and establish better organizational skills. The anticipated pay off for these efforts was an end to the frustration my students were feeling and an increased learning as demonstrated in test results. In summary, I called my

priorities “TOM” for time, organization, and motivation and used the acronym to focus on these items while seeking to increase my students’ level of achievement.

I encourage readers to look over all educational research with a healthy dose of skepticism. If you were told class size did not matter in a high school setting, and you had more students than seats and could not maneuver to check on individual students' work, be leery. If you had seen a trial version of mainstreaming students that provided actual support staff and team teaching, be skeptical when it is adopted without these components. When smaller learning communities are initiated and teachers are simultaneously asked to make exams shorter and reduce the number of higher-level questions, be cautious of claims that exam scores are improving because of smaller learning communities. While maintaining an open positive approach to new ideas, be cognizant of the complexities and pressures present in educational research. Do not allow your skeptical mind and common sense to be disregarded. When conducting your own action research projects, use methods to help you maintain as much objectivity as possible, such as working closely with a colleague who is willing to take the time to discuss your findings and techniques. Collaboration is recognized as an integral component of the action research methodology and is helpful when exploring teaching techniques, which address real classroom concerns. By investing substantial time needed to share and improve ideas and methods and through overseeing each other’s results, the enthusiasm of both teachers in this research project increased, as did the quality of the notebook implementation for each class. By maintaining a skeptical mind, a realization should be apparent that the many positive influences of collaboration could create a placebo effect on our students’ enthusiasm and thereby have contributed to the

improvements noted in this project research project. Furthermore, the high correlation between constructs might have been due to overlapping survey questions that did not clearly distinguish between constructs. The anonymous nature of the surveys did not allow for student-by-student comparison of survey constructs to assessment results. Therefore, I could not run correlations of survey self-efficacy with essay grades, even though I thought the students' improvements in writing were due to their increasing self-efficacy.

Looking Forward

I do not want to overstate claims for this action research project, but I was so encouraged by the results that I will be incorporating these methods into the organization of every class I teach. Since I am certified in physics, chemistry, biology, and general science, my schedule is apt to change from year to year, so it is wonderful to have worked on procedures applicable to all of these disciplines. I have made the commitment to use an organizational notebook/journal because of the many positive results I saw for my students. I was incredibly pleased by the tests, essays, term grades, and survey results (Table 2). Five students improved their term grade by over 10%, a full letter grade change. Only one student displayed a grade decline and he had simply failed to submit his notebook on time for credit (Appendix O). Even the end-of-the-year class evaluations completed by my students had only praise for the course. I found all of the data analyzed showed slight upward trends. Individually, the essays, quizzes, multiple-choice, grades, constructs, etc., hinted at positive results for this project. Collectively, these components had an undeniable upward trend in student learning. I was frankly encouraged, excited,

and motivated by the results. I plan to develop efficient means to analyze incoming data throughout my teaching.

Teachers have many sources of data, including tally sheets, classroom observation, journal entries, notebook quality, pre- and post-surveys, exit surveys, test results, quizzes, essay quality, etc. (Mills, 2007). Multiple feedbacks are often casually used within a classroom. The action research project demanded a more analytical approach to data gathering and analysis. The many statistical methods for working with our data were intriguing, yet overwhelming. The time needed for analysis could distract from the action research appeal of practical research and its priority of providing a framework easy to adapt to classroom settings. Therefore, I worked on ways the data analysis could have been done more efficiently and regularly. For example, students had appreciated giving input on assignments through their daily log ranking, and I found this feedback useful, but time consuming. In the future, simple items will be added to the end of my multiple-choice tests to seek student input. These items would not be included in test scores, but the gathered information would be readily available to monitor study habits and other concerns. For longer surveys, data entry could be done with new technology. I recently received a grant to purchase technology, which would allow students to respond electronically to survey items presented on a classroom’s overhead screen. These data could be retrieved in Excel format and analyzed without tedious manual entry of each student response, as done with this research. Students could respond anonymously for surveys or students' answers could be linked to their grades. The improvements seen in this action research project have encouraged me to continue to

implement surveys for inventorying student progress in learning and these suggested methods would simplify the process of analysis.

I found a strength of this action research project to be flexibility which allowed streamlining the implementation of the organized biology notebook to fit the individual classroom's needs. For example, the major concern for my collaborating teacher had been the immaturity and disorganization of her academically advanced classroom of students. Her class of 17 students were mostly freshman taking her sophomore biology class. Her approach focused primarily on organization and study skills for these highly motivated students. My classes of 26 students faced attendance, motivation, and learning struggles, so my approach originally focused on time management, organization, and motivation (TOM). With these established broad-based goals, I went on to established methods to foster the belief in my struggling students that despite many failures in the past, they could succeed. The encouraging results caused me to extend this project, working on a problem-solving table, developing other survey methods, and establishing efficient methods to input data for analysis. I found action research to be a valuable problem-solving tool. Rather than dwell on frustrations associated with current educational trends, I was able to focus my efforts on what I as a teacher can do to provide a quality education for my students.

The objective of this action research project was to solve specific classroom problems, but the encouraging preliminary findings revealed an unexpected result, the effectiveness of collaboration. While recognizing the benefits and importance of collaboration, we worked closely with our advisor to assure the independent nature of our work. I established priorities for my individual class and proceeded independently to

implement a biology journal stressing the components that would best help my diverse student population. After separate analysis of our students' assessments and survey responses and with our individual conclusions in hand, we joined our separate databases together to examine the effect of collaboration on our two classes and thereby adding collaboration to our conclusions.

With substantial research supporting the effectiveness of teacher collaboration, it is encouraging to witness the efforts of our university's education department to establish criteria for collaborative action research projects that maintain the importance of independent work. Unfortunately, the dual but contrasting foci of collaboration and independence may paradoxically discourage the implementation of collaborative action research projects. Cornell University's Davydd J. Greenwood found that action research is only possible at universities when voluntary, unfunded, and requiring no changes in the administrative structures or practices (Greenwood, 2007). These obstacles might inhibit an action research program and thereby slow or eliminate educational progress that might occur through collaboration.

The steps required to develop a vibrant action research projects at our university are moving forward. Currently, my action research colleague and I fit into the category Cornell University's D. Greenwood described as, "graduate students… dissatisfied with conventional training …[who] manage to find an AR-based course,… and apprentice themselves…to an action researcher"… and…"at the end of the day, success in a single classroom may be important for the individuals present...but it will have little impact on the structure of public higher education without more self-conscious efforts at institutional change" (Greenwood, 2007, p. 249-264). This seemingly harsh statement

may have been designed to encourage support for action research by indicating the necessity of progress in this direction. The support within our university allowed us to move forward and include a collaborative aspect into our final project, which was particularly important as our data and research identified the essential role that teacher cooperation and teamwork played in improving students' performance. Just as collaboration was important for mankind's original footsteps on the moon, it grew into a prime component of our project, making educational strides not otherwise possible for a lone researcher. Based on our results, I appreciate our university's first cautious steps toward establishing guidelines for collaboration within joint action research and recommend continued efforts in this direction.

Chapter 7: Conclusions on Collaborative Action Research

The beauty of this action research approach for improving and testing teaching strategies is that action research can be individualized to align with specific needs. As we came together and discussed our results and our students, we gained appreciation for this project's ability to meet the specific needs of our very divergent classes. On one end of the spectrum, we had a class of overachievers with maturity and organizational needs. The other end of the spectrum had a class of students with poor attendance, low motivation, and faltering grades. Of course, not all students fit neatly into these general groupings, but implementing the biology notebook had an organizing and motivational effect on all of our students. Improvements were evident in the areas focused on by each teacher. We were energized by the direct influence this common tool had on their students, especially noteworthy was the improvement in grades. A benefit of action research is that the needs of students are the priority, and this practical approach to research should draw more teachers to undertake action research methodology.

The goal for Hill-Manson had been to increase organization for her students, a skill her students could apply to future courses and carry with them on to college. This organizational goal was met as evidenced by the surveys and notebooks. The three goals for my classes focused on increasing time efficiency with a daily log thereby making the teacher available to help struggling students, building confidence by helping struggling students learn organizational and study skills as demonstrated by notebooks and test scores, and developing communication skills through journaling activities and demonstrated through test essays. Overall, students improved in these areas with the most

improvement found to match the priorities of the individual teachers as they worked together to develop plans for each classroom.

The researchers particularly enjoyed collaboration that resulted in discussions and implementations of many motivational teaching strategies and plans. Teacher enthusiasm is often contagious and transfers to positive student behaviors within the classroom, which was the case in our classrooms. With this positive aura encompassing our students, we as researchers were encouraged to pursue developing these techniques into our Master of Science Education thesis. On the surface, pursuing a simple folder as a thesis might seem strange, but simplicity is actually the point. Students must possess certain skills. To send students on to college, technical schools, or jobs without organizational skills would create a continuing problem. Professors and employers are right to expect high school students to have these skills. They also have the right to expect appropriate educational content knowledge from students. If the less is more approach results in inadequate foundational knowledge, our students will not have mastered the concepts needed to move on. We will have let down our students and their future instructors or employers.

Within the simplicity of the biology notebook are well thought out plans to develop not only organizational skills, but also responsibility, self-efficacy, motivation, study skills, time management, metacognitive development and writing skills based on educational theories and research literature. This action research project was designed to assist in all of these areas and be flexible in its application and is the only project we, as teacher researchers, have found to have such broad applications. The skills students gained from learning how to keep an organized notebook could be used across the curriculum help build a variety of skills, and most importantly, set the stage for us to

effectively fight the trend of expecting too little from our students. We believe this project provides a critical tool for effective teaching in many disciplines. The versatility of this type of intervention led colleagues to ask that we present our strategies during a professional development day and showcase methods we used to address common classroom problems. In anticipation of providing training on this methodology, I created Table 1 outlining the benefits of our notebook intervention and specifying problem specific solutions.

REFERENCES

Bandura, A. (1994). Self-efficacy [Electronic version]. In (V. S. Ramachaudran, Ed.). *Encyclopedia of human behavior* (Vol. 4, 78-81). New York: Academic Press.

Benton-Kupper, J. (1999). Can less be more? The quantity versus quality issue of curriculum in a block schedule. *Journal of Research and Development in Education*. *32*(3), 168-77. (ERIC Document Reproduction Service No. EJ590568). Retrieved from ERIC database.

Berlinger, D. (1990). *The nature of time in schools theoretical concepts, practitioner perceptions*. Retrieved Feb 24, 2008, from Arizona State University Website: http://courses.ed.asu.edu/berliner/readings/fuss/fuss.htm

Bloom, B. S. (1968). Mastery learning. In J. H. Block (Ed.), *Mastery learning theory and practice* (pp. 47-63). Holt Rinehart Winston Inc. NY.

Carroll, J. B. (1963). A model of school learning. *Teachers College Record, 64*(8), 723-733.

Cunningham, J., Krull, C., Land, Nora., & Russell, S. (2000, May). *Motivating students to be self-reflective learners through goal-setting and self-evaluation.* Unpublished thesis/dissertation, Saint Xavier University, Chicago, Illinois. (ERIC Document Reproduction Service No. ED446872). Retrieved from ERIC database.

Franzblau, A. (1958). *A primer of statistics for non-statisticians*. Harcourt, Brace & World (Chap. 7).

Fuchs, L. S., Fuchs, D. & Tindal, G. (May/June 1986). Effects of mastery learning procedures on student achievement. *Journal of Educational Research, 79(5),* 286-291.

Gideon, B. (2002, October). Structuring schools for teacher collaboration [Electronic version]. *The Educational Digest, 68*(2), 30. www.eddigest.com.

Greenwood, D. (2007). Teaching/learning action research requires fundamental reforms in public higher education. *Action Research, Volume 5(3): 249–264.* http://arj.sagepub.com/cgi/reprint/5/3/249. doi: 10.1177/1476750307081016

Gonick, L & Huffman, A. (1990). *The cartoon guide to physics.* HarperCollins Publishers, NY.

Hanlon, E. H., & Schneider, Y. (1999, April). *Improving math proficiency through self-efficacy training.* Paper presented at the Annual Meeting of the American

Educational Research Association, Montreal, Quebec, Canada. (ERIC Document Reproduction Service No. ED433236). Retrieved from ERIC database.

Imel, S. (2002). *Metacognitive skills for adult learning trends and issues alert*. Unpublished manuscript, Ohio State University. (ERIC Document Reproduction Service No. ED469264). Retrieved from ERIC database.

Inger, M. (1993, December). Center focus number 2. National Center for Research in Vocational Education: University of California at Berkley. http://ncrve.berkeley.edu/CenterFocus/CF2.html

Leech, N. L., Barrett, K. C., Morgan, G. A., (2004). SPSS for intermediate statistics: use and interpretation. Routledge. Retrived from http://www.informaworld.com/978-1-4106-1142-0

Likert scale (2007). Wikipedia. Retrieved May 24, 2008, from http://en.wikipedia.org/wiki/Likert_scale

Marzano, R. J., Brandt, R. S., Hughes, C. S., Jones, B. F., Presseisen, B. Z., & Rankin, S. C., (1988). *Dimensions of thinking: a framework for curriculum and instruction.* Alexandria, VA: The Association for Supervision and Curriculum Development.

Marzano, R. J., Pickering, D. J., Pollock, J. E., (2001). *Classroom instruction that works: research-based strategies for increasing student achievement.* Alexandria, VA: The Association for Supervision and Curriculum Development.

Mertler, C. A. (2006). *Action research: teachers as researchers in the classroom.* Thousand Oaks, CA: Sage Publications.

Mills, G. E. (2007). *Action research: A guide for the teacher researcher 3rd edition.* Upper Saddle River, NJ: Pearson Prentice Hall.

Monahan, S., Ognibene, B., & Torrisi A., (2002, December). *Effects of teaching organizational strategies,* 1st ed. Chicago: Saint Xavier University. (ERIC Document Reproduction Service No. ED450941). Retrieved from ERIC database.

Newton, Isaac, (2007). Wikipedia. Retrieved July 1, 2008, from http://en.wikiquote.org/wiki/Isaac_Newton.

Nonparametric Tests, (2007). MVP programs. Retrieved July 1, 2008, from http://mvpprograms.com/help/mvpstats/NonparametricTests#np8.

Olsen, D. G. (1995). "Less" can be "more" in the promotion of thinking. *Social Education, 59,* 130-4. (ERIC Document Reproduction Service No. EJ502216). Retrieved from ERIC database.

Paris, S. G., & Winograd, P. W. (1990). How metacognition can promote academic learning and instruction. In B. Jones & L. Idol (Eds.), *Dimensions of thinking and cognitive instruction* (p. 15 - 51). Hillsdale, NJ: Lawrence Erlbaum Associates.

Penn, C., Shelley, S., & Zaininger L. (1998). *Enhancing transfer of learning among seventh graders*. Unpublished master's thesis, Saint Xavier University, Chicago, IL. (ERIC Document Reproduction Service No. ED422117). Retrieved from ERIC database.

Perez-Katz, A. (2007, May). Teacher support systems: A collaboration model [Electronic version]. *Principal leadership (highsch ed)*, *7*(9), 39. (ERIC Document Reproduction Service No. EJ767329). Retrieved from ERIC database.

Schmoker, M. (1999). *Results: The key to continuous school improvement-2nd edition.* Alexandria, VA: The Association for Supervision and Curriculum Development.

U.S. Department of Education: No child left behind growth models: Ensuring grade-level proficiency for all students by 2014. Retrieved November 5, 2007, from http://www.ed.gov/admins/lead/account/growthmodel/proficiency.pdf

U.S. Department of Education. (1998). Policy brief: What the third international mathematics and science study (TIMSS) means for systematic improvement. Perspectives on educational policy research. Washington, D.C.: The National Institute on Educational Governance, Finance, Policymaking and Management; Office of Educational Research and Improvement.

University of Northern Iowa. SPSS techniques series: Statistics on Likert scale survey. Retrieved May 24, 2008, from http://www.uni.edu/its/us/document/stats/spss2.html

Vojnovich, C. M. (1997). *Improving student motivation in the secondary classroom through the use of critical thinking skills, cooperative learning techniques, and reflective journal writing*. Unpublished master's thesis, Saint Xavier University, Chicago, IL. (ERIC Document Reproduction Service No. ED411334). Retrieved from ERIC database.

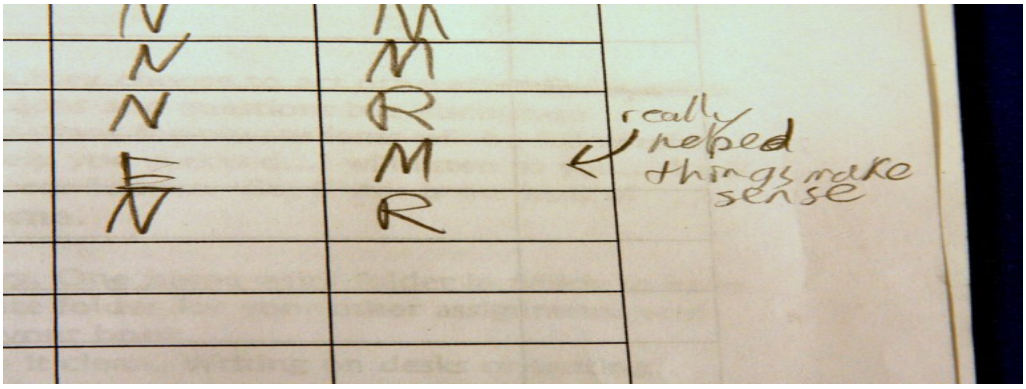
APPENDIX A

Daily Log for Journals

Difficulty Ranking: H = hard, N = normal, E = easy

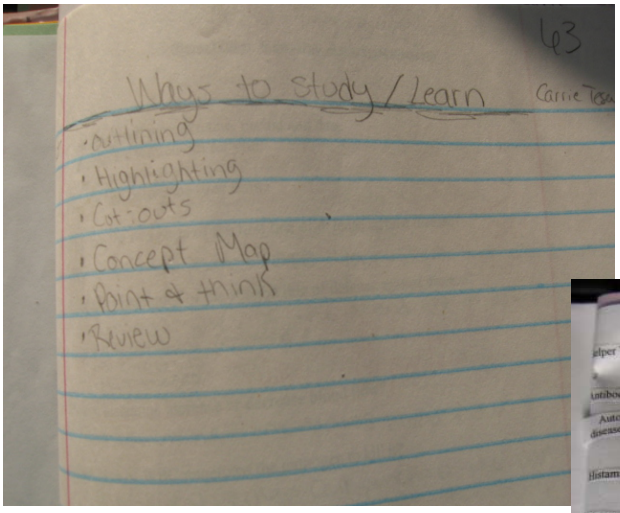
Meaningfulness Ranking: M = meaningful, R= related to class work, U = useless

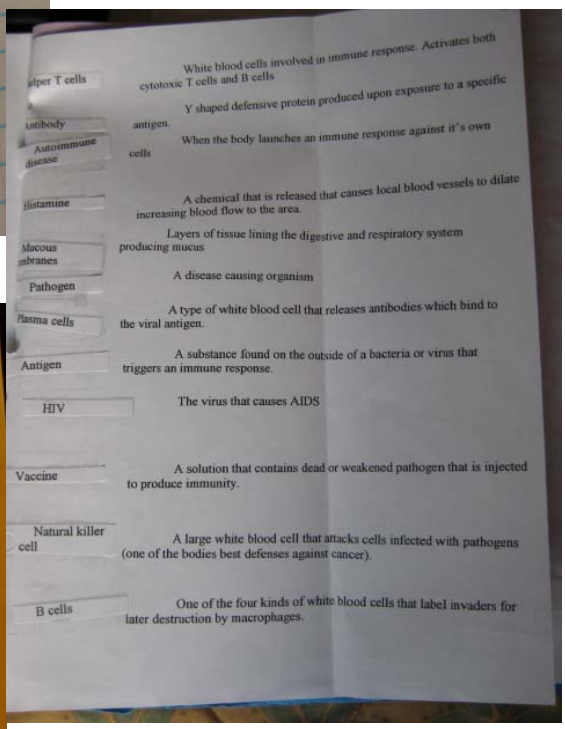
Date	Assignment	Difficulty	Meaningfulness
04/25	worksheets	N	R
4/28	correcting labs	N	R
4/29	debate + Worksheet	N	M
4/30	Movie worksheet	N	R
5/2	Quiz, Pre test WS	ok	ok
5/5	study for test	N	R
5/6	retake Quiz	N	M
5/7	test active Reading	ok	R
5/8	Hand in NB	E	R
5/9	Outline, Highlight	N	R
5/12	Blood Type w/ food clone	N	R
5/13	blood typing W.S.	N	R
5/14	outline, cut outs	N	R
5/15	blood disease Quiz	N	R
5/16	Acting Bonus WS	N	R
5/18	W.S. reviewing	N	R
5/19	book W.S. Survey	N	R
5/20	Swamp lab	N	R
5/21	review Vocab	N	R

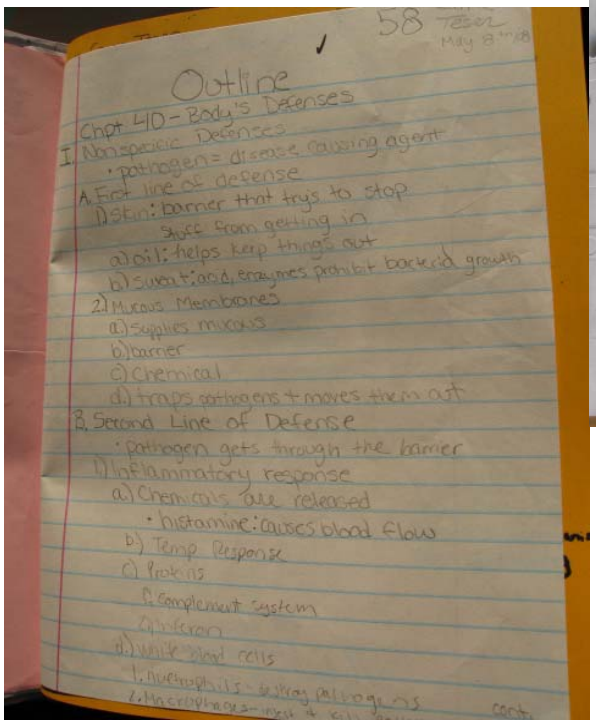


APPENDIX B

Student Study Guide, Modified Flash Cards and Chapter Outline

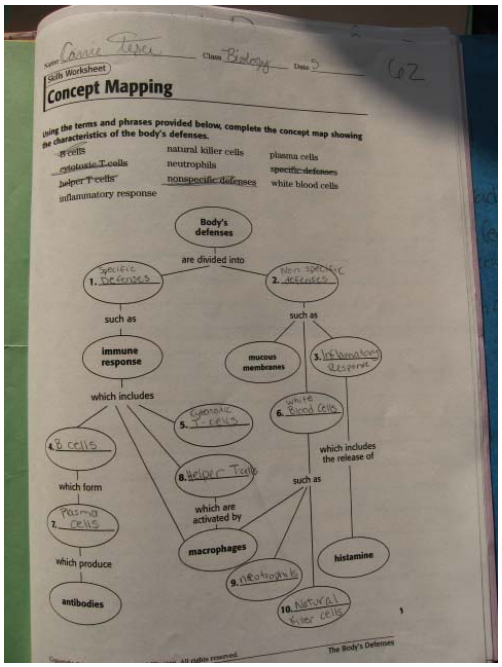


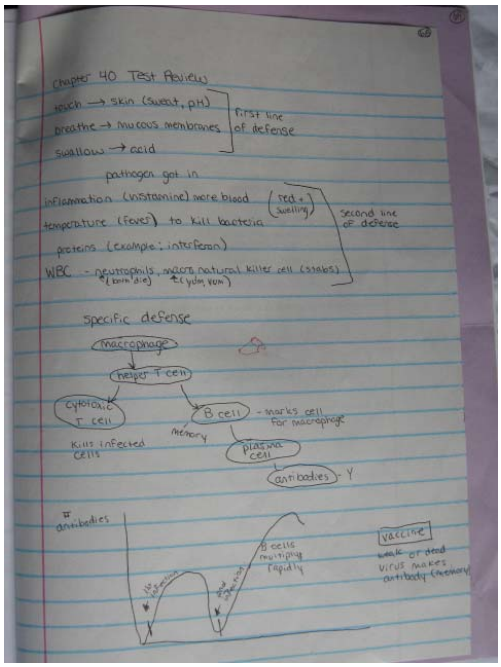


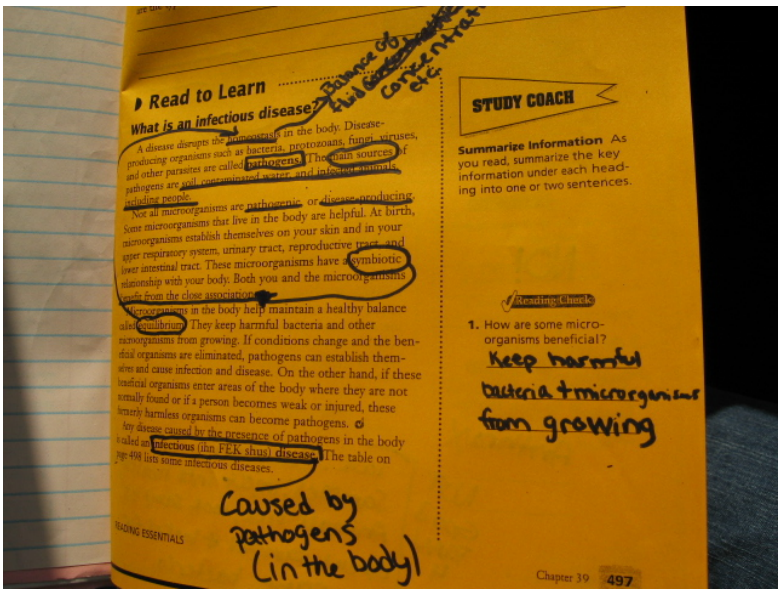


APPENDIX C

Student Concept Maps and Highlighting

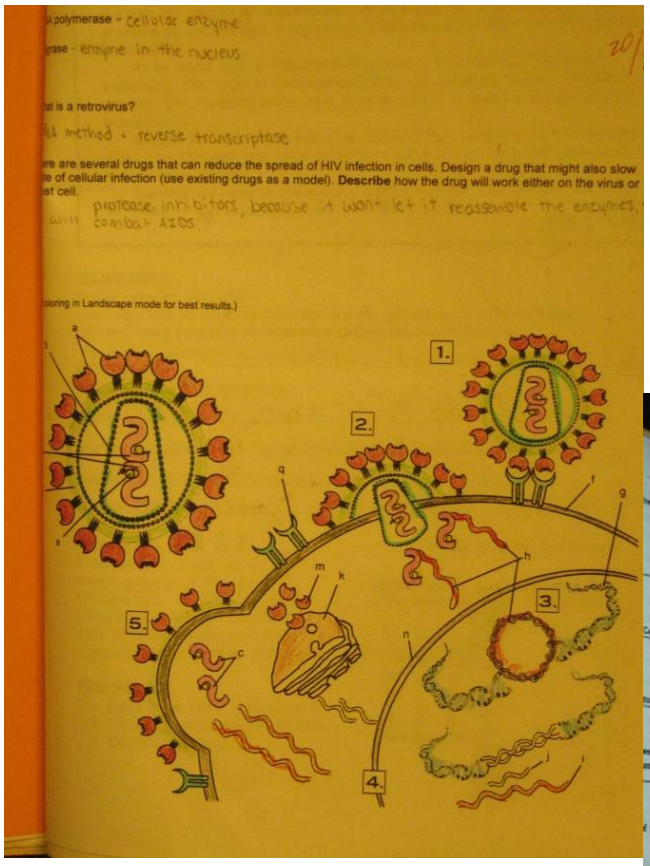


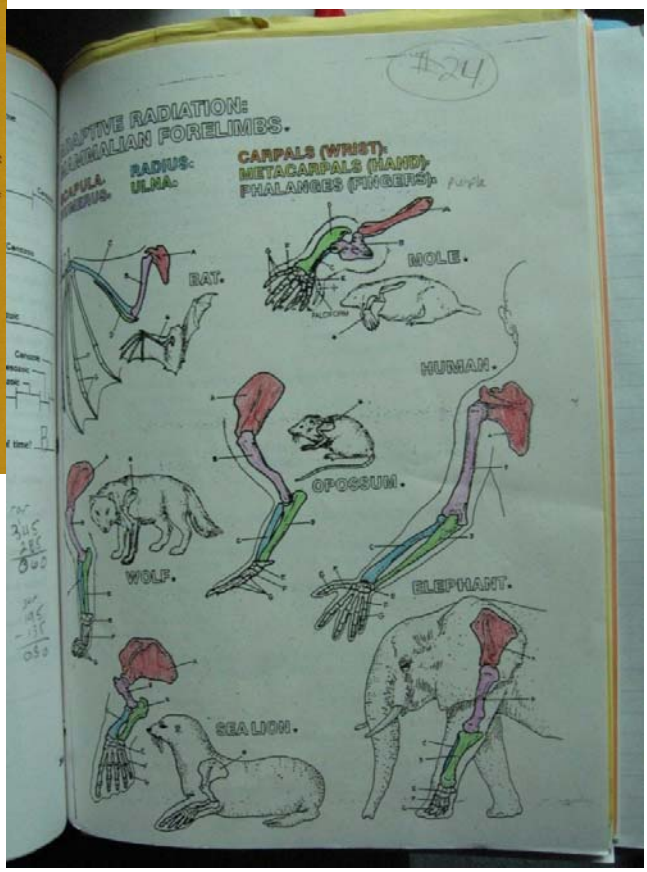




APPENDIX D

Notebook Diagrams





APPENDIX E

Detailed Steps Followed for the Action Research Project

Existing Information

Previous term grade for third quarter
Pre-test scores are low and have essays added as bonus even through their quality is low
Pre-tallies for time needed for absent students
Observations that students are disorganized and test scores are low
Research on educational theories is done to guide the action research project

Project Gradually Implemented

Daily log setup to increase organization and help absent students
Tallies for time needed for absent students drops
Quiz with retake for mastery and all scores improved except for student not studying for either quiz
Testing during setup period is showing improvement
Essays still poor
Pre-survey approved and given but notebook had already been started
Quiz given with study materials within the notebook
Test scores compared with earlier quizzes and improvements
Essays better but still need improvement
Journaling activities begun
Post-survey given two weeks after pre-survey and lowest cognate is metacognition

Project Results are Encouraging and Project are Extended

Exit survey written for students to indicate degree of improvement and it is administered to the students
Journaling activities extended to assist with metacognition
Essays show remarkable improvement
Post-test scores show improvement

Results Analyzed and Data Reviewed

Quantitative data for test and quiz grades are diagrammed and show improvement
Essay scores show steady increase over time
Tallies for the time needed to help previously absent students indicate the daily log is helping
Survey data analyzed with frequency for distribution curves, sign tests, mediums, modes, minimums, maximums, averages, and standard deviations

APPENDIX F

Pre and Post Student Survey of Organization and Grades

Code name: Pet name and the last 2 digits of your phone number (Keep the same for first and second survey)_____

Please read all questions carefully. Your feedback will be used to help teachers improve the way students learn. Your responses will **never** be identified with you nor will it affect your grades. Circle the closest estimate for each question.

1. How would you rank your current level of organization?

Poor Below average Average Above average Excellent

2. Current grade in class. (closest estimate)

A *B* *C* *D* *E*

3. Grade desired in class.

A *B* *C* *D* *E*

4. How important is it to think about what you have learned?

Not important *Some what important* *Very important*

5. Do you complete homework assignments daily?

Never Rarely Sometimes Usually Always

6. Do you spend over 30 minutes studying for a test?

Never Rarely Sometimes Usually Always

7. How do you study for tests? Circle all that apply

Never study Read Chapter Look over notes and assignments

Make flash cards Write out concepts Discuss concepts with someone

*Other:*_____

8. When I go into a test I feel I have mastered the content

Never Rarely Sometimes Usually Always

9. I feel confident I have mastered what I have learned before tests?

Never Rarely Sometimes Usually Always

10. Do you know what to study for tests?

Never Rarely Sometimes Usually Always

11. Do you feel like you have control over your Biology grades?

Never Rarely Sometimes Usually Always

12. Do you enjoy Biology class?

Never *Rarely* *Sometimes* *Usually* *Always*

13. Do you think being organized helps improve grades?

Never *Rarely* *Sometimes* *Usually* *Always*

14. How often do you remember what you learned in Biology the day before?

Never *Rarely* *Sometimes* *Usually* *Always*

15. How often do you think about what you have learned?

Never *Rarely* *Sometimes* *Usually* *Always*

16. I know how to master the material I am taught.

Never *Rarely* *Sometimes* *Usually* *Always*

17. Before we started your Biology notebook did you keep homework organized in a folder?

Never *Rarely* *Sometimes* *Usually* *Always*

18. Do you write down homework daily?

Never *Rarely* *Sometimes* *Usually* *Always*

19. Do you think you could do better in class?

Never Rarely Sometimes Usually Always

20. Do you know what to study for a test?

Never Rarely Sometimes Usually Always

21. When receiving a low grade do you look over mistakes and try to learn from them?

Never Rarely Sometimes Usually Always

22. Do you find the subjects covered in Biology interesting?

Never Rarely Sometimes Usually Always

23. Do you see applications for Biology concepts outside of the classroom?

Never Rarely Sometimes Usually Always

24. Is the atmosphere of your Biology classroom comfortable for learning?

Never Rarely Sometimes Usually Always

All students will participate in this in-class activity based on course curricula. Students' participation in the research of the course curricula is voluntary. Students will read the following information about informed consent:

The completion of this survey is voluntary. No names or identifying numbers will be used. There is no retribution for deciding not to participate in this study. Completion of the survey will serve as permission to use your responses. You may stop the survey at anytime. If you have any questions about the study, you can contact Dr. Judy Puncochar at Northern Michigan University (227-1366 or jpuncoch@nmu.edu).

I understand that if I have any further questions regarding my rights as a participant in a research project I may contact Dr. Cindy Prosen of the Human Subjects Research Review Committee of Northern Michigan University by telephone at (906) 227-2300 or by email at cprosen@nmu.edu. Thank you!

APPENDIX G

Student Assessments of Multiple-Choice, Essays and Quizzes

	2/27/2008		2/27/2008		3/15/2008		3/24/2008	
	unit one				unit two			
	test		essay		quiz		test	
	T1pre		E1pre		Q2		T2	
possible points	90		16		20		82	
student ID								
1	75	83.3%	9	56.3%	20	100.0%	57	69.5%
2	66	73.3%	15	93.8%	20	100.0%	69	84.1%
3	63	70.0%	10	62.5%	14	70.0%	72	87.8%
4	57	63.3%	10	62.5%	12	60.0%	48	58.5%
5	78	86.7%	9	56.3%	16	80.0%	57	69.5%
6	63	70.0%	16	100.0%	19	95.0%	60	73.2%
7	66	73.3%	3	18.8%	13	65.0%	72	87.8%
8	69	76.7%	8	50.0%	17	85.0%	51	62.2%
9	63	70.0%	3	18.8%	13	65.0%	48	58.5%
10	54	60.0%	7	43.8%	14	70.0%	57	69.5%
11	81	90.0%	6	37.5%	13	65.0%	57	69.5%
12	69	76.7%	0	0.0%	9	45.0%	36	43.9%
13	75	83.3%	11	68.8%	20	100.0%	78	95.1%
14	66	73.3%	15	93.8%	17	85.0%	54	65.9%
15	72	80.0%	11	68.8%	18	90.0%	78	95.1%
16	72	80.0%	13	81.3%	18	90.0%	66	80.5%
17	72	80.0%	13	81.3%	20	100.0%	78	95.1%
18	66	73.3%	16	100.0%	18	90.0%	60	73.2%
19	81	90.0%	16	100.0%	18	90.0%	78	95.1%
20	81	90.0%	4	25.0%	16	80.0%	72	87.8%
21	60	66.7%	13	81.3%	20	100.0%	60	73.2%
22	63	70.0%	6	37.5%	16	80.0%	57	69.5%
23	75	83.3%	15	93.8%	20	100.0%	72	87.8%
24	57	63.3%	5	31.3%	13	65.0%	54	65.9%
25	81	90.0%	16	100.0%	20	100.0%	75	91.5%
26	75	83.3%	15	93.8%	16	80.0%	72	87.8%
average	69.2	76.9%	10.2	63.7%	16.5	82.7%	63.0	76.8%
average percent	76.9%		63.7%		82.7%		76.8%	

	3/24/2008		4/9/2008		4/17/2008		4/17/2008	
	unit three							
	essay		***quiz***		***test***		***essay***	
	E2		***Q3post***		***T3post***		***E3post***	
possible points	**16**		**20**		***68***		**12**	
student ID								
1	11	*68.8%*	18	*90.0%*				*0.0%*
2	16	*100.0%*	20	*100.0%*	*64*	*94.1%*	12	*100.0%*
3	12	*75.0%*	18	*90.0%*	*58*	*85.3%*	9	*75.0%*
4	8	*50.0%*	12	*60.0%*	*58*	*85.3%*	11	*91.7%*
5	15	*93.8%*	18	*90.0%*	*56*	*82.4%*	10	*83.3%*
6	10	*62.5%*			*56*	*82.4%*	8	*66.7%*
7	7	*43.8%*	16	*80.0%*				*0.0%*
8	16	*100.0%*	16	*80.0%*	*46*	*67.6%*	7	*58.3%*
9	7	*43.8%*	18	*90.0%*	*56*	*82.4%*	12	*100.0%*
10	8	*50.0%*			*50*	*73.5%*	12	*100.0%*
11	16	*100.0%*	18	*90.0%*	*58*	*85.3%*	10	*83.3%*
12	11	*68.8%*	17	*85.0%*	*54*	*79.4%*	9	*75.0%*
13	18	*112.5%*	18	*90.0%*	*66*	*97.1%*	12	*100.0%*
14	9	*56.3%*	20	*100.0%*	*60*	*88.2%*	11	*91.7%*
15	10	*62.5%*	18	*90.0%*	*54*	*79.4%*	4	*33.3%*
16	18	*112.5%*	16	*80.0%*				*0.0%*
17	15	*93.8%*	20	*100.0%*	*60*	*88.2%*	12	*100.0%*
18	18	*112.5%*	18	*90.0%*	*60*	*88.2%*	12	*100.0%*
19	16	*100.0%*	20	*100.0%*	*60*	*88.2%*	12	*100.0%*
20	12	*75.0%*	18	*90.0%*	*62*	*91.2%*	9	*75.0%*
21	15	*93.8%*			*60*	*88.2%*	12	*100.0%*
22	16	*100.0%*			*54*	*79.4%*	6	*50.0%*
23	16	*100.0%*	18	*90.0%*	*58*	*85.3%*	12	*100.0%*
24	9	*56.3%*	18	*90.0%*	*48*	*70.6%*	11	*91.7%*
25	18	*112.5%*	20	*100.0%*	*64*	*94.1%*	12	*100.0%*
26	18	*112.5%*	20	*100.0%*	*58*	*85.3%*	7	*58.3%*
average	13.3	*82.9%*	18.0	*89.8%*	*57.4*	*84.4%*	10.1	*84.1%*
average percent	82.9%		89.8%		*84.4%*		84.1%	

Note: All grades available by the project completion date are included within the tables and subsequent graphs.

APPENDIX H

Exit Survey Organized by Construct

Exit Survey: Student Survey of Organization and Grades

Code name: Pet name and the last 2 digits of your phone number (Keep the same for first and second survey)_____

Please read all questions carefully. Your feedback will be used to help teachers improve the way students learn. Your responses will **never** be identified with you nor will it affect your grades. Circle the closest estimate for each question. Please pick only one answer.

1. Has keeping a notebook increased your level of organization? (organization)

Never Rarely Sometimes Usually Always

2. Has keeping a notebook helped you improve your study skills? (mastery)

Never Rarely Sometimes Usually Always

3. Have the journal entries helped you think about what you learned? (metacognition)

Never Rarely Sometimes Usually Always

4. Has keeping a log of assignments helped you be more organized? (organization)

Never Rarely Sometimes Usually Always

5. Do the journal entries help you see applications for Biology outside the classroom? (metacognition)

Never Rarely Sometimes Usually Always

6. Do you find yourself more motivated to study when you have an organized binder of what will be on the test or quiz? (motivation)

Never Rarely Sometimes Usually Always

7. Have you learned more methods of how to study for a test? (self-efficacy)

Never Rarely Sometimes Usually Always

8. Are you now more likely to complete assignments? (motivation)

Never Rarely Sometimes Usually Always

9. Now, do you feel more confident that you know what will be on the test? (self-efficacy)

Never Rarely Sometimes Usually Always

10. Do you feel like you have more control over your Biology grade? (self-efficacy)

Never Rarely Sometimes Usually Always

11. Do you enjoy being able to give input on whether assignments are meaningful? (self-efficacy)

Never Rarely Sometimes Usually Always

12. Do you enjoy Biology class more with the organizational binder? (self-efficacy)

Never Rarely Sometimes Usually Always

13. Do you think being organized helps the average student improve grades? (organization)

Never Rarely Sometimes Usually Always

14. Does journaling help you remember what you learned in Biology the day before? (metacognition)

Never Rarely Sometimes Usually Always

15. Do you find yourself more motivated to study for tests now that you are more organized? (motivation)

Never Rarely Sometimes Usually Always

16. Has your notebook helped you to master the Biology topics? (mastery)

Never Rarely Sometimes Usually Always

17. Now that you have a log of assignments are you more likely to record your assignments? (organization)

Never Rarely Sometimes Usually Always

18. By taking more frequent quizzes or being able to retake a quiz, has your mastery of the topic improved? (mastery)

Never Rarely Sometimes Usually Always

19. What was you level of organization before using this binder?

Low *Medium* *High*

20. How satisfied were with your grades before using the binder?

Low *Medium* *High*

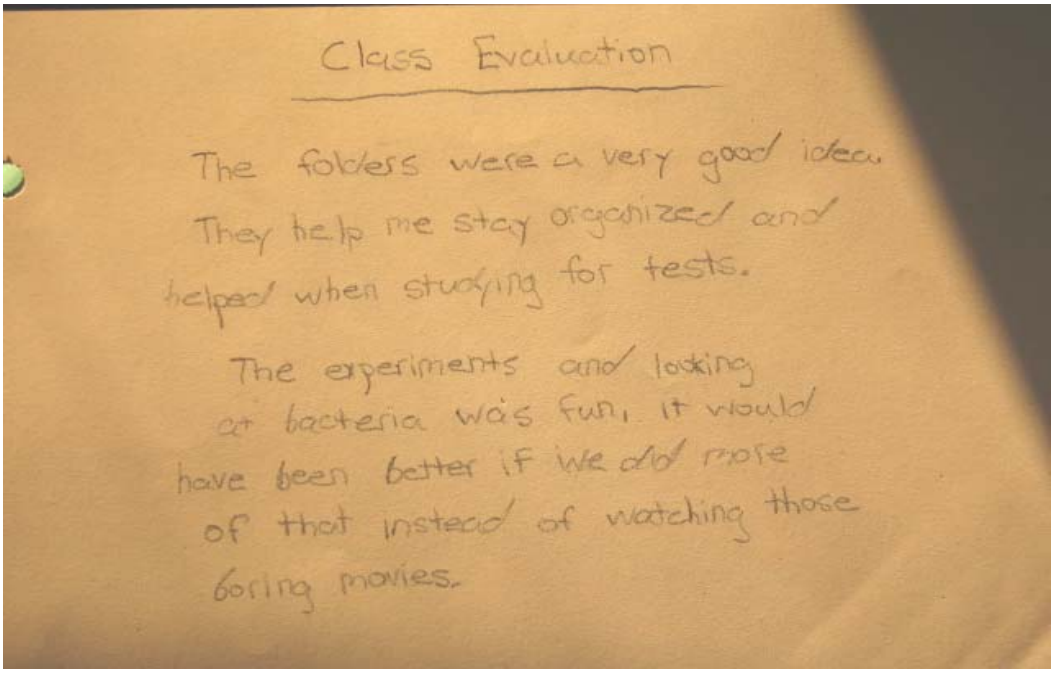
All students will participate in this in-class activity based on course curricula. Students' participation in the research of the course curricula is voluntary. Students will read the following information about informed consent:

The completion of this survey is voluntary. No names or identifying numbers will be used. There is no retribution for deciding not to participate in this study. Completion of the survey will serve as permission to use your responses. You may stop the survey at anytime. If you have any questions about the study, you can contact Dr. Judy Puncochar at Northern Michigan University (227-1366 or jpuncoch@nmu.edu).

I understand that if I have any further questions regarding my rights as a participant in a research project I may contact Dr. Cindy Prosen of the Human Subjects Research Review Committee of Northern Michigan University by telephone at (906) 227-2300 or by email at cprosen@nmu.edu. Thank you!

APPENDIX I

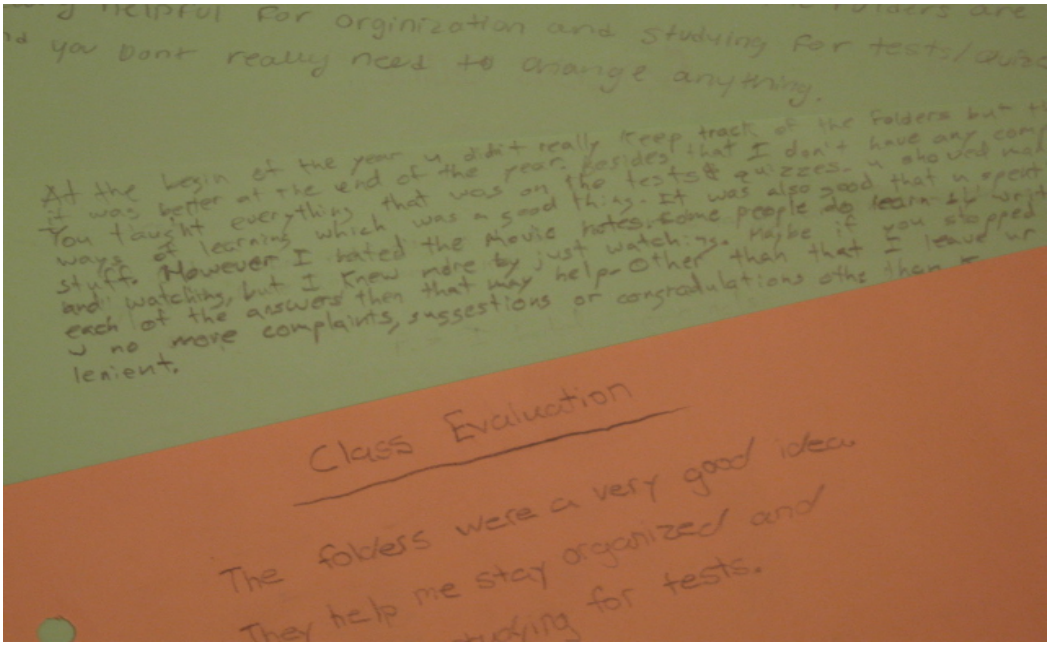
Student End-of-Year Class Evaluations



Class Evaluation

The folders were a very good idea. They help me stay organized and helped when studying for tests.

The experiments and looking at bacteria was fun, it would have been better if we did more of that instead of watching those boring movies.



you dont really need to arange anything.

Class Evaluation

The folders were a very good idea

APPENDIX J

Wilcoxon Signed Ranks Test for Both Classes' Pre and Post-Surveys

Ranks

		N	Mean Rank	Sum of Ranks
SPreOrg - SPoOrg	Negative Ranks	20[a]	16.60	332.00
	Positive Ranks	8[b]	9.25	74.00
	Ties	6[c]		
	Total	34		
SPoMast - SPreMast	Negative Ranks	9[d]	8.56	77.00
	Positive Ranks	12[e]	12.83	154.00
	Ties	13[f]		
	Total	34		
SPoMotv - SPreMotv	Negative Ranks	11[g]	8.86	97.50
	Positive Ranks	9[h]	12.50	112.50
	Ties	13[i]		
	Total	33		
SPoMeta - SPreMeta	Negative Ranks	10[j]	15.05	150.50
	Positive Ranks	16[k]	12.53	200.50
	Ties	8[l]		
	Total	34		
SPoSE - SPreSE	Negative Ranks	8[m]	7.50	60.00
	Positive Ranks	11[n]	11.82	130.00
	Ties	15[o]		
	Total	34		

a. SPreOrg < SPoOrg
b. SPreOrg > SPoOrg
c. SPreOrg = SPoOrg
d. SPoMast < SPreMast
e. SPoMast > SPreMast
f. SPoMast = SPreMast
g. SPoMotv < SPreMotv
h. SPoMotv > SPreMotv
i. SPoMotv = SPreMotv
j. SPoMeta < SPreMeta
k. SPoMeta > SPreMeta
l. SPoMeta = SPreMeta
m. SPoSE < SPreSE
n. SPoSE > SPreSE
o. SPoSE = SPreSE

Test Statistics [c]

	SPreOrg - SPoOrg	SPoMast - SPreMast	SPoMotv - SPreMotv	SPoMeta - SPreMeta	SPoSE - SPreSE
Z	-2.977[a]	-1.389[b]	-.285[b]	-.643[b]	-1.480[b]
Asymp. Sig. (2-tailed)	.003	.165	.776	.521	.139

a. Based on positive ranks.
b. Based on negative ranks.
c. Wilcoxon Signed Ranks Test

APPENDIX K

Wilcoxon Signed Ranks Test for Clement Classes' Pre and Post-Surveys

Ranks

		N	Mean Rank	Sum of Ranks
SPreOrg - SPoOrg	Negative Ranks	7[a]	7.00	49.00
	Positive Ranks	5[b]	5.80	29.00
	Ties	5[c]		
	Total	17		
SPoMast - SPreMast	Negative Ranks	5[d]	5.00	25.00
	Positive Ranks	6[e]	6.83	41.00
	Ties	6[f]		
	Total	17		
SPoMotv - SPreMotv	Negative Ranks	4[g]	4.00	16.00
	Positive Ranks	4[h]	5.00	20.00
	Ties	9[i]		
	Total	17		
SPoMeta - SPreMeta	Negative Ranks	3[j]	10.00	30.00
	Positive Ranks	10[k]	6.10	61.00
	Ties	4[l]		
	Total	17		
SPoSE - SPreSE	Negative Ranks	3[m]	4.00	12.00
	Positive Ranks	7[n]	6.14	43.00
	Ties	7[o]		
	Total	17		

a. SPreOrg < SPoOrg
b. SPreOrg > SPoOrg
c. SPreOrg = SPoOrg
d. SPoMast < SPreMast
e. SPoMast > SPreMast
f. SPoMast = SPreMast
g. SPoMotv < SPreMotv
h. SPoMotv > SPreMotv
i. SPoMotv = SPreMotv
j. SPoMeta < SPreMeta
k. SPoMeta > SPreMeta
l. SPoMeta = SPreMeta
m. SPoSE < SPreSE
n. SPoSE > SPreSE
o. SPoSE = SPreSE

Test Statistics [c]

	SPreOrg - SPoOrg	SPoMast - SPreMast	SPoMotv - SPreMotv	SPoMeta - SPreMeta	SPoSE - SPreSE
Z	-.803[a]	-.758[b]	-.284[b]	-1.102[b]	-1.642[b]
Asymp. Sig. (2-tailed)	.422	.449	.776	.271	.101

a. Based on positive ranks.
b. Based on negative ranks.
c. Wilcoxon Signed Ranks Test

APPENDIX L

Nonparametric Correlations between Constructs for Students' Exit Surveys

Correlations

			ExitOrg	ExitMastr	ExitMotiv	ExitSE	ExitMetaC
Spearman's rho	ExitOrg	Correlation Coefficien	1.000	.679**	.725**	.628**	.737**
		Sig. (2-tailed)	.	.001	.000	.003	.000
		N	20	20	20	20	20
	ExitMastr	Correlation Coefficien	.679**	1.000	.801**	.755**	.630**
		Sig. (2-tailed)	.001	.	.000	.000	.003
		N	20	20	20	20	20
	ExitMotiv	Correlation Coefficien	.725**	.801**	1.000	.819**	.609**
		Sig. (2-tailed)	.000	.000	.	.000	.004
		N	20	20	20	20	20
	ExitSE	Correlation Coefficien	.628**	.755**	.819**	1.000	.610**
		Sig. (2-tailed)	.003	.000	.000	.	.004
		N	20	20	20	20	20
	ExitMetaC	Correlation Coefficien	.737**	.630**	.609**	.610**	1.000
		Sig. (2-tailed)	.000	.003	.004	.004	.
		N	20	20	20	20	20

**. Correlation is significant at the 0.01 level (2-tailed).

APPENDIX M

Permission to Use Mode Cartoon

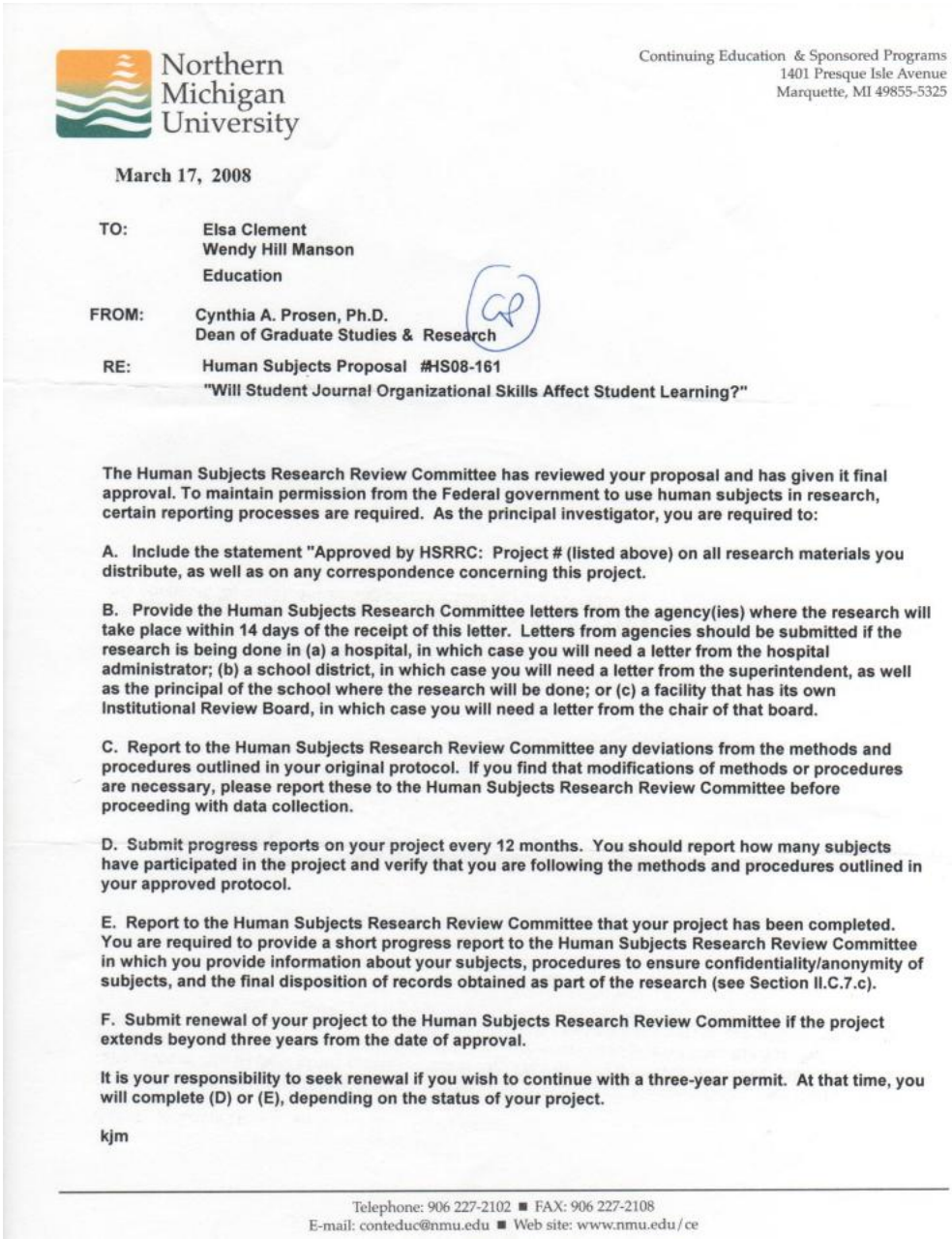
I give Elsa Clement my unlimited permission to use the "Ah, the mode" cartoon.

William (Bill) Houle

July 18, 05
Date

APPENDIX N

Permission Letter from Northern Michigan University



Northern Michigan University

Continuing Education & Sponsored Programs
1401 Presque Isle Avenue
Marquette, MI 49855-5325

March 17, 2008

TO: Elsa Clement
Wendy Hill Manson
Education

FROM: Cynthia A. Prosen, Ph.D.
Dean of Graduate Studies & Research

RE: Human Subjects Proposal #HS08-161
"Will Student Journal Organizational Skills Affect Student Learning?"

The Human Subjects Research Review Committee has reviewed your proposal and has given it final approval. To maintain permission from the Federal government to use human subjects in research, certain reporting processes are required. As the principal investigator, you are required to:

A. Include the statement "Approved by HSRRC: Project # (listed above) on all research materials you distribute, as well as on any correspondence concerning this project.

B. Provide the Human Subjects Research Committee letters from the agency(ies) where the research will take place within 14 days of the receipt of this letter. Letters from agencies should be submitted if the research is being done in (a) a hospital, in which case you will need a letter from the hospital administrator; (b) a school district, in which case you will need a letter from the superintendent, as well as the principal of the school where the research will be done; or (c) a facility that has its own Institutional Review Board, in which case you will need a letter from the chair of that board.

C. Report to the Human Subjects Research Review Committee any deviations from the methods and procedures outlined in your original protocol. If you find that modifications of methods or procedures are necessary, please report these to the Human Subjects Research Review Committee before proceeding with data collection.

D. Submit progress reports on your project every 12 months. You should report how many subjects have participated in the project and verify that you are following the methods and procedures outlined in your approved protocol.

E. Report to the Human Subjects Research Review Committee that your project has been completed. You are required to provide a short progress report to the Human Subjects Research Review Committee in which you provide information about your subjects, procedures to ensure confidentiality/anonymity of subjects, and the final disposition of records obtained as part of the research (see Section II.C.7.c).

F. Submit renewal of your project to the Human Subjects Research Review Committee if the project extends beyond three years from the date of approval.

It is your responsibility to seek renewal if you wish to continue with a three-year permit. At that time, you will complete (D) or (E), depending on the status of your project.

kjm

Telephone: 906 227-2102 ■ FAX: 906 227-2108
E-mail: conteduc@nmu.edu ■ Web site: www.nmu.edu/ce

APPENDIX O

Pre and Post Intervention Term Grades SSPS Analysis of Paired Samples

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PostTerm	83.0973	26	11.60014	2.27497
	PreTerm	79.7185	26	12.24470	2.40138

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	PostTerm - PreTerm	3.37885	7.09325	1.39110	.51382	6.24387	2.429	25	.023

APPENDIX P

Repeated Measures ANOVA for Independent Assessments
Including Mauchly, Greenhouse-Geisser and Bonferroni

Measure:MEASURE_1

prepost	assessments	Dependent Variable
1	1	PreMC1
	2	PreE1
	3	PreQ1
2	1	PostMC2
	2	PostE2
	3	PostQ2

Mauchly's Test of Sphericity[b]

Measure:MEASUR
E_1

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[a]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
prepost	1.000	.000	0	.	1.000	1.000	1.000
assessments	.534	10.655	2	.005	.682	.719	.500
prepost * assessments	.596	8.804	2	.012	.712	.756	.500

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

b. Design: Intercept
Within Subjects Design: prepost + assessments + prepost *
assessments

Within Subjects Tests of Effects Pre and Post Intervention Assessments

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
prepost	Sphericity Assumed	3993.159	1	3993.159	13.510	.002
	Greenhouse-Geisser	3993.159	1.000	3993.159	13.510	.002
	Huynh-Feldt	3993.159	1.000	3993.159	13.510	.002
	Lower-bound	3993.159	1.000	3993.159	13.510	.002
Error(prepost)	Sphericity Assumed	5320.443	18	295.580		
	Greenhouse-Geisser	5320.443	18.000	295.580		
	Huynh-Feldt	5320.443	18.000	295.580		
	Lower-bound	5320.443	18.000	295.580		
assessments	Sphericity Assumed	2368.116	2	1184.058	5.497	.008
	Greenhouse-Geisser	2368.116	1.365	1735.448	5.497	.019
	Huynh-Feldt	2368.116	1.438	1646.482	5.497	.017
	Lower-bound	2368.116	1.000	2368.116	5.497	.031
Error(assessments)	Sphericity Assumed	7753.764	36	215.382		
	Greenhouse-Geisser	7753.764	24.562	315.681		
	Huynh-Feldt	7753.764	25.889	299.498		
	Lower-bound	7753.764	18.000	430.765		
p > .05 no interaction prepost * assessments	Sphericity Assumed	970.741	2	485.370	2.715	.080
	Greenhouse-Geisser	970.741	1.424	681.573	2.715	.100
	Huynh-Feldt	970.741	1.512	642.062	2.715	.097
	Lower-bound	970.741	1.000	970.741	2.715	.117
Error(prepost*assessments)	Sphericity Assumed	6436.133	36	178.781		
	Greenhouse-Geisser	6436.133	25.637	251.051		
	Huynh-Feldt	6436.133	27.214	236.497		
	Lower-bound	6436.133	18.000	357.563		

Estimated Marginal Means for Assessments

3. prepost * assessments

Measure:MEASURE_1

prepost	assessments	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
1	1	78.763	1.996	74.569	82.957
	2	65.158	7.143	50.150	80.166
	3	81.579	3.708	73.788	89.369
2	1	85.137	1.691	81.584	88.689
	2	85.084	4.305	76.039	94.129
	3	90.789	2.172	86.227	95.352

2. assessments

Estimates

Measure:MEASURE_1

assessments	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	81.950	1.537	78.720	85.180
2	75.121	4.599	65.460	84.782
3	86.184	2.596	80.730	91.638

Pairwise Comparisons (Bonferroni)

Measure:MEASURE_1

(I) assessments	(J) assessments	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
					Lower Bound	Upper Bound
1	2	6.829	4.218	.369	-4.303	17.961
	3	-4.234	2.102	.177	-9.781	1.312
2	1	-6.829	4.218	.369	-17.961	4.303
	3	-11.063*	3.435	.014	-20.129	-1.998
3	1	4.234	2.102	.177	-1.312	9.781
	2	11.063*	3.435	.014	1.998	20.129

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

*. The mean difference is significant at the .05 level.

1. prepost

Estimates

Measure:MEASURE_1

prepost	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	75.167	3.668	67.461	82.872
2	87.004	2.084	82.625	91.382

APPENDIX Q

Exit Survey Student Responses

Statistics

		NPost1	NPost2	NPost3	NPost4	NPost5	NPost6	NPost7	NPost8	NPost9	NPost10
N	Valid	20	20	20	20	20	20	20	20	20	20
	Missing	11	11	11	11	11	11	11	11	11	11
	Median	4.0000	3.5000	2.5000	2.5000	3.0000	3.5000	3.0000	4.0000	4.0000	4.0000
	Mode	4.00[a]	2.00[a]	4.00	2.00	3.00	4.00	3.00[a]	4.00	4.00	3.00
	Minimum	1.00	1.00	1.00	1.00	1.00	1.00	2.00	1.00	1.00	2.00
	Maximum	5.00	5.00	5.00	5.00	4.00	5.00	5.00	5.00	5.00	5.00

a. Multiple modes exist. The smallest value is shown

Statistics

		NPost11	NPost12	NPost13	NPost14	NPost15	NPost16	NPost17	NPost18	NPost19	NPost20
N	Valid	20	20	20	20	20	20	20	20	20	20
	Missing	11	11	11	11	11	11	11	11	11	11
	Median	4.0000	3.0000	4.0000	3.0000	3.0000	3.0000	2.5000	3.0000	2.0000	2.5000
	Mode	4.00	4.00	4.00	3.00[a]	2.00	2.00	2.00	3.00	2.00	3.00
	Minimum	1.00	1.00	2.00	1.00	1.00	1.00	1.00	3.00	1.00	1.00
	Maximum	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	3.00	3.00

a. Multiple modes exist. The smallest value is shown

APPENDIX R

Highest Ranked Exit Items for Median and Mode

Construct	Question Number	Median /Mode	Question
organization	1	4/4	Has keeping a notebook increased your level of organization?
motivation	8	4/4	Are you more likely to complete assignments?
self-efficacy	9	4/4	Now, do you feel more confident that you know what will be on the test?
self-efficacy	11	4/4	Do you enjoy being able to give input on whether assignments are meaningful?
organization	13	4/4	Do you think being organized helps the average student?

APPENDIX S

Student Responses to Pre-Survey Items

ID/Variable	Teacher	Pre_1	Pre_2	Pre_3	Pre_4	Pre_5	Pre_6	Pre_71	Pre_72	Pre_73	Pre_74	Pre_75	Pre_76	Pre_7	Pre_8	Pre_9	Pre_10	Pre_11	Pre_12	Pre_13	Pre_14	Pre_15	Pre_16	Pre_17	Pre_18	Pre_19	Pre_20	Pre_21	Pre_22	Pre_23	Pre_24
Toby34	1	3	1	4	3	3	3			1			1		4	4	5	4	4	5	4	3	5	3	5	5	4	5	5	4	4
Cubby03	1	4	4	4	3	5	4		1	1					4	4	4	5	4	5	4	4	5	4	5	5	4	5	4	5	5
Oreo95	1	5	3	4	2	5	4		1	1	1				4	4	4	4	4	5	4	3	3	5	5	5	4	5	4	4	4
Cheetoh87	1	1	2	4	2	4	4								3	3	2	3	4	5	2	2	3	2	3	5	2	3	3	4	5
Toby97	1	1	1	2	3	5	3			1				3	2	2	1	4	4	4	4	2	1	1	1	5	2	4	3	2	5
Bailey98	1	5	3	4	3	5	4		1	1					3	3	5	5	4	4	5	4	4	2	3	3	4	3	4	3	5
Cozmo34	1	3	4	4	2	4	3			1			1		3	3	3	3	2	4	4	4	4	3	5	5	3	5	2	2	3
Misty32	1	2	3	4	2	4	1	1						1	4	3	1	4	2	3	3	2	4	3	1	3	1	4	2	1	5
Pebbles 46	1	1	2	3	1	4	1	1						1	4	4	3	3	2	1	3	2	4	1	1	5	3	3	2	3	4
Wolfy26	1	5	4	4	3	5	1			1				3	4	3	4	5	4	3	4	4	4	1	4	3	4	3	5	4	4
Bandit47	1	4	1	4	2	4	2			1				3	4	4	4	4	3	3	4	3	5	4	1	4	4	4	4	1	4
Gromit00	1	3	4	4	3	5	3		1	1					5	5	4	5	5	4	5	4	5	4	2	2	5	4	5	5	4
Maggie08	1	4	4	4	3	5	2			1				3	4	5	5	4	4	5	4	4	4	3	3	2	3	4	5	4	3	4
Piper24	1	4	4	4	3	5	2		1	1					5	4	5	5	5	4	4	4	5	2	2	3	4	5	5	5	5
CH42	1	3	4	2	4	3				1				3	3	4	3	4	5	4	3	3	2	1	5	3	4	3	3	5	5
Rosie14	1	3	3	4	3	5	3			1		1			3	3	5	4	3	4	4	3	4	3	4	5	5	4	3	5	4
Khloe86	1	4	3	4	2	4	2			1	1				4	4	4	5	4	5	4	4	4	5	5	5	4	5	4	4	5
67	2	5	2	4	3	4	3		1	1			1		3	3	4	4	3	4	4	2	3	3	2	4	4	3	3	3	4
Lucy55	2	3	3	4	3	5	4		1	1					3	2	4	4	3	4	5	3	4	4	5	5	4	5	3	3	4
Dexter76	2	3	2	3	2	3	1	1						1	3	3	4	3	4	4	3	3	3	1	1	4	3	2	2	1	4
Frosty28	2	3	3	3	2	4	1	1						1	4	4	1	3	2	1	2	2	4	4	5	2	4	2	3	1	3
Shadow23	2	3	3	4	3	5	4		1	1	1				4	4	4	3	4	4	4	3	4	5	4	5	4	5	4	4	5
Spike74	2	4	3	4	2	4	2		1	1					3	2	3	3	3	5	4	1	2	4	1	3	3	4	3	2	3
Rosie65	2	5	4	4	3	5	1	1						1	5	5	5	5	4	5	5	4	5	5	1	1	5	5	4	5	5
Zerstoren	2	3	3	3	2	5	3			1				3	4	3	4	3	4	4	4	3	4	4	3	4	4	3	4	3	4
Hockey392	2	3	3	4	2	4	1	1						1	3	3	3	4	3	4	3	2	4	3	1	5	3	3	3	3	4
Fredrick56	2	3	3	3	2	4	2			1				3	3	3	3	4	3	4	3	3	3	4	4	3	3	4	3	3	4
Smokey24	2	3	1	2	3	4	2			1				3	3	3	4	4	4	3	3	3	4	4	3	4	4	3	3	3	5
Jackson42	2	1	2	4	2	2	1		1					2	4	4	3	4	4	4	4	4	4	2	1	5	3	3	4	4	4
AK67	2	3	3	4	2	3	1			1				3	4	4	4	2	3	4	2	1	4	1	1	4	3	3	2	4	4
Sammy92	2	3	3	4	3	4	3			1				3	3	3	3	4	4	3	3	3	2	3	5	4	3	3	3	2	4
Willie03	2	4	4	4	2	5	4			1				3	4	4	5	5	4	5	4	4	3	2	2	4	4	5	4	4	5
Redmen Hockey	2	3	2	3	2	5	3			1				3	4	3	3	3	4	4	5	4	4	5	5	4	4	4	4	4	4
Cooper99	2	5	3	4	2	5	3		1					2	3	2	4	4	3	5	3	2	3	5	5	4	4	3	2	1	5
Toto1789	2	3	3	4	3	4	4			1				3	4	4	5	5	4	5	3	3	4	2	2	4	4	4	3	2	4
PineSap	2	2	2	3	2	4	1	1						1	4	4	3	4	3	5	5	4	5	5	4	2	5	4	5	5	5
Thor37	2	2	1	4	2	4	4		1					2	1	2	3	3	3	4	3	2	1	3	1	4	3	2	3	3	2
Yo	2	3	4	4	2	3	3		1					2	4	3	4	4	3	3	3	3	3	2	2	5	3	5	3	2	4
No pets 15	2	2	1	3	1	3	1	1						1	3	2	5	5	1	5	2	2	5	4	1	5	5	1	1	3	4
68	2	5	2	4	2	4	4			1	1	1	1		4	4	3	3	3	2	2	3	1	5	5	4	3	3	2	3	4
AB7992	2	4	3	4	2	5	3			1				3	3	4	4	4	4	4	4	3	3	5	4	4	4	4	3	2	3
Buddy34	2																														
Elvis	2																														
Annes	2																														
Jessie37	2																														
Forgot	2																														
Peka92	2																														
Toby Mufasa71	2																														

APPENDIX T

Student Responses to Post-Survey Items

ID/Variable	Post_1	Post_2	Post_3	Post_4	Post_5	Post_6	Post_7_1	Post_7_2	Post_7_3	Post_7_4	Post_7_5	Post_7_6	Post_7	Post_8	Post_9	Post_10	Post_11	Post_12	Post_13	Post_14	Post_15	Post_16	Post_17	Post_18	Post_19	Post_20	Post_21	Post_22	Post_23	Post_24
Toby34	4	3	4	3	3	4		1	1			1	2,3,6	5	5	5	5	5	5	4	3	5	2	4	5	5	5	5	5	4
Cubby03	5	4	4	3	5	4		1	1			1	2,3,6	4	4	4	5	4	5	4	4	5	5	5	5	4	5	4	5	5
Oreo95	5	3	4	2	5	4		1	1	1			2,3,4	4	4	4	4	3	5	4	4	3	5	5	4	3	4	3	4	4
Cheetoh87	2	2	4	3	4	4				1	1		4,5	3	3	4	3	4	5	3	3	3	2	4	5	4	4	5	5	5
Toby97	4	2	3	2	5	3		1	1		1		2,3,5	3	3	3	3	4	5	4	2	2	1	2	4	3	3	3	2	5
Bailey98	5	4	4	3	5	3		1	1				2,3	3	3	4	5	4	3	4	3	3	2	3	3	4	3	3	3	5
Cozmo34	4	4	4	2	5	3			1			1	3,6	4	4	4	3	3	4	4	3	4	4	5	5	4	5	3	3	3
Misty32	3	3	4	2	4	1	1						1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Pebbles 46	4	3	4	1	3	1	1						1	4	4	3	3	3	1	2	1	4	1	1	3	3	2	2	3	4
Wolfy26	4	3	5	1	3	3				1			4	4	4	2	4	4	4	2	4	3	5	3	4	4	4	4	4	4
Bandit47	4	3	4	2	4	2			1				3	4	4	4	4	4	5	5	3	4	5	2	5	4	5	4	2	5
Gromit00	3	4	4	3	4	2		1					2	3	7	5	5	5	5	5	4	5	5	5	3	2	3	5	5	5
Maggie08	4	4	4	3	5	2			1				3	4	4	4	4	4	4	4	3	3	4	3	3	4	5	4	4	4
Piper24	5	4	4	3	5	2		1	1		1		2,3,5	5	4	5	4	5	4	3	4	4	2	5	4	5	4	4	4	4
CH42	5	3	4	3	4	3		1	1				2,3	3	3	5	4	4	5	4	3	4	2	2	5	5	5	3	3	5
Rosie14	4	3	4	3	4	3		1	1		1		2,3,5	4	4	4	4	3	3	4	4	4	4	4	5	4	4	3	5	4
Khloe86	4	3	4	2	4	3		1	1	1			2,3,4	4	4	4	4	3	4	4	3	3	5	5	5	4	5	3	3	5
67	3	2	4	3	4	3		1	1			1	2,3,6	3	3	3	3	3	4	4	3	3	2	3	4	3	3	3	3	4
Lucy55	3	3	4	3	4	3		1	1	1	1	1	2,3,4,	2	3	4	4	4	5	4	3	4	4	5	5	3	5	3	3	4
Dexter76	3	2	3	2	3	1	1						1	3	3	4	4	3	4	3	2	3	1	1	5	4	3	3	2	3
Frosty28	3	3	3	2	3	1	1						1	4	3	4	4	3	3	2	2	4	3	4	3	4	3	3	2	4
Shadow23	3	4	4	3	4	5		1	1	1	1		2,3,4,	4	4	4	5	4	4	4	4	5	5	3	4	4	5	4	5	4
Spike74	4	4	4	2	4	2		1	1				2,3	3	3	3	3	3	5	3	2	3	4	1	3	3	4	3	2	4
Rosie65	5	4	4	3	5	1	1						1	5	5	4	5	4	5	5	4	5	5	4	4	4	5	4	4	5
Zerstoren	3	3	3	2	4	4			1				3	4	4	3	3	3	3	4	3	3	4	3	5	3	4	3	4	5
Hockey392	4	3	4	3	4	1	1						1	3	3	3	4	3	5	3	2	4	3	2	5	3	3	3	3	4
Fredrick56	3	3	3	2	4	2			1				3	3	3	3	4	4	4	3	3	3	4	5	4	3	4	3	4	4
Smokey24	3	1	2	2	3	2			1				3	4	3	4	4	4	4	3	3	3	3	3	4	3	3	4	3	5
Jackson42	3	1	4	2	3	2	1	1					1,2	4	4	4	4	4	5	4	3	4	3	1	5	4	4	5	4	4
AK67	3	3	4	2	4	1								3	2	4	3	4	2	2	1	5	4	1	2	4	1	4	1	5
Sammy92	3	3	4	2	4	2			1				3	3	3	4	4	4	3	4	2	3	3	4	4	3	3	3	4	4
Willie03	4	3	4	3	4	4			1				3	5	4	5	4	4	5	3	4	4	2	2	4	4	5	3	4	4
Redmen Hockey	3	2	3	3	4	4			1				3	4	4	5	5	5	5	5	4	4	5	5	5	5	4	4	4	4
Cooper99	5	3	4	2	5	3		1	1				2,3	3	4	4	4	3	3	4	3	4	5	5	3	3	2	2	3	4
Toto1789																														
PineSap																														
Thor37																														
Yo																														
No pets 15																														
68																														
AB7992																														
Buddy34	3	2	4	2	4	2							3	2	2	3	3	3	4	3	2	2	3	4	5	3	3	3	3	3
Elvis	4	4	4	3	2	3							2	3	4	4	4	4	4	1	2	3	3	2	3	3	3	2	3	3
Annes	4	3	4	2	4	3							2	4	4	4	4	4	4	3	3	4	4	4	4	4	4	3	2	4
Jessie37																														
Forgot																														
Peka92																														
Toby																														
Mufasa71																														

APPENDIX U

Student Responses to Exit Survey by Item

ID/Variable	NPost1	NPost2	NPost3	NPost4	NPost5	NPost6	NPost7	NPost8	NPost9	NPost10	NPost11	NPost12	NPost13	NPost14	NPost15	NPost16	NPost17	NPost18	NPost19	NPost20
Toby34	3	4	2	4	3	4	4	4	4	4	4	3	4	3	3	4	4	4	3	2
Cubby03	5	4	4	3	4	5	4	5	4	4	3	4	5	4	4	4	3	5	3	3
Oreo95	4	4	4	3	3	4	5	5	4	4	4	3	4	4	3	4	4	5	3	2
Cheetoh87	4	4	3	3	3	5	3	4	4	5	5	2	5	4	4	4	4	5	1	1
Toby97	4	4	3	3	2	5	5	4	4	4	1	4	5	3	4	3	3	3	1	1
Bailey98	5	4	3	3	3	2	4	4	4	4	3	2	4	2	3	4	3	3	1	2
Cozmo34	5	4	4	4	3	3	2	3	3	3	3	3	4	3	2	2	4	3	3	2
Misty32	4	2	3	4	3	2	2	3	4	4	3	3	3	3	2	3	4	4	2	2
Pebbles 46	3	1	1	1	1	1	1	3	2	2	1	1	3	1	1	1	1	2	1	2
Wolfy26	1	1	1	2	1	1	3	2	5	4	2	1	4	1	1	1	1	3	3	3
Bandit47	4	4	3		5	2	2	3	4	4	2	3	4	4	2	2	4	5	2	3
Gromit00	3	3	4	3	4	1	2	2	3	5	5	3	4	3	2	3	2	4	1	3
Maggie08	5	4	5	4	5	2	3	4	4	4	5	4	5	4	2	3	4	4	2	3
Piper24	3	4	5	4	2	4	2	5	4	3	1	2	4	5	4	3	3	4	3	3
CH42	5	4	3	4	3	5	4	5	4	4	5	3	4	4	5	4	5	3	2	1
Rosie14	4	4	4	4	3	4	3	3	3	3	3	2	3	4	3	3	4	3	2	3
Khloe86	5	5	4	5	3	4	5	5	5	4	5	5	4	5	4	4	4	4	2	2
67	1	1	1	2	4	2	2	3	4	3	4	3	4	3	2	2	3	3	1	2
Lucy55	5	4	2	3	1	4	3	5	3	4	4	2	5	4	4	3	2	3	2	3
Dexter76																				
Frosty28	3	2	1	2	1	2	3	3	4	3	4	3	3	1	2	2	2	3	2	2
Shadow23	5	5	5	2	4	5	5	5	5	5	4	3	4	2	5	5	1	5	3	3
Spike74	5	5	3	3	2	3	4	4	3	3	2	5	4	4	3	3	4	3	3	3
Rosie65	4	4	2	2	2	4	3	4	5	5	2	4	4	2	4	4	2	5	3	3
Zerstoren	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	2	2
Hockey392	5	2	3	4	3	3	3	4	4	4	3	3	4	3	2	3	3	5	1	2
Fredrick56																				
Smokey24	4	4	4	3	2	4	4	4	3	4	4	4	4	4	5	4	4	3	2	1
Jackson42																				
AK67																				
Sammy92	2	2	2	2	2	1	2	3	2	3	4	2	3	2	2	1	2	4	2	3
Willie03	4	4	4	5	3	4	5	4	4	5	3	3	5	5	4	4	3	4	1	2
Redmen Hockey	5	5	4	3	3	4	4	4	4	4	4	4	5	4	3	5	4	3	3	3
Cooper99																				
Toto1789	2	1	1	3	1	1	3	1	1	2	5	1	3	3	2	3	1	5	2	3
PineSap	2	2	4	2	4	3	4	3	2	3	5	1	5	3	1	2	1	3	2	2
Thor37																				
Yo																				
No pets 15																				
68																				
AB7992																				
Buddy34	4	3	2	2	3	3	2	3	4	3	3	4	4	3	2	2	3	3	1	1
Elvis	5	4	4	4	4	5	4	5	3	4	4	5	5	4	3	4	4	3	3	3
Annes																				
Jessie37	3	2	2	2	1	2	2	3	3	3	1	1	3	2	1	1	2	3	1	2
Forgot	1	1	1	2	1	4	3	4	5	5	2	2	4	1	4	3	2	3	2	3
Peka92	4	5	3	4	3	5	4	4	4	5	5	4	5	3	4	2	5	4	1	1
Toby	2	2	1	1	3	1	3	3	2	2	3	2	2	2	2	2	1	3	2	3
Mufasa71	4	3	1	1	2	4	4	3	3	3	4	3	3	1	2	3	2	4	1	2