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Student's Perception of Computer Tutorials When Reviewing for Exams

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I have spent the last year and a half learning the many aspects required when creating a dynamic student-centered classroom. I was very interested in the many topics that were presented to me in my graduate courses. This made it very difficult for me to narrow my research topic. As a result I find myself on a significantly different path than I had started on in September. Having had these rich experiences with differentiation and having tried many of the strategies I decided I would focus on some aspect of differentiation. However, this past fall I was enrolled in an instructional technology course that introduced me to the many ways in which a teacher can infuse technology into the classroom. This experience then led me down another path. I was very interested in the subject but also wanted to know if technology really is as beneficial as some believe it to be. Is technology the answer to our educational woes or just something nice and pretty to show the kids? Through all of these experiences and false starts I finally came to realize my true research question. I want to examine the benefits of using computer tutorial to review for an exam. I especially want to know from students who participate in the computer tutorial if they prefer the tutorial to the usual paper-and-pencil review sheets they receive before an exam. I also want to know what particular aspects of the tutorial they find beneficial and if they feel it is worth doing again.

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Student's Perception of Computer Tutorials

When Reviewing for Exams

Kelly A. Keys

St. John Fisher
Chapter 1 - The Introduction

Inspiration

I have spent the last year and a half learning the many aspects required when creating a dynamic student-centered classroom. I was very interested in the many topics that were presented to me in my graduate courses. This made it very difficult for me to narrow my research topic. As a result, I find myself on a significantly different path than I had started on in September.

At the beginning of this research project, I found myself focusing on differentiation. It seemed logical, as I had spent much time in investigating this area. I was first introduced to differentiation last fall when I participated in a professional development conference offered by my school, that experience provided me with my first formal introduction to differentiation. This workshop really sparked my interest and this past spring I decided to enroll in a college course that exposed me to a vast amount of information about differentiation including methodologies, which I have since used in my classroom.

Having had these rich experiences with differentiation and having tried many of the strategies I decided I would focus on some aspect of differentiation. However, this past fall I was also enrolled in an instructional technology course that introduced me to the many ways in which a teacher can infuse technology into the classroom. This experience then led me down another path. I was very interested in the subject but also wanted to know if technology really is as beneficial as some believe it to be. Is
technology the answer to our educational woes or just something nice and pretty to show the kids?

This course was something that was very new to me. I would describe myself as technically functional but I lacked any true skill. This course exposed me to the many opportunities that technology can offer students. In this course we became exposed to the many programs that can be used to enhance student's educational experience as well as make us more efficient teachers. I became especially interested in ways I can use technology to help improve my student's understanding of the content. One thing that I began to realize was that technology is very useful in creating differentiated learning experiences for students. At this point I began to investigate the benefits of using technology in the classroom as well as how I could use it to differentiate learning.

In their article, Smeets and Mooij (2001) discussed the ways in which pupil-centered learning requires differentiated lessons and that can be accomplished by using computers as a tool in the classroom. One technology application that I feel is inherently differentiated is the computer tutorial. Each student has a very different experience depending on their individual prior knowledge, as accessed by their responses to the tutorial. A student that has mastered a particular component of the curriculum is able to continue on and spend more time on an area that they need more specialized assistance. I began to see tutorials as the way for technology and differentiation to be combined.

Then further focused my research on the benefits of using computers in the classroom. No longer is the computer a fancy typewriter. The computer and its accompanying technology should be used to enhance the learning environment. However,
much goes into deciding how to best use this technology. Smeet and Mooj (2001) emphasized the importance of teacher's attitudes and choice of computer use on the impact the technology has on students. In an article by Strot (1997) the author explained how students might benefit from technology that prevents students from becoming bored and therefore increases motivation. Strot, as well as Berger (2002) found technology to be most beneficial to gifted and talented students. Likewise, Xin (1999) found that computers and technology could be used to differentiate for students with disabilities.

After investigating the many aspects of technology used in education I began to concentrate on those articles that studied the use of computer tutorials. Several authors reported in their research that they and their students had positive experiences with computer tutorials. For example, Cann and Scale (1999) found that computer tutorials helped students to reflect upon their learning. The author found that when students use the tutorial they take more time to organize, interpret, and explore the content they are reviewing. Cooper (1998) found that tutorials created by the teacher are particularly beneficial.

Through all of these experiences and false starts I finally come to realize my true research question. I want to examine the benefits of using computer tutorial to review for an exam. I especially want to know from students who participate in the computer tutorial if they prefer the tutorial to the usual paper-and-pencil review sheets they receive before an exam. I also want to know what particular aspects of the tutorial they find beneficial and if they feel it is worth doing again.
Chapter 2 - The Literature Review

Introduction

Many different sectors of our society are involved in the exploration of the plethora of options available to educators today to create effective learning environments that will produce well-educated young adults who are prepared for higher education or the work force. We all should be invested in this search. Educators and administrators today have an overwhelming number of options that can be utilized in creating a better learning environment. One of the biggest areas of interest is the collaboration of technology and education in our schools. Schools that have the latest and greatest in technology are perceived as having an advantage over those schools that are not as technically equipped. However, does all of this technology really make a difference and how can educators best use the technology they have available to them?

There is much literature, in the research journals, examining the use and benefits of the various technology and education collaborations that can be used in the classroom. Some of the many terms given to this collaboration are computer-assisted education, computer-assisted learning, and educational technology. This melding of technology and education can and does look very different in each classroom. The use of technology can be as simple as the application of word processing and graph-generating programs or as complicated as enrolling in an online course where the entire student-teacher interface occurs through the medium of a computer.
While researching the benefits of using a computer tutorial with my students, to review for an exam, I read many studies that also researched the use of tutorials and other related educational technologies. The following is an analysis of that research.

A Review of the Literature

Meta-analyses review. Christmann, Badgett, & Lucking (1997) examined previously conducted research to determine any differences in the academic achievement of secondary students whether they received traditional instruction alone or traditional instruction supplemented by computer-assisted instruction. This meta-analysis research included all educational settings across all subject areas. The previously conducted studies were all set in a secondary school, included quantitative data of student achievement, and had a combined minimum of 20 students in the control and experimental group. The authors found that with regard to the 26 studies they analyzed there was a higher achievement scores attained by the groups that received computer-assisted instruction. A student in the 50th percentile who was exposed to the computer-assisted instruction moved to the 57.2nd percentile. The authors further categorized this effect as small. The authors also pointed out that those studies conducted before 1985 found a more positive effect than those studies conducted after 1985. A possible reason for this difference is that during the 1984 to 1995 time period more energy was spent on developing the computer hardware and not the software (Christmann, Badgett, & Lucking, 1997). The authors also cautioned that research journals might only be
publishing those studies that show a positive relationship between computer-assisted
instruction and student achievement. If this is true the results of this study may not be
accurate. The authors also recommended researchers using more qualitative research
methods to determine how students react to computer-assisted instruction activities. As
suggested by this and other authors I will use qualitative research in my study.

Lowe (2001) conducted a review of previously conducted meta-analyses to
compare computer-based education to traditional classroom instruction. This review
included 5 meta-analyses that were conducted from 1980-1998. The studies that were
included in these meta-analyses were carried out between 1964 and 1997. The subjects of
these studies included: college, adult basic education, technical training, and elementary
through college-age students. Each study used a final exam to measure the achievement
of students in a traditional or computer based instructional setting. These results were
used as data to determine the effect of the two teaching methods. The computer based
instruction activities that the various studies examined include: computer managed
instruction, hyper-media instruction, tutorial, drill and practice, simulation, programming,
and problem solving. The author concluded that the review indicated that computer-based
instruction has a positive effect compared to traditional instruction. In particular
simulations and tutorials were found to be most effective. Several articles I found stated
tutorials to be a more effective method of applying technology in the classroom. The
author did caution that because various additional variables cannot be held constant the
results of this review "have limited validity." This is one reason why a qualitative
research is more effective for my study. The author suggested that in some studies
different teaching styles might be responsible for the positive effect of computer-based instruction. This is an example of one of the variables that cannot or may not have been controlled in the studies. This review also found that computer-based education has a more positive effect when used as a supplement to and not replacement of the traditional instruction.

The following 3 meta-analyses look at studies that deal specifically with computer assisted (or computer-based) instruction in the science content area. In the study by Christmann & Badgett (1999) the authors intended to “evaluate the effectiveness of computer assisted instruction (CAI) on the science achievement of students across four science areas within urban, rural, and suburban educational settings. Additionally, a comparison was made between the effectiveness of microcomputers and traditional instructional methods.” The studies in this meta-analysis met the following criteria: they were conducted in an educational setting, included quantitative data, and the control and experimental groups had a minimum combined total of 20 students. Eleven studies met the criteria for the study. This research found that the use of computer-assisted instruction had a positive effect, though the effect was classified as small. A student exposed to the computer-assisted instruction would move from the 50th percentile to the 60.4th percentile. Though the effect was determined to be small I find it to be a significant improvement for any individual student. The content area of science that had the highest effect by the use of CAI was the general science group. The other groups, in order of decreasing effect were, physics, chemistry, and biology. The authors of this study expressed the positive effects of simulations in particular. Through a computer simulation
"students can complete experiments that are ordinarily considered hazardous, unworkable, or unrealistic." Using the simulations allows students to focus on the content of the labor and the implications of the results instead of focusing on carrying out the steps of the procedure (Chrismann & Badgett, 1999). The authors of this study also call for more research to determine the effectiveness of the use of CAI with science students.

Another meta-analysis, by Bayrak (2002), purported to examine the effectiveness of CAI on the achievement of students enrolled in secondary and college science courses. The courses students in the study were enrolled in included: physics, chemistry, biology, general science, and physical science at the secondary and college level. The CAI activities students were engaged included: drill and practice, tutorials, and simulations. The 42 studies, that met the criteria for the analysis, found CAI to have a small positive effect on the achievement of science students in computer-assisted instruction classroom as opposed to students in a traditional instruction classroom. A student in the 50th percentile would move up to the 62nd percentile if exposed to CAI. These findings are very similar to the previous research discussed by Chrismann and Badgett (1999). This article also found simulations and tutorials to be the most effective methods of CAI. As with other studies previously mentioned the author indicates some variables, not controlled, may be the real reason for the difference in achievement between the two groups. One of the variables the author mentioned was whether or not the software was commercially manufactured or created by the teacher. The possible explanation as to why the teacher created software is more effective is that the teachers are more aware of the specific objectives (Bayraktar, 2002). In the study that I will be
conducting the program will also be teacher created. The content is too specific to use a commercially created program. A program that is created with specific objectives in mind is more likely to be effective. Overall the author found CAJ to be effective particularly under certain circumstances thereby including other variables. Again, this author calls for more research particularly where physics is the content area.

A review conducted by Weller (1996) included K-16 science students. This review focused on the impact of learning when computers are used in the science content areas. This article was very critical of the type of research that attempts to compare different instructional methods. The author pointed out that too many other variables cannot be controlled and therefore there are other possible explanations for any differences found. The authors also mentioned that the length of time the studies were conducted was not sufficient and longer-term studies may have found a more positive effect. This author also suggested more qualitative research might be more beneficial for this type of research.

Effect on various student behaviors. The preceding studies examined numerous previous studies and determined that overall the collaboration of technology and education was a positive one, however small. I next reviewed articles that looked at how specifically technology can improve our student's quality of education. Each article examines a different possible benefit of computers in our classroom. One benefit that came up in many of the articles was the effect of computers on student motivation (Bergen, 2002; Nugent, 2001; Peat, 2000; & Strot, 1997). I also hope to determine if a computer tutorial effects student motivation. I am curious how the motivation of both
accelerated and struggling students will be affected by the use of a computer tutorial review. Strot (1997) found the use of technology in the classroom to be very beneficial. Motivation was among the many positive side effects Strot found when using technology. The author explained the increased motivation is due to student choice, independence, and creative opportunities. Strot also linked the student's increase in motivation to a decrease in boredom and subsequent misbehavior. Bergen (2002) and Nugent (2001) found the use of technology with the gifted and talented students to be a great motivational tool and therefore enriching the educational experience. I will also be examining the effects of a computer tutorial on some students who have been labeled as gifted and talented.

A study by Din (1996) attempted to determine if high school student's off-task behaviors were different if they were engaged in computer-assisted instruction or seatwork during their business class. Two classes were included in this study and each class exhibited less off-task behaviors when they were engaged in the computer-assisted instruction. The average percent of off-task time during the CAI activity for both groups was, 1.1% and .88%. The average percent of off-task time during the seatwork activity for both groups was, 16.7% and 18.4%. They also performed better academically when engaged in the CAI activity. For the two groups the CAI activity scores ranged from, 85% - 98% and 78% - 99%. The seatwork grades, for the two groups, ranged from 63% - 92% and 58% - 92%. The authors determined that when the two groups were involved in the CAI activity they performed much better. Possible explanations as to why the students did better and were on-task during the CAI activities include: students felt
the computers would help them complete the assignment, produce better quality work, or help them to learn. Students also may have been more interested and motivated in the CAI activities (Din, 1996). Overall the increase in on-task behavior can be viewed as a benefit of using technology in the classroom. My research will include observations of students to determine their level of interest. Off-task behaviors will also be noted.

Cann and Seale (1999) found computer tutorials to be beneficial in providing students with the opportunity to reflect upon their learning. Some of the possible attributes of tutorials that provide the opportunity for students to reflect are: the freedom to explore their own search, the ability to provide goals and feedback, or the chance to communicate with peers and teachers (Cann & Seale, 1999). The researchers examined student’s use of a World Wide Web tutorial called How Now Mad Cow. Elements of the tutorial that allowed students to be more reflective included: a bulletin board where students could communicate with one another, the ability to go at one’s own pace so that the tutorial could be interpreted and organized and explored (Cann & Seale, 1999).

Individual pacing is one benefit I foresee in using a computer tutorial. Overall, the author determined that for a tutorial to be effective at providing an opportunity to reflect than the design of the tutorial must be considered as well as how it is implemented. Much thought must be put into each element of the tutorial. The use of some of these elements will be described later in the literature review.

Xin (1999) examined the effects of computer-assisted education when students with disabilities and students without disabilities work together. The author found that the
visual imagery of the technology provided an opportunity for students of differing abilities to discuss and explore the program together. This particular method may increase student attention, motivation, and collaboration. I plan to use visual imagery in the tutorial to further clarify content.

Effect of elements of the technology. So what is it exactly that makes computer applications an effective way to teach students? The following studies examine what it is about the use of technology that may make it a better choice. Computer-based multimedia, which is the use of text, picture, video, and sound, has been found increasingly in educational settings. Some feel that presenting information in this way is beneficial while others feel it has no benefit or is even less effective than traditional classroom instruction. Gerlick and Jausovec (1999) studied the effects of computer-based multimedia on the cognitive processes by measuring the electrical activity of the brain. An electroencephalograph (EEG) was used to measure the brain's electrical activity when shown information presented in a multimedia presentation. The authors also attempted to find if intelligence level affected the impact of multimedia on the brain activity. The results showed that different media presentations increased different areas of the brain. The video and picture presentations increased the activity of the occipital and temporal lobes. The text presentation increased the activity of the frontal lobes only. The difference in the way the brain is stimulated by the various media presentations may explain the benefit of multimedia. It may be the use of visual presentations that result in an increase in mental imagery that is necessary for problem solving, creativity, and discovery (Gerlick & Jausovec, 1999) By combining text and visuals more students
learning styles are bound to be met compared to using only one mode to present the information.

A study by Nichols, Merkel, & Cordts (1996) examined how the use of animation can be helpful in studying dynamic biological processes and also to understand the connection between microscopic processes and the macroscopic impact. In this study two groups were formed, one to view a video tutorial while the other group received the same information from textbooks and lectures. Both groups were given a pre-test to assess prior knowledge before receiving the information and then they were given a post-test. With regards to half of the questions on the post-test it appeared that viewing the tutorial was beneficial. This author also cautioned that there might be more to the benefits of a tutorial than just the use of multimedia. Perhaps it is the attention paid to the quality of the instruction that is more important than the presentation of the instruction. It might be that the tutorial was better planned than the alternative presentation. Though the author expressed that animation was able to present concepts that were difficult to duplicate in static graphic. In particular, the science content area contains many concepts that cannot fully be comprehended by a static presentation. Yet again the research is unable to control multiple variables.

Animation was also the focus of another study that was conducted by Szabo and Pookay (1996). This study examined the effect of animation, graphics, and text on learning during a math lesson. The most effective method was found to be animation followed by graphics and text, respectively. Student's attitude toward the computer-assisted instruction was also measured. Students reported having more positive feelings
about the animation and graphics instruction than they did the text only instruction. Apparently animation has certain qualities that help students achieve a better understanding. I feel that animation in the tutorial would greatly benefit students understanding of concepts related to force and motion.

Another technique often used in computer-assisted instruction is hypermedia. Hypermedia uses a combination of text, video, graphics, and links to present information. Ruffini (1999) studied the differences in achievement between two groups, one that used their own notes to study for a midterm exam and the other group that used their notes and hypermedia. The study also gauged student's attitudes toward using hypermedia. The author supported the idea that hypermedia is based on the constructivist theory of learning. Students have the opportunity to explore when using hypermedia and in doing so they are able to construct their own understanding (Ruffini, 1999). The author of this study found that hypermedia is an effective way to review lecture notes to improve academic achievement. The results showed that the hypermedia group scored above average while the lecture notes only group performed at an average level. The majority of the students found the hypermedia experience to be a positive one. Students and researchers found the program to have positive attributes. Students found the program to be clear and easy to use while the researchers noted that students did not become bored or distracted when using the hypermedia. Having observed students using computers before I know how students can become so engrossed in the activity that they tend to shut out other stimuli. I imagine that this will help students stay interested and focused on the
review and therefore they will retain more information than had they participated in a
more traditional review. Although the overall sentiment was that the hypermedia use was
beneficial none of the students involved felt that the instructors could be replaced by the
hypermedia presentation.

*Computer tutorials.* The following reviews are of studies done specifically
involving tutorials. Though the tutorials are on a range of topics set in many different
environments they all are studies to discover the benefits of their use. A study by Rosen
The tutorial was to teach students library skills. The format of the tutorial included text,
graphics, and illustrations. After each “chapter” of the tutorial a quiz was administered
online. This study was of a qualitative nature and so it did not include statistics of the
effectiveness of this particular method of instruction. What the study did include was
anecdotal evidence from students, faculty, and library staff. From this data the authors
were able to consider the tutorial to be useful and overall successful.

Another study examined the use of a tutorial in an academic library setting. This
study, by Michel (2001), was different in that a comparison was made between student’s
choice between a tutorial and a more traditional approach to instruction. Students were
first given a survey to assess their computer experience, level of comfort using
computers, prior library use, prior library instruction, and comfort accessing information
from the library. The students in the research group were freshman enrolled in an English
course. Overall the students were novice library users. It came as a surprise to the
researchers that only 50.4% of the students would choose to use the library tutorial over a
traditional library lesson. The author provided some possible reasons for this finding. Students may have had issues with the organization and wording of the tutorial, or they preferred a more individualized instruction, one that was specific for their course or task. Those students who reported positive feelings about the tutorial were students that rated themselves as confident in using the library or the Web. Also students that had prior and extensive experience with the tutorial rated it higher than the average student who lacked the experience. This is one factor that I fear may negatively affect my student's perceptions of the tutorial. Though students are generally comfortable with computers this is a very different type of activity for most students. I hope that the unfamiliarity factor does not negatively affect the data.

A final study, by Germain, Jacobson and Kaczor (2000), looked at the use of a tutorial in an academic library. The University of Albany library conducted a study that compared the effectiveness of a Web-based interactive tutorial to a lecture accompanied by a hands-on computer activity. A pre-test, identical to the post-test, was administered to all students after their instructional period ended. The tutorial group had an average of 7.91 correct answers on the post-test while the lecture group had an average of 7.72 correct answers. The authors concluded that there was no difference in the two types of instruction. The tutorial was found to be more effective in teaching one particular skill, keyword searching. The results of this study suggested to the authors that the course of action needed to best instruct students is to use the tutorial in combination with direct instruction from the library staff. This seems to be a common theme in most of the research. The best method seems to be the combination of computer assistance with
teacher instruction. No study that I encountered suggested that direct instruction could be replaced with computer instruction.

Rowe and Thorburn (2000) conducted a study done to determine the benefits of using an on-line tutorial, VINCE, to increase student understanding of computer programming. The study also was conducted to determine student's perception of the tutorial. All students involved in the research participated in a one-on-one interview that rated students ability in computing. Of those students in the study one group was asked to use the tutorial, in conjunction with the course, while the other was asked not to use the tutorial. Students were then evaluated on programming exercises and exams given throughout the 9-week course. Following the course the students were given another interview consisting of similar questions to the first interview. The data analysis found that student's perception of their understanding of computer programming was not different for either group. However, it was found that the students rated the program positively, though they felt that the tutorial is best used as a supplement to traditional lecture.

In another study, by Cooper (1998), a tutorial was used to allow students, in a mathematics education course, the opportunity to explore topics in-depth. Students reported that the tutorials made them feel more comfortable in using the computer but felt it would be more beneficial if they were able to work in groups, have access to more real life classroom situations, and printed copies. One student noted that it was better "being able to get feedback on my answer instead of a 'correct' or 'incorrect.' The feedback made me stop and think about the action I had chosen." This is one of the benefits I see to
using tutorials with my students. It will be interesting to see if my students agree. I think that the direct, immediate feedback will have the most positive impact on correcting student errors. Doing a problem incorrectly and receiving the correct answer the next day, or later, does not appear to be very effective.

Science content tutorials. The next 2 studies review tutorials that were used specifically in science education environments. The tutorial in the study conducted by Littlejohn, Suckling, and Campbell (2002) was called Carbohydrate Chemistry. This program allows students to try out their ideas and get appropriate feedback to correct their answers. This study's main goal was to evaluate how students interacted with the on-line tutorial and how they would deal with learning chemistry in this way. The students showed discomfort with using the program. The students reported spending a large amount of time learning how to use the program and not spending the necessary time on the content concepts that were the focus of the program. Despite the initial difficulties learning how to use the tutorial the students rated the tutorial positively. Hopefully my students will be comfortable enough with computers that this will not be an issue. I can also alleviate this problem by creating a user-friendly tutorial. Again students stated that the tutorial should be used in conjunction with lectures.

The second science-based tutorial was conducted in an animal pathology course in a veterinary school. In the study by Brown (2001) students were given a pre-tutorial worksheet to attempt to complete in 10 minutes. The students were then given a brand new identical worksheet and given 40 minutes to complete the worksheet with the aid of the tutorial. Students were then asked to complete the worksheet, without the tutorial,
four weeks later. The author felt the results of the data suggest that the tutorial is beneficial to teaching veterinary pathology. Students were also asked to complete a survey to evaluate their attitudes toward the tutorial. Students’ responses were favorable toward the use of the tutorial.

*CD-ROM tutorials.* Another way students can experience a tutorial is through the use of a CD-ROM. Watkins (1998) examined the use of a CD-ROM compared to traditional instruction and students attitudes towards each. The students in the study were enrolled in an Introduction to Allied Professional college course. Students were randomly assigned to one of 4 groups: instruction by CD-ROM with teacher facilitation, CD-ROM without teacher facilitation, instruction by lecture with teacher facilitation, or lecture without teacher facilitation. The data found that the students had greater achievement when instruction was by an instructor with or without facilitation. This was a very different outcome than Watkins reported in the study’s literature review. Furthermore the attitudes of the students were not significantly different for either group. This finding was also contrary to the studies Watkins cited in the literature review. Findings similar to those of this study have been rare. However, this study brings the alleged benefits of such computer technology into question.

A study by Wasserman (2001) examined the use of a CD-ROM to enrich an 11th grade social studies classroom. Wasserman’s goals of the study were to determine if the CD-ROM would “enrich the curriculum, extend students’ thinking about issues of consequences, engage students’ interest in the content, and give teachers a valuable teaching resource.” Both teachers and students were given a survey to determine there
attitudes toward the program. Students responded more favorably when they had more control over the use of the CD-ROM. Like the CD-ROM, students using a tutorial have more control over the pace. They can skip parts that do not pertain to them and focus on their personal areas of weakness. Students also responded that the CD-ROM increased their understanding of the events and issues involved. Some of the more insightful student comments were: "I found it easier if I could hear a voice and read along; it caught my attention more than a teacher or textbook can; I was able to take the time I needed."

The teachers also found the CD-ROM beneficial. Teachers reported that "students were highly engaged" and thinking critically about the issues presented in the CD-ROM.

**Designing a tutorial.** From the research I have done it is clear that it is very important to plan a tutorial carefully. The elements you include and exclude from the tutorial will have a direct affect on how the tutorial is accepted by the students. As Nugent (2001) suggested "technology should not become the focus (of the lesson)."

Suarez (2002) offers volumes of advice for creating Web-based tutorials. Though Suarez’s main audience was libraries creating tutorials the advice is appropriate for all content areas. Suarez suggests spending one-third of your production time on the planning of your tutorial. To plan a tutorial, it is best to use storyboards and sketches to plan and keep track of ideas. The author also suggests creating a home page that would act as an index for more specific pages. It is also important to create a logo that is prominently placed on each new page. Each page should also clearly be labeled with a page title that identifies its contents. All items on a page should be lined up and
consistent. Make sure that important content is visible at the top of the page. Animation and interactivity is important to include but do not overdo it. Finally, trial and error is necessary to build the very best tutorial for your students. This advice should be taken into consideration when planning a tutorial.

It is easy for a teacher to decide to use a tutorial and then go about acquiring the skills necessary for building one. However, that teacher must first have the right attitude. It can be difficult and time consuming for a teacher to incorporate technology. However, with the right tools and skills it can be worth it. In their article, Idling, Crosby, and Speitel (2002), suggested focusing on the goals and purposes of using technology with education. It is important to consider whether the technology is meeting your needs and whether the technology is providing you with something that cannot be supplied in any other way. If the technology meets your needs and the needs of your students it can produce wonderful results when used effectively.
Chapter 3 – Methodology

Methodology Introduction

The use of a tutorial will be studied in an 8th grade science classroom. Students in the class are of varying academic ability and backgrounds. I selected 8 students to investigate deeply in hopes to determine if the computer tutorial is a positive tool in the classroom and worth doing again. I selected 4 students from the computer tutorial group and 4 from one of the classes participating in the traditional review activity. For each student in the computer tutorial group I picked a student in the other review group, who had similar qualities. I was interested in those particular qualities to see how the different review styles would respond to them. By doing this I hope to discover how students with particular qualities such as: lack of motivation, difficulties in learning, and academic success, respond to the different review activities. I will analyze the data to determine if student motivation, success, or interest is significantly affected by the use of computer tutorial or traditional paper-and-pencil review sheet.

Methodology: Participants

How they are selected. There will be 8 students whose responses will be included in the results of this study. I have chosen to have one 8th grade science class to review with the tutorial and the other 3 classes to review with a standard pencil-and-paper review sheet. The class to participate in the tutorial was chosen because of its rich diversity. The students are not only academically very diverse but they also have very different socioeconomic and cultural backgrounds. From this class I singled out 4 students whose reactions and comments to the tutorial I will include in my results. These students were
chosen for their unique characteristics, both personal and educational. I also chose to include the reactions and comments of 4 students who were selected to engage in the paper-and-pencil review sheet. These students were also selected for their unique characteristics that will be described in detail.

Who are the participants? From the group that engaged in the tutorial review I selected 4 students who I will collect data from. In this group there are 2 girls and 2 boys. I have also chosen 4 students from the group that is taking the paper-and-pencil review sheet. In that group there are also 2 boys and 2 girls. For each student in the tutorial that is being focused on there is a similar student in the paper-and-pencil review group.

The tutorial students. Mary is an ESL student who is pushed in for science and social studies. The rest of the time she is in a 12:1:1 classroom where she learns math and English. She also gets support from the district ESL (English as a second language) teacher. Mary came to live in the United States when she and her other siblings were adopted by a local family. Her family is an upper middle-class, religiously dedicated, and highly educated. She has had several older brothers and sisters attend the Bloomfield school and they were very successful in academics and sports. When Mary came to Bloomfield she was enrolled in the elementary school and has made marvelous strides since that time. Mary is a very popular, social, and pleasant young lady. She has a very active social life and is involved in 3 sports. Success in school is important to her but some factors seem to get in her way of achieving that success she desires. Mary is unlikely to ask for help when she is lost and she has trouble with comprehension. She is also less likely to put in extra time or effort to ensure better results. Her social life and
sports play a very important role, often overshadowing her school commitments. I am hoping to find if this tutorial will help a student who is not only an ESL student but also struggles with the content area and desires to achieve but lacks the skills and commitment to do so.

Linda is the second girl selected for this group. Linda is a very smart and hard working student. Linda is from a middle class family. She puts in a lot of extra effort to do her very best in school. Linda consistently achieves the high honor roll. Linda is able to balance her schoolwork with sports and a typical teenage social life. Linda does have a tendency to become anxious when presented with work that she finds to be challenging. However she is quick to ask questions and find clarification. As a student she is every teacher's dream, a student who is willing to go the extra mile and eager to learn. In choosing to include Linda in this study I hope to find if a tutorial is of any benefit to a student who is already highly motivated.

Allan one of the boys in the tutorial group is a very smart child who is in all available accelerated programs. Due to Allan's ease with the current 8th grade level he becomes bored and so secure in his abilities that he puts in very little effort even when he should be. I have overheard Allan saying on more than one occasion that he doesn't study and he doesn't need to. Unfortunately I can see where this may be a problem for Allan later down the road when he is met with more challenging tasks. I recently expressed this concern to his parents in a parent-teacher conference. They too had similar concerns. I am hoping that something more active will keep him engaged. Also if the activity is tailored to meet Allan's more sophisticated understanding of the material than he may be able to
see the significance in studying. It will be interesting to me to see if a student like Allan, one who is not sufficiently challenged, will benefit from the differentiated nature of the tutorial.

The final boy in the tutorial study is Gary, an admitted C student. He has stated both he and his parents have set their expectation at the C grade level. I don’t believe that this is a true indication of his ability but rather the amount of effort he is willing to put in. He has never outwardly expressed feelings of insecurity with regards to academics but I believe it just isn’t a priority at this point in the 13 year-old’s life. He is very interested in sports and friends and this receives much more attention than his studies. Gary will often ask for help on simple assignments that he could do himself. He and a friend have come to see me during a free period to get help on several occasions. While there he is very focused on doing the work but seeks a lot of reassurance. I am not sure if this is due to uncertainty or if he is trying to get me to do the work for him. I suspect it is more of the latter. I hope to see if this computer tutorial motivates Gary to put more effort into his studying and as a result break the C average barrier he has set for himself.

The paper-and-pencil students. There are also 4 students in the paper-and-pencil review group that I collected data from. In this group there were also 2 girls and 2 boys. The students I chose for this group were very similar to students in the tutorial group. By choosing the students this way I will be able to see how “that type” of student responds to the two different types of review. Obviously it would be very unprofessional, as well as unrealistic, to state that the two students, one from each group, were the same. There are simply too many variables to compare two different children. Instead what I hoped to do
is find certain common qualities between the two students. I am interested in seeing how
the common qualities respond to the different tutorial.

Donna is one of the girls that will be participating in the paper-and-pencil review.
Donna has certain characteristics most similar to Mary. Donna also is a borderline
passing student. Donna has been having difficulties in school for a few years and had to
go to summer school before entering 8th grade. This year she failed two subjects the first
marking period, one of which was not science. Donna received a C in science the first
marking period this year. Unlike Mary, Donna does not receive services from special
education. However, as recent as last spring Donna was tested for potential learning
difficulties. The tests did not show any signs of a learning issue but her parents are
continuing to look for a reason for her lack of success. Donna’s issues have been
categorized as attention and organizational problems. Similar to Mary, Donna is active in
sports and has a full social life. Again as with most students of this age Donna’s friends
are extremely important to her. She has a very sweet disposition and tries very hard to
please people. Her desire to do well is apparent but she also is very reluctant to let anyone
know she is confused or unsure. Things that are explained several times will somehow
elude her. Despite her good intentions Donna is just struggling to keep her head above
water. I hope to discover how she feels about the review sheets she normally receives in
science and find out how she uses them to study.

Amy is most similar to Linda who is in the computer tutorial group. Linda and
Amy are very similar academically and personally. Amy is also a student who is able to
balance friends, sports, and academics. Like Linda, she is particularly conscientious of
her grades. She takes learning seriously and surrounds herself with others who have a similar view. Amy is in all available accelerated subjects and excels. She is a consistent high honor roll member and does so with an extremely high average. Amy is eager to learn and asks questions often. Unlike Linda, Amy does not seem to become overwhelmed by and actually enjoys challenges. I am wondering if a traditional review sheet meets Amy's needs. Because she is very articulate and insightful I am hoping Amy will provide me with some valuable data.

Scott, like Allan, is an accelerated boy who finds most of the work in 8th grade to be unchallenging. Scott is more focused on high grades than Allan and so he is more likely to put in more time and effort for the sake of a higher grade. Scott is a student who is most motivated by the all-powerful grade. This is not necessarily a positive thing because he may be lacking the internal motivation to succeed which will be the only thing left after leaving the academic arena. I have noticed that Scott memorizes definition and answers word for word. This makes me wonder if he has a real understanding of some concepts or if he just feels more secure with those definitions given to him. I wonder if the type of worksheet Scott has been given is able to show off his real understanding.

The final student being highlighted in this study is Jake. Jake is a similar student to Gary. Jake is a C+ to B- student who does receive some additional support by the way of a math AIS. However unlike Gary, Jake has pressure from home to do the very best, which I suspect to more in the B- to A- range. Jake is a student who desires to put in as
little effort as he can and do the job as quickly as he can. He is often done first with an assignment and it is lacking in attention to detail. With Jake I am hoping to determine how much a traditional review helps him prepare for a test. I also want to know from Jake what he would find to be most advantageous in helping him to review.

The Setting. The Bloomfield Central School District covers a large, rural geographic area in western New York State. Students come from various backgrounds. Some students come from single households living below the poverty level while other students have 2 well-educated, upper-middle class parents. The great variety in the student population makes the school more interesting yet it can also cause some problems. There is a great, obvious distinction between the groups that often leads to lack of communication and understanding as well as mistrust among students.

One of the attributes that make Bloomfield such an impressive district is the availability of technology to students and teachers. In the middle school/high school building there are 5 computer labs of varying size. One lab that has 30 computers, more than enough for a single class, is exclusively for the approximately 300 middle school students. Many teachers, including myself, submitted an application for and received a pod of 5 computers in our classroom. However, with all of the amazing technology we have access to many teachers do not take full advantage of our resources. This is something that I am personally trying to rectify. I am trying to integrate technology into my teaching and this study of tutorial use is just the beginning.

My classroom is in the middle school wing of our building. I have 28 desks in my room that are arranged in various ways depending on the activity of the day. On 2 of the
walls there is counter space and cabinets for students to conduct experiments. The third wall is where the pod of computers resides. At the front of the room is my desk and teacher demonstration table. This is the room in which the students will participate in the paper-and-pencil review.

Students who will be participating in the computer tutorial will be in the middle school computer lab. This lab has 30 computers and a teacher computer with a projector. Students have used this computer lab before and are quite familiar with the monitors and printers.

Methodology: Data Sources

There will be two instruments that will be used in the data collection. All students participating in the computer tutorial and paper-and-pencil will be given a survey to glean student insight about the tutorial and review sheets. There will be multiple choice as well as open-ended response questions. The surveys will be given to determine student perception of the tutorial and paper review exercise. The surveys have yet to be written at this point in the project because the tutorial has yet to be developed. There will also be a set of interview questions for the 8 students.

The necessary materials for this study include the two different review exercises. The paper-and-pencil review sheet will include the same exact questions as the computer tutorial. The difference between the 2 reviews is that with the tutorial students will receive immediate, differentiated assistance for questions they answer incorrectly. Other materials needed for this activity are computers for each student.
Methodology: Data Collection

How to collect the data: Data that will be collected from students include surveys, interviews, and field notes. All students, whether they used the computer tutorial or the traditional review sheet, will take a survey that will gauge their perception of the task.

The students will be asked what they enjoyed about the task as well as what they had trouble with. I will ask questions to determine how effective the technology aspects of the tutorial were. For example, I will ask students if the tutorial was easy to navigate and if the color contrast and font size was helpful in reading. I will also ask questions about the content of the tutorial. For example, if you answered a question wrong did the tutorial supply you with the needed help to answer the question right the second-time? I will also ask students if they felt the tutorial was helpful to them in preparing for the test and what they did do to prepare for the test. The 8 students who were chosen to be highlighted in this study will also be interviewed. The interview will be a chance to delve deeper and create a clearer picture of the student's perceptions of the task they were given. From my experience with my misconception interviews in inquiry class I believe that this will be an opportunity for me to ask tailored questions in response to unique interactions with the individual students. Finally, I will take field notes while observing those same 8 students while they are engaged in the review. They will be observed to determine their level of engagement, off-task behavior, interest, and frustration with the review.
How to analyze the data. When analyzing the data I will be looking for 3 things. For one I want to see if the computer tutorial increases student motivation. I believe I will be able to determine this from observations of the students, answers to survey questions pertaining specifically to student motivation, and then an even greater insight will be achieved when I have the one-on-one interviews. I will be especially interested to see if the motivation of Mary, a reluctant learner, and Allan, an intelligent yet unmotivated student, has improved. I will also ask students if they felt the tutorial helped to better prepare them for the test then the paper-and-pencil review sheets that I have used in the past and if so what is it about the tutorial that is better. Finally, I am looking to find from the students themselves their reactions to the 2 different review tasks. I especially want to know from the students who participate in the computer tutorial if they prefer the tutorial to the paper-and-pencil review sheets. I want to know what it is that they like or do not like about the tutorial and whether they find it useful enough to do again.

Methodology: Procedures

Lesson Plans. This unit will begin before Christmas break and commence mid-January before review for the school-wide mid-term week. During this 5-week period the 8th graders will also be taking the New York state science practical test and the New York state English-language arts test. The following chart outlines the tentative curriculum timeline. All activities mentioned in the following section are included in the appendix.
<table>
<thead>
<tr>
<th>Date</th>
<th>Subject</th>
<th>Activity</th>
</tr>
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<tbody>
<tr>
<td>Thursday 12/12</td>
<td>Motion, Force, and Friction</td>
<td>KWL Chart, Sneaker Lab</td>
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<tr>
<td>Friday 12/13</td>
<td>Weight and Gravity</td>
<td>Literature Circle on Weight and Gravity</td>
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<tr>
<td>Monday 12/16</td>
<td>Momentum</td>
<td>Momentum Lab, Momentum Problems</td>
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<tr>
<td>Tuesday 12/17</td>
<td>Speed/Velocity</td>
<td>Speed Lab, Speed Problems</td>
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<tr>
<td>Wednesday 12/18</td>
<td>Acceleration/Deceleration</td>
<td>Snails Pace</td>
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<tr>
<td>Thursday 12/19</td>
<td>Newton's Laws</td>
<td>Stations and Reading</td>
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<tr>
<td>Friday 12/20</td>
<td>Quiz</td>
<td>Quiz</td>
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<tr>
<td>Thursday 1/3</td>
<td>Rate of Falling Object</td>
<td>Falling Object Activity, Vacuum Demo</td>
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<td>Friday 1/4</td>
<td>Projectile Motion</td>
<td>Projectile Lab</td>
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<tr>
<td>Monday 1/6 – Thursday 1/9</td>
<td>Science Practical/Review of first five units</td>
<td>Practice, Test, or Midterm-Review</td>
</tr>
<tr>
<td>Friday 1/10</td>
<td>Orbital Motion</td>
<td>Orbital Motion Activity, Reading, and Bill Nye Video Clip</td>
</tr>
<tr>
<td>Monday 1/13</td>
<td>Work</td>
<td>Work Activity, Discussion, Problems</td>
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<tr>
<td>Tuesday 1/14</td>
<td>Power</td>
<td>Can You Feel The Power Lab Problems</td>
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<tr>
<td>Wednesday 1/15</td>
<td>ELA or Review</td>
<td>Tutorial or review sheet</td>
</tr>
<tr>
<td>Thursday 1/16</td>
<td>ELA or Review</td>
<td>Tutorial or review sheet</td>
</tr>
<tr>
<td>Friday 1/17</td>
<td>Unit 5 Test</td>
<td>Test</td>
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The first day of this unit we will begin with a warm-up activity in which students will on their own work for 3-4 minutes to construct a personal list of words they associate with force and motion. I will then have them get with a clock buddy and compare lists for 1-2 minutes. From that point I will have the students, as a class, construct a KWL chart for this unit. We will create one chart per class and they will be hung in the classroom. As the unit progresses we will add to our chart. With the remaining time I will have students conduct the "Sticky Sneaker Lab". We will then conclude with a class discussion of the terms: force, motion, and friction and how they all work together. Homework will be to do the lab write-up for this activity.
Friday students will do a literature circle discussing the connection between weight and gravity. The reading is a short one in their textbook so students will have time to read the section in class and do their assigned task. Students will then have 10 minutes to share their task with their circle. We will conclude with a class discussion to emphasize and clarify any issues.

To observe and to learn to calculate momentum we will do a momentum lab. We will begin the class with a warm-up activity that asks students what they know about momentum. Next, we will have a 5 minute discussion of what momentum is and how it can be calculated. Students will then get with lab partners and do the momentum lab. Homework will be a worksheet of practice momentum problems.

The next class will begin with a check of the momentum problems assigned for homework the night before. I will then refer students to their note packet and ask them to determine the difference between speed and velocity and we will then have a class discussion of those two definitions. Students will then do a lab entitled "Toy Tester." Upon finishing the lab I will model several speed problems and students will have an opportunity for guided practice. There will also be a lab write-up and some practice speed problems to do for homework.

Again I will call upon student’s prior knowledge of the terms acceleration and deceleration. Their warm-up will be to describe the terms and give examples of each. To demonstrate the idea of acceleration and deceleration I will have a 10-meter line marked off and will have volunteers demonstrate acceleration and deceleration as they walk the line. Next I will model some acceleration problems and they will have an opportunity for
guided practice. The students will then, with a partner, do a paper-and-pencil lab that gives them the opportunity to "race snails" and practice velocity and acceleration problems.

On the sixth day of the unit students will be able to work in groups at three different stations to experience Newton's 3 laws. To observe the laws students will conduct a series of activities in small groups. While half of the class is working on stations the other half will be reading portions of the Cartoon Book of Physics and answering questions. Then Friday before Christmas break students will be taking a quiz on the previously described topics.

Upon returning from break we will be discussing the rate of falling objects and the effect of air resistance. For their warm-up I will ask the students to predict which would fall first a golf ball or a bowling ball. I will then have students do an activity where they drop various objects such as: a notebook, flat piece of paper, and a crumpled piece of paper. They will then in groups of two discuss their observations and come up with an explanation for those observations. After their group discussion I will show all students a demonstration of a penny and a feather falling in a vacuum. Finally we will end the class with a discussion of what we learned about air resistance and falling objects.

I will begin the class by having students get in pairs to toss a ball back and forth. A third student will write down their observations of the motion of the ball. Each student will have the opportunity to observe and record. We will then have a short discussion of the activity and define the forces involved. The class will next do a projectile motion lab.
The objective of the lab is for students to be aware of the forces that cause the motion and also how an object thrown horizontally or straight down will drop at the same rate.

Friday, students will do an activity to explore orbital motion. They will swing an object at the end of a meter length string and observe the effect of speed and length of string on the object's motion. We then will, as a class, read about the forces involved in rocket take off and satellite motion and have a class discussion about what was read. The class will end with a short viewing of a Bill Nye video that uses a bucket of water to demonstrate the forces involved.

The next topic to be discussed in class is work. I will begin by having students do a warm-up that asks what work is and how do you know if you are doing it. I will generate a list of ideas and give students an opportunity to discuss them. Next we will do an activity that involves moving objects in various ways and determining which is the most effective. Students will develop hypotheses and test them. Then we will come back together as a group and discuss the scientific definition of work and how it is different from our usual idea of what work is. I will then model for students how to calculate the work being done and students will have an opportunity to do some problems with guided practice. There will also be homework problems for students to do independently.

Today will be the final topic and lab of the unit. Students will do a lab called "can you feel the power." Students will do a stepping up exercise and determine the power needed to do the activity. After students do the activity we will as a class learn how to use the formula to find power. Finally students will be given some problems to practice for homework.
The last two days before the test I will only see half of the students as the other half will be taking the English-language arts assessment. When the students do have science they will be either doing the review sheet or participating in the computer tutorial. At this time I will give students surveys of the activity they were involved in and I will be observing certain student’s behaviors. On the last day of the unit the students will all take the same unit exam.
Bibliography


