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Abstract

Technology is changing the way in which mathematics and science are taught, and this radical transformation in teaching is causing teachers to take a closer look at how lessons are designed. In an effort to demonstrate how to design instructional modules using technology, this paper will include the following: 1)A review of the National Educational Technology Standards for teachers to establish a framework for the development of the teaching modules; 2)instructional designs and techniques with special emphasis on multiple intelligence and critical thinking skills; 3) strategies and techniques for infusing technology into a standard based curriculum; and 4) an analysis of the evaluative data completed by pre-service teachers to determine the effectiveness of the modules. Middle and elementary pre-service teachers at a historically Black university are required to take a course, Integrated Methods of Teaching Science and Mathematics and the previously mentioned instructional modules were used in this course. The learning modules provided the pre-service teachers with technology enhanced experiences that were aligned with the national science and mathematics standards.

Pre-service teachers were asked to complete five modules which included both formative and summative assessments. They were also asked to complete a survey to obtain their perceptions of the teaching strategies, their performance, the use of tools and assistance, and comfort with using the computer. The only statistically significant correlation ($p<.01$) was between performance and teaching strategies.

During the exit interview for the course, five of the pre-service teachers indicated that they liked the web-enhanced course and that it was good for their personal schedules; however, all the students had a concern about the required assignments and the amount of time required to complete them. All but one of the students indicated that they would take another web-enhanced course. Teaching modules that incorporate the use of technology are an excellent way to meet the learning needs of a diverse population

Using Technology to Design Teaching Modules in Mathematics and Science

Introduction

Technology is changing the way in which mathematics and science are taught, and this radical transformation in teaching is causing teachers to take a closer look at how lessons are designed. Traditionally, mathematics and science teaching have included lectures, problem solving activities and limited laboratory experiences. One way to expand this traditional format of teaching is to develop modules that allow students to interact with computers, take virtual field trips, communicate via email with teachers and other students, observe and perform simulations of selected procedures, and to complete homework assignments online. In an effort to demonstrate how to shift from a teacher-centered instructional design to a more student-centered one, this paper will include the following: 1) A review of the National Educational Technology Standards for teachers to establish a framework for the development of the teaching modules; 2) instructional designs and techniques with special emphasis on multiple intelligence and critical thinking skills; 3) strategies and techniques for infusing technology into a standard based curriculum, and 4) an analysis of the evaluative data completed by pre-service teachers to determine the effectiveness of the modules.

Rationale

The student population is changing in our Pk-12 schools in that they are no longer sit still and quiet types. They are students who have been interacting with technology and electronics either by playing video games, operating a Digital Versatile Disc player, or setting the controls on high definition televisions prior to entering school (Thoms, 2007). One way to meet the academic needs of these high tech students is to design lessons that incorporate the use of technology. This design will allow teachers to meet the needs of the students while shifting from a teacher-centered instructional design to a more student centered one that supports rigorous and challenging instruction. Mckenna, Avery, and Schuhardt (2000) report that there are many benefits for infusing technology into the teaching of science and mathematics, and some of them are: Expanding the opportunity to meet the needs of students through more individualized learning opportunities, improving assessment through immediate feedback, enhancing communication between students and teachers, providing more opportunities for problem solving activities, and

the development of critical thinking skills. Students sometimes have trouble grasping concepts when taught in a large group, and many of them become passive and fail to engage in learning experiences. With the use of teaching modules that incorporate the application of technology students are given the opportunity to work in small groups or individually which lowers the level of frustration and decreases the embarrassment of participation when placed in a larger group. When students complete assignments using technology, they receive immediate feedback and the results of the assessment indicate whether the students are making progress in mastering selected content (Staudt, 2002). This type of feedback is necessary in order for students to correct their mistakes and continue the learning process. It is also a good way to chart student progress. Students must have the opportunity to engage in activities that require them to think critically, and this can be done through inquiry experiences that incorporate the use of technology. There are many inquiry models, but this paper will be limited to two: Bybee's (2002) Five "E" Model and a simple format of the Scientific Method. Mckenna et al. state that we are presently living in the information age and that there is a need to communicate constantly with other individuals in order to obtain information as well as to give information. Technology allows teachers and students to communicate during both the school and after the school hours via email, text messages, teleconferencing, facsimile, and telephone. All of these are ways to improve communication between students, teachers, and the home. These benefits lend themselves to improving the academic performance of students while allowing teachers to shift an educational paradigm from traditional teaching to a more student-focused environment.

Questions

Mckenna et al. (2000) write that there are many benefits of infusing technology into classroom teaching; therefore, this paper will examine the following questions: 1) What is instructional technology? 2) What historical developments influence instructional technology? 3) What are the National Education Technology Standards and how do they impact instructional planning? 4) How do learning theories support the use of technology in the development of learning experiences? 5) How to develop instructional modules that utilize technology in science and mathematics? 6) What impact did the modules have on the performance of the pre-service teachers?

Definition of Instructional Technology

The Association for Educational Communication and Technology (AECT) (1994) reports that instructional technology is the theory and practice of design, development, utilization,

management and evaluation of processes and resources for learning. The development of learning activities using technology should be theoretically sound and should employ the principles of the theories in the implementation of learning experiences. Hug (1978) writes that instructional technology is the identification, generation, application and evaluation of processes which create a purposeful structure for developing learning experiences from available resources. Lever-Duffy, McDonald and Mizell (2003) define instructional technology as any media that is used in teaching and it might include printed media, models, projected and non-projected visuals, audio, digital and video media which includes computers, computer peripherals, and computer software. For this paper, instructional technology is inclusive of the media, materials, teaching strategies, instructional designs and theories that support learning using technology as a tool.

History of Educational Technology

Instructional technology began to influence the teaching and learning process during the 1600s with the invention of the quill pens and slates that were used to teach students how to write. This material impacted the way in which teachers taught students how to cipher letters (Lever-Duffy et al, 2003). Technology became more sophisticated and paradigms shifted in the early 1900s with the invention of the movie projector and later the filmstrip projector. These inventions made classroom instruction better for the visual and auditory learners. In the mid 1900s the television was invented and was later used for instructional purposes. Programs were developed by the Public Broadcasting Station that introduced a form of technology that allowed for the design of lessons not only for the visual and auditory learners but also the musical rhythmic and kinesthetic learners. Students were able to move and follow rhythmic patterns pictured on the television screen. This innovation led to the Public Broadcasting Act which established the Public Broadcasting Service and National Educational Radio in the late 1960s. The invention of the personal computer was the beginning of the information age and a new type of instruction, Computer Assisted Instruction (CAI) which was a drill type of instruction that provided immediate feedback to students. Later, the use of digital videos, computer discs, multimedia tools, interactive video, teleconferencing, and the internet expanded instructional technology and made it appealing for all learners regardless of their learning preference (Anglin, 1991). Instructional technology continues to influence the way in which teachers design and implement lessons so that students will have good positive challenging learning experiences that foster success in the classroom.

National Education Technology Standards

The purpose of the National Education Technology Standards Project is to develop goals and objectives that will guide teaching and learning using technology as a tool (2005). The standards delineate both acceptable teacher and student performances that are required for them to function in an information rich society. This paper will focus on teacher performance standards which ultimately will impact student performance. Middle and elementary pre-service teachers at a historically Black university are required to take a course, Integrated Methods of Teaching Science and Mathematics and the previously mentioned instructional modules were used in this course. According to the National Education Technology Standards, teachers must be able to demonstrate the knowledge and skills of technology operations and concepts; plan and design learning environments and experiences; implement curriculum plans that include methods and strategies for applying technology that maximizes learning; apply technology to facilitate a variety of effective assessment and evaluation strategies; use technology to enhance their productivity and professional practices, and understand the social, ethical, legal, and human issues surrounding the use of technology in PK-12 schools and apply these principles in their selected work places. Teachers must know what technological resources are available to them and they must have the knowledge and skills to use them. In the implementation of the modules for this study, pre-service teachers needed to have good knowledge of the use of computers, Microsoft Office Software, calculators, and search engines. Students who were challenged technologically received support from the university's technology and resource center. The use of technology allows teachers to develop learning experiences that meet the needs of diverse student populations. Through the use of modules in the methods course, student needs were met because the modules allowed for various learning styles, allowed students to work at a time that was convenient for their schedules, provided opportunities for both interpersonal and intrapersonal experiences, and enhanced their research skills through the application of selected inquiry models. In addition to completing the five required modules, the pre-service teachers were asked to create developmentally appropriate models for selected grade levels that they could use during their pre-service teaching experience. The learning modules provided the pre-service teachers with technology enhanced experiences that were aligned with the National Science and Mathematics Standards. Pre-service teachers must know the content of their subject areas as well as how to use technology; therefore, they were required to complete assignments that demonstrated that they have adequate knowledge to teach the content in their discipline of choice. Assessment was

determined academically by the portfolio that the pre-service teachers completed; however, they were given an opportunity to evaluate the modules and express their motivation for completing them through a teacher made survey. The completion of the modules required the pre-service teachers to communicate with the instructor and other students electronically. This communication tool was very beneficial because it allowed the pre-service teacher access to the instructor daily at unlimited times. This tool also lowered the level of frustration for the pre-service teachers who were experiencing challenges completing the modules.

There are legal and ethical issues that must be considered when using technology. A review of the university's position on these two topics was shared with the pre-service teachers, and a copy of the policy was included as a part of the syllabus. These standards were developed to guide the use of technology as well as to help prepare students for the technological challenges that they will face as classroom teachers.

Learning Theories

There are many theories that impact learning and student performance. The Constructivists believe that learning is based on prior experiences and is influenced by one's culture; the Behaviorists think that learning results from being rewarded in order to avoid punishment, and the Cognitivists think that learning is the result of understanding new ideas that result from critical thinking. Gardner (1993), a Constructivist, proposed the Theory of Multiple Intelligence in 1983 in which he identified nine innate capabilities: Verbal-linguistic, visual-spatial, bodily-kinesthetic, logical-mathematical, rhythmic-musical, intrapersonal, interpersonal, naturalist, and existentialist. He wrote that all students have a combination of these intelligences and that teachers should teach in such a way that would encourage them to develop the preferred abilities. Gardner proposes that teachers use a variety of ways and intelligences in presenting lessons so that the individual learning needs of all students are met. The use of technology is one way to differentiate lessons so that they appeal to a variety of learners and their preferred intelligence.

One way to implement Gardner's theory (1991) is to use the tool of technology to develop instructional modules that require the use of multiple intelligences. Lessons may be designed that incorporate the use of two or more of the intelligences, and students should have an opportunity to select the activities in which they would like to engage based on their preferred intelligence. In addition, interdisciplinary units may be developed in which students may be

given assignments that require the use of all of the intelligences in order to strengthen those areas

in which they might feel challenged to perform.

Differentiating Instruction

Not only are teachers required to make lessons appropriate for all student intelligences, they must develop lessons that are rigorous and challenging. This can be done by designing lessons that apply Bloom's Taxonomy for classifying objectives. Bloom proposes a hierarchy for grouping objectives, and the lowest level of the hierarchy is knowledge in which students are asked to recall information; comprehension which requires the interpretation of information; application requires the use of information to solve problems or understand new situations; analysis requires the breaking down of wholes into parts and recognizing parts within the data set, synthesis allows for putting data sets together to generate new ideas, and evaluation requires making judgments (Bloom, 1956). Bloom's hierarchy is used as a guideline for developing the objectives for each of the modules, and this was done to make sure that the objectives were rigorous and challenging for all students.

Developing the Modules

The modules were developed using Microsoft Office and WebCT (Vista) software. Microsoft Word was used to develop the reading passages and other print assignments. Microsoft Power Point was use to develop lectures and some assignments. Microsoft Excel was used for developing data bases and organizing data for analysis. A video camera was also used to tape demonstrations of laboratory experiments which were posted as a part of the modules. All of these requirements were posted on the class WebCt (Vista) page as modules for the pre-service teachers to complete. Other activities were linked to the internet via the use of a uniform resource locator (URL). Assessment and survey instruments were developed using WebCT (Vista) which also graded and organized the results of the data. Microsoft Office Software and WebCT (Vista) were the technological tools that supported the development of the modules.

The pre-service teacher population consisted of eight females and two males who were classified as upper-class students based on the number of credits that they had earned. All of the students attended a required orientation in the computer center and learned how to navigate using WebCT (Vista). Students were also given directions for completing the modules and several resources were identified where they could obtain assistance if needed.

In an effort to help pre-service teachers obtain the content necessary for teaching elementary and middle grade mathematics and science as well as to demonstrate for them how to incorporate the use of technology in their teaching strategies, the modules were developed. Five modules

were developed by the teacher with the assistance of a colleague, and these modules were selected based on the requirements for meeting the knowledge standards as explained by the National Science Standards (1-6, and 8), National Educational Technology Standards (1-6), and the National Mathematics Standards (4, 5, 7, and 12). The instructor working with a colleague selected the content for the course and developed the modules using the national standards as a guideline. The modules are: Safety, Measurement, Flowering Plants, Body Parts, and Earth Science. Each of the modules contained objectives that covered the range of Bloom's Hierarchy (1956); a reading selection to explain the content so that students would have knowledge of the concept; a Power Point Presentation, laboratory experiences both virtual and actual; virtual field trips and other internet activities, an art or music activity, and an assessment activity. The modules were interactive, promoted critical thinking and allowed for individual learning style or intelligence preference as delineated by Gardner (1983). Pre-service teachers were to have all of the modules completed by the mid-semester grading period. After completing the modules, pre-service teachers were to complete a survey to assess the effectiveness of the modules as well as to provide feedback on how they could be improved.

The objectives were written in measurable terms and moved from very simple tasks to more complex ones. For example, in the module, Body Parts, a simple objective was: Identify and label all parts of the heart; and a more complex objective stated: Research a prosthesis that is used to help with the flow of blood through the heart and determine the effectiveness of the devise that you researched. These objectives moved from a recall activity (identify) to an application experience (research) to requiring an evaluative response (determine the effectiveness). These examples are used to demonstrate for the pre-service teachers how to develop meaningful and challenging learning experiences for their students.

Activities were organized and followed Gardner's Theory of Multiple Intelligence (1983) and Bybee's Five E Model (2002). Engaging, exploring, explaining, elaborating, and evaluating are the Es' that make up the Bybee Model. The first E is engaging, and pre-service teachers using the modules were engaged by first of all reading the objectives and determining what was required to complete it. In addition to the objectives, each module contained a minimum of one selected reading passage which explained the concepts covered in the module. Students were asked to read the selection and then write a discussion of the passage following guidelines given by the instructor (Verbal Linguistic). The second E is exploring in which students were required to complete a laboratory/hands-on-mind-on activity (Bodily Kinesthetic). For example in the

module, Body Parts, one of the requirements for this section was to develop a model of their heart and to scale it to the size of their heart based on their weight, height, and the size of other body parts. They also observed a virtual dissection (Visual Spatial) of the human heart as well as a heart transplant. At the end of this section, they were asked to write a poem about the flow of blood through the heart, set it to a beat, develop a song, and teach it to the other pre-service teachers (Musical Rhythmic). The third E is explaining and these activities allowed pre-service teachers to explain the findings of their investigations to others in both small and large group settings (Interpersonal) and to clarify any misunderstanding about the knowledge required to complete the assignment. This part of the process is critical because the assignments so far have been at the recall and application levels of Bloom's Hierarchy, but the next E, elaborate, will require the pre-service teachers to analyze and evaluate data. The Body Part module asks the pre-service teachers to extend their knowledge of the heart by analyzing the model of the heart that they constructed and the way in which the blood flows through it. Then the module moves to the, "what if question", by asking them to consider the flow of blood if there is blockage in one of the vessels or chambers. The pre-service teacher has the choice of selecting the type of blockage. It is at this point that they are asked to develop a devise and determine if it will help to relieve the blockage and allow the blood to flow smoothly through the heart. This type of activity requires the pre-service teachers to transfer the knowledge to a new situation and to dig for deeper meaning of the concepts. The fifth E is evaluation and evaluations were both formative and summative that were done electronically. In order to complete the module, pre-service teachers had to navigate through the module using WebCT (Vista), use a search engine to do research, use Microsoft Office Software to develop the portfolio, and complete the assessments.

Each module required the development of an electronic portfolio showing the products developed, the assignments completed, the assessment results, and the reflection of the teaching experience. These four pieces were a must for all portfolios; however, if a student wanted to add additional information, he or she could.

Results

The purpose of this paper is to examine how technology could be used to design teaching modules in mathematics and science and to determine the effectiveness of the modules as perceived by the pre-service teachers. The modules were developed using Microsoft Office and WebCT (Vista) software. There were ten pre-service teachers enrolled in the course, all of them African-American. All pre-service teachers completed the five assessments and the mean scores

for the electronic portfolio (See Appendix A) for each of the modules is as follows: Safety 83.78 with a standard deviation of 8.41; Measurement 77.38 with a standard deviation of 9.08; Flowering Plants 92.43 with a standard deviation of 6.08; Body Parts 87.74 with a standard deviation of 6.41, and Earth Science 88.60 with a standard deviation of 7.90. All of the means showed moderate variation as indicated by the standard deviation. All of the students made a passing score on the modules with 100 being the highest score and 70 the lowest.

In addition to completing the assessments for the modules, students were asked to complete the OMIM Survey (See Appendix B) to determine their perception of the course and the use of technology. The survey was scored on a Likert (1932) type scale from 1 to 5 with 5 being strong agreement and 1 being strong disagreement. The survey consisted of 15 items and was divided

Table 1 Means and Standard Deviations for Modules

Module	Mean	Standard Deviation
Safety	83.78	8.41
Measurement	77.38	9.08
Flowering Plants	92.43	6.08
Body Parts	87.74	6.41
Earth Science	88.60	7.90

into the following sections: Section 1) comfort with using the computer; section 2) performance; section 3) teaching strategies, and section 4) tools and assistance. Students completed the surveys and submitted them electronically.

The mean for section 1 is 4.40 with a standard deviation of .894; section 2 has a mean of 3.97 with a standard deviation of .753; section 3 has a mean of 4.53 with a standard deviation of .548, and section 4 has a mean of 4.30 with a standard deviation of .610. The sections showed little variance about the mean indicating that the scores were close together.

Table 2. Descriptive Statistics for the Survey Sections

Section	N	Minimum	Maximum	Mean	St. Dev.	Pearson Correlations (p<.01)
Comfort With Using the Computer	10	3.00	5.00	4.40	.894	.2520
Performance	10	2.00	5.00	3.97	.612	1.00
Teaching Strategies	10	4.00	5.00	4.53	.115	.8076
Tools and Assistance	10	3.00	5.00	4.30	.346	.4794

Several Pearson Product Moment Correlations were done to determine the strength and direction of any association between performance and comfort with using the computer, teaching strategies and the use of tools and assistance. When pre-service teacher performance was compared with teaching strategies, the value obtained for r was .8076 which showed a strong positive relation between the two variables that was statistically significant (p<.01). There was a very small positive correlation, .2520 between performance and comfort with the using the computer which was not statistically significant (p<.01); and a small positive correlation, .4794 between performance and tools and assistance which was not statistically significant (p<.01). The only statistically significant correlation was between performance and teaching strategies.
During the exit interview for the course, five of the pre-service teachers were asked the following questions: What did you like about the course? What changes would you make in the course? Would you take another web-enhanced course? The students' responses are as follows:
Question 1, what did you like about the course?

Student 1: I liked being able to submit assignments on WebCT and being able to work on assignments when I got ready.

Student 2: I liked the chat room discussions and the lecture notes that I could get from WebCT because I could check my notes against the lecture notes to make sure that I had them right.

Student 3: I liked the modules and being able to do them in my room. Student 4: I liked the flexibility of not having to come to campus and getting my work done at the same time.

Student 5: I liked being able to send my work in without going to class and emailing everybody at one time.

Question 2: What change would you make to the course?

Student 1: I felt like I was rushing to get my work done so I think if I had had more time to do it I would have done better.

Student 2: I didn't have time to do all of the assignments. I think that I would give the students more time to complete assignments.

Student 3: I wouldn't give so many assignments, and I would let the students choose the ones that they wanted to do.

Student 4: For the students completing the modules, they would not have to come to class and for the students who wanted to come to class, they could. It was a lot to have to do all of that work and keep up with other assignments.

Student 5: I would give the students more time to do the work.

Question 3: Would you take another web-enhanced course?

Student 1: No.

Student 2: Yes.

Student 3: Yes.

Student 4: Yes.

Student 5: Yes.

All of the students agreed that they liked the web-enhanced course and that it was good for their personal schedules; however, all the students had a concern about the required assignments and the amount of time required to complete them. All but one of the students indicated that they would take another web-enhanced course.

Conclusion

The purpose of this paper is to examine how technology could be used to design teaching modules in mathematics and science and to determine the effectiveness of the modules as perceived by the pre-service teachers. Modules were designed using a cognitivist approach that focused on the Theory of Multiple Intelligence as developed Gardner (1993). Activities were included in the designs that allowed for a variety of learning and cultural styles and preferred intelligence. The modules were a good way to demonstrate to the pre-service teacher how to incorporate the use of technology into the development of learning experiences. In addition to incorporating the technology, teachers must make sure that the instructional activities are standards based and academically challenging. Again this was demonstrated in the modules in that the National Education, Mathematics, and Science Standards provided the foundation for the

development of the modules. Critical thinking strategies were required to complete the inquiry segments of the modules which meant that the pre-service teachers had to apply prior knowledge to complete many of the assignments.

The impact of the modules on the performance of the pre service teachers was determined by the quality of work that they completed and the results of the summative assessment activity. Student performance was very good, and not one of the pre-service teachers received a failing grade. All of them attempted to complete the modules even though, they admitted that they were challenged by the assignments and the amount of time required to complete them. Time allocation for completing the modules will be taken into consideration if the modules are used again.

The design of the modules using technology was good and had a positive impact on the students as indicated by the strong positive correlation when the Pearson Product Moment Correlations were determined. Teaching modules that incorporate the use of technology are an excellent way to meet the learning needs of a diverse population.

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Appendix A

This rubric format was used to assess students' performance for each of the modules and to determine their mean score for all of the activities required for the module.

Name _____ Score _____

Rubrics for Electronic Portfolio

Evaluative Criteria	**Exceptional**	**Acceptable**	**Developing/Incomplete**
Case Studies	Well organized, accurate information, all components evident, well thought out, creative, and innovative (9-10 points)	Organized, accurate information, most components evident, good thinking, creative and innovative (8-6 points)	Poorly organized, some information accurate, some components missing, not well thought out, some creativity (5-2 points)
Inquiry Project	Title inclusive of variables, purpose stated comprehensively, essential materials listed, procedure contains details, written in 3rd person and past tense, graphs and tables electronically developed, data analyzed statistically and conclusions and comparisons made by referencing the data. (9-10 points)	Title stated, purpose limited, some materials listed, procedure written in past tense, 3rd person, with some details missing and not sequential, graphs and tables limited, data analysis limited and conclusions and comparisons made with minimum reference to the data (8-6 points)	No title, no purpose, lacking materials list, procedure missing some details, not written in past tense, not written in 3rd person, many details missing, graphs and tables poorly done, conclusion not stated (5-2 points)
Video Summaries/Lecture Notes	Well organized, accurate information, all components evident, well thought out, creative, and	Organized, accurate information, most components evident, good thinking, creative and innovative (8-	Poorly organized, some information accurate, some components missing, not well thought out, some creativity (5-2 points

	innovative (9-10 points)	6 points)	
Lab Reports	Title inclusive of variables, purpose stated comprehensively, essential materials listed, procedure contains details, written in 3rd person and past tense, graphs and tables electronically developed, and conclusions drawn by referencing the data. (9-10 points)	Title stated, purpose limited, some materials listed, procedure written in past tense, 3rd person, with some details missing and not sequential, graphs and tables limited, conclusions drawn with minimum reference to the data (8-6 points)	No title, no purpose, lacking materials list, procedure missing some details, not written in past tense, not written in 3rd person, many details missing, graphs and tables poorly done, conclusion not stated (5-2 points)
Assessment Instruments	Formative and summative assessments completed at or before deadline with a mean score of 90% or higher (9-10 points)	Formative and summative assessments completed at or before deadline with a mean score of 75% or higher (8-6 points)	Formative and summative assessments completed at or before deadline with a mean score of 60% or higher (5-2 points)
Article Critiques	Accurately explains the author's purpose, hypothesis, and methodology, analyzes the data and gives statistical significance of the data, explains the validity of the conclusions and makes 3 or more recommendations for expanding the study (9-10 points)	Explains the author's purpose, hypothesis, and methodology, analyzes the data, explains the conclusions and makes 2 or more recommendations for expanding the stud y (8-6 points)	Gives a limited explanation of the author's purpose, hypothesis, and methodology, analyzes some of the data, gives limited explanations of the conclusions and makes one recommendation for expanding the stud y (5-2 points)
Field Trips (Virtual)	Explains the purpose in detail, gives allowance for interactions with examples, targeted audience identified with an explanation, knowledge and content obtained	Explains the purpose, allowance for interactions, targeted audience identified, knowledge and content obtained as a result of the experience,	Lacks purpose, minimum allowances for interactions, no targeted audience identified, does not mentioned knowledge and content obtained as a result of the experience, no reflections regarding credibility of the site, and one recommendation for improvement (5-2 points)

	as a result of the experience, reflections regarding credibility of site, and 3 or more recommendations for improvement (9-10 points)	reflections regarding credibility of the site, and 2 or more recommendations made for improvement (8-6 points)	
Reflective Essay	Well organized, accurate information, all components evident, well thought out, creative, and innovative (9-10 points)	Organized, accurate information, most components evident, good thinking, creative and innovative (8-6 points)	Poorly organized, most information accurate, some components missing, not well thought out, some creativity (5-2 points)
Optional: Artifacts	Excellent selection, excellent visuals, demonstrates knowledge of all of the objectives, clearly presented, has a reflection with many details and examples (9-10 points)	Good selection, good visuals, demonstrates knowledge of some of the objectives, presented in somewhat of a clear format, has a reflection with some details and examples (8-6 points)	Poor selection, lacks visuals, does not demonstrates knowledge of the objectives, presented in a poor format, reflection lacks details and examples (5-2 points)

Appendix B

Survey for Web-Enhanced Course

Listed below are several statements that will be used to obtain your perception of a Web-enhanced course. Please respond to them by placing an X in the appropriate space.

Statement	**Strongly Agree (5)**	**Agree (4)**	**Neither Agree nor Disagree (3)**	**Disagree (2)**	**Strongly Disagree (1)**
1. I felt comfortable using the computer.					
2. I felt comfortable using WEBCT.					
3. The web-enhanced course helped me excel in this course.					
4. I enjoyed the flexibility of the web-enhanced course.					
5. The web-enhanced course enabled me to successfully complete all assignments.					
6. The web-enhanced course created additional stress for me.					
7. The orientation session prepared me to use the WEBCT software.					
8. The assignments were challenging.					
9. The lecture notes helped my performance.					
10. The Web page was well organized.					
11. The assignments allowed me to work independently.					
12. I have adequate knowledge to do well in a web-enhanced course.					
13. The professor provided assistance when requested.					
14. The email tool was helpful.					
15. I will take another web-enhanced course from this professor.					

Comments_____

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