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An integrated technology project in one Iowa middle school

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An integrated technology project in one Iowa middle school

Abstract

The purpose of this research was to determine whether implementing an integrated technology project at Columbus Middle School in the Columbus Community, Iowa School District would have any positive learning effects on the eighth grade students. Secondly, the research set out to determine if there are advantages to integrating technology into middle school curriculum. Finally, the purpose of the research was to find selection criteria for an integrated technology project for the middle grades. After selection and implementation, the project was evaluated through teacher observations and student self-evaluations. Both evaluations indicated that this integrated technology project had positive learning effects upon the middle school learners at Columbus Middle School.

AN INTEGRATED TECHNOLOGY PROJECT IN ONE IOWA MIDDLE SCHOOL

A Graduate Research Project
Submitted to the
Division of Middle Level Education
Department of Curriculum and Instruction
in Partial Fulfillment
of the Requirements for the Degree
Master of Arts in Education

UNIVERSITY OF NORTHERN IOWA

By
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The purpose of this research was to determine whether implementing an integrated technology project at Columbus Middle School in the Columbus Community, Iowa School District would have any positive learning effects on the eighth grade students. Secondly, the research set out to determine if there are advantages to integrating technology into middle school curriculum. Finally, the purpose of the research was to find selection criteria for an integrated technology project for the middle grades. After selection and implementation, the project was evaluated through teacher observations and student self-evaluations. Both evaluations indicated that this integrated technology project had positive learning effects upon the middle school learners at Columbus Middle School.

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An Integrated Technology Project in One Iowa Middle School

Chapter 1

Introduction

The United States shifted from an industrial age to an informational age in the 1970s. Middle school students have grown up in a digital world. Using technology as an integral part of the middle school curriculum is necessary to prepare students for successful participation in the 21st Century.

This project describes the research, planning, implementation, and assessment of an interdisciplinary, integrated technology project used at Columbus Middle School (CMS) in the Columbus Community School District in Iowa. Some questions that were considered in this project were: Why is it important to integrate technology into middle school curriculum? How can teachers effectively implement an integrated technology unit into their curriculum? Does utilizing technology in middle school learning experiences have any positive effects on student learning?

First of all, is it important to integrate technology into middle school curriculum? Middle school students need to be able to use technology effectively in order to live, learn, and work successfully in our information-rich society (International Society for Technology in Education [ISTE], 2001). As McGrath (1998) points out, integrating technology into curriculum engages students in real-world problem-solving and makes students curious about new areas of inquiry.

Learning experiences with appropriate technology infused into the student tasks help prepare students with the necessary skills and competencies to join our nation's future workforce. The (Secretary's Commission on Achieving Necessary Skills [SCANS]), 2000) found essential foundation skills and competencies that students must

master to acquire meaningful work. The foundation skills are categorized into three domains (a) basic skills, such as reading, writing, and computing; (b) thinking skills, such as visualization, reasoning, and the ability to solve problems; and (c) personal qualities, such as perseverance, politeness, self-esteem, and empathy (SCANS, 2000).

Beyond these foundation skills, middle school students need to be challenged in their learning tasks to develop competencies that prepare them to enter the future workforce. SCANS (2000) summarizes the five competencies:

1. Planning Skills: such as allocating time, money, space, and staff.
2. Interpersonal Skills: such as negotiating and teaching.
3. Information Skills: such as acquiring, evaluating, interpreting, and communicating information.
4. Technology Skills: such as selecting using, and fixing technology.
5. Systems Skills: such as understanding, improving, and designing systems.

Effective middle school curriculum provides meaningful learning experiences that allow these competencies and foundation skills to be taught in context through inquiry rather than as abstract concepts and skills to be applied later. Inquiry-based learning for middle school learners is valuable because it “cultivates students’ responsibility for their own learning and introduces students to authentic intellectual pursuits of scientists, mathematicians, historians, and writers” (Windschitl and Irby, 1999, p. 42). Projects with real-world data that infuse technology into student tasks offer learning experiences that prepare students for meaningful work in the 21st Century.

Once the importance of integrating technology into middle level instruction is established, the question becomes how to successfully integrate the technology. Two requirements are suggested “for effective integration of technology skills into curriculum: (a) The skills must directly relate to the content area and to the classroom assignments,

and (b) the skills themselves need to be tied together in a logical and systematic model of instruction” (Eisenberg and Johnson, 1996, p.73).

In 1985, Apple Computer, Inc., in partnership with a handful of school districts, began the Apple Computer of Tomorrow (ACOT) Project to find the most productive uses of technology in schools. Gerry Smith, a K-8 principal of one of the ACOT schools, explained in a speech delivered to education leaders at the Mississippi Bend Area Education Agency in Bettendorf, Iowa in October, 1997 that integrating technology is not about technology, it is about curriculum. The vision for his technology-enriched school had focused on the restructuring of the curriculum so that students would acquire the necessary skills, knowledge, and behaviors to be competitive in the global economy of the 21st Century. The use of technology within the curriculum had helped engage, enable, and empower students to achieve their potential. Technology was used as a tool to apply their content area learning.

Because teachers are responsible for designing lesson plans and units that meet their specific content area standards, they must find ways to infuse the technology as a tool to enhance the content area learning (ISTE, 2001). Fortunately, there are numerous resources available to teachers that make this task easier than in the past. Teachers can find lesson plans with integrated technology at many education web sites. Publications from institutions such as the International Society for Technology in Education are other useful resources. Every ISTE publication of Learning and Leading with Technology features integrated technology units that teachers across the nation have developed. Each unit identifies both the student technology and content area learning standards that the unit can be used to meet. Teachers may select a model from one of the many credible sources or choose a lesson or unit that is already being taught where technology could enhance the content area learning (Dockstader, 1999). Dockstader cautions educators to

be certain of having “curriculum drive technology usage, not having technology drive the curriculum” (p. 73).

Before implementing integrated technology units, teaching strategies need to be examined. In Teaching with Technology: Creating Student-Centered Classrooms, Sandholtz (1997) recommends a shift from instruction to construction classrooms. Construction classrooms have learning environments that “feel more like real workplaces where problems are solved through conversation, inquiry, trial and error, and constant comparison of one approximate solution against another” (p.13). Many integrated technology units require problem solving of this nature. Therefore, the constructivist teaching strategy was examined.

The final part of the project is an assessment of its effectiveness in terms of student learning. According to McNabb, Hawkes, and Rouk (1999) in Critical Issues in Evaluating the Effectiveness of Technology, “Where once the emphasis was on building and implementing a technology infrastructure, today it is on evaluating the effectiveness of its use in schools and classrooms” (p. 1). Furthermore, schools are challenged “to find new ways to identify and measure the skills and knowledge that students gain from using technology” (p. 2). This requires looking at other measures than standardized test scores to evaluate the effectiveness of integrated technology projects.

According to the Technology Foundation Standards for Students, one component of the social, ethical, and human issues strand states, “Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity” (ISTE, 2001, p.1). To evaluate the project in these terms, CMS students completed a self-assessment of their learning. The Columbus eighth grade core teaching team completed a group evaluation of the project. Both were used to evaluate the effectiveness of the project.

Chapter 2

Methodology

Summary of Methodology

The purpose of this project was to determine if implementing an integrated technology unit would have any positive effects upon middle school student learning at the Columbus Middle School. Current literature from refereed sources and government reports was examined to find support for implementing this type of project. After finding a great deal of supporting literature, a search to find a model for our unit was conducted. The model for the Columbus Middle School (CMS) project was selected after careful consideration of national content area and student technology standards. After the implementation of the project, the project was assessed by our core team. The students also completed a self-evaluation that provided information about the effectiveness of the project.

With support of my administration, I began experimenting with integrating technology into some of my learning units. It appeared that my students were more engaged in their learning when technology was introduced as a part of the students' learning tasks. Students entered my classroom asking if we were going to be able to go to the computer lab to continue to work on our project. Therefore, I wanted to expand both the application of the technology and the assessment of its effectiveness.

The expansion was possible due to several factors. Our school formerly operated as a junior high. In the fall of 2000, we shifted from a junior high to a middle school. We moved to our own building which contained grades six through eight and now had grade level core teaching teams. Our eighth grade team was extremely cooperative. We were flexible and eager to try novel teaching approaches. Our schedules were changed so that the core team teachers had common planning time.

Additionally, our middle school received a technology grant that allowed for the purchase of a 22 station iMac lab. Technology staff development training was offered. Each member of our team participated in various types of training. Also, our school district's school improvement plan encouraged integrating technology into our curriculum. Another focus of the school improvement plan encouraged teachers to plan and implement group collaboration learning projects. An interdisciplinary, integrated technology project met both goals. The timing seemed right to implement an interdisciplinary, integrated technology unit.

Project Selection Source

I began to search for a model for our project. One of my favorite sources was the ISTE publication entitled, Learning and Leading with Technology. Each issue featured several integrated technology units. The units always listed the national content area and student technology standards that could be met through its use. It also identified the grade level appropriateness of the lesson or unit. Many of the units were appropriate for middle school use. Most of them were interdisciplinary units of study.

World Tour

I found a unit entitled, "World Tour" (WT) (Appendix A) that required the students to create a fictitious rock band, plan its world tour, and evaluate its success based upon profitability through the use of student-generated spreadsheets that calculate the expenses and profits of the tour (Sosenke, 2000). It incorporated mathematics, science, language arts, foreign language, art, and geography. It was designed for 12 to 14 year old learners in grades seven through nine. The technology utilized is the Internet/Web, an integrated package (e.g., AppleWorks or Microsoft Works) or word processing software, spreadsheets, databases, and graphics or desktop publishing software (e.g., Photoshop [Adobe]; Color It! 9MicroFrontier).

The project can be modified to meet the specific needs of middle school teachers. Sosenke, a middle school math teacher from Park Tudor Middle School in Indianapolis, Indiana who won the 1996-97 Presidential Award for Excellence in Mathematics and Science Teaching, designed the original project. As Sosenke (2000) stated the project began as a pencil-and-paper project that had as its main objective, practicing arithmetic skills. Sosenke explained that it was expanded with the help of Elizabeth Kratz, the technology teacher, to utilize computer spreadsheets. Finally, Sosenke reported that activities from other disciplines were added. This resulted in an authentic learning project that integrated technology into the learning process.

Interdisciplinary Project Adoption

I presented the project idea to our eighth grade core teacher team. The language arts, social studies, science/computer, and I (the math teacher) decided to adopt "World Tour" as a model for our interdisciplinary, integrated technology project. As a team, we allowed each teacher to utilize teaching strategies that the individual teacher felt would best evoke the learning outcomes for their subject matter area. I decided to use a combination of the traditional instruction and non-traditional construction teaching strategies.

Data Collection Process

Fifty-five eighth grade students participated in the project. Further descriptions of the subjects, the teaching team, and the school demographics will be provided in Chapter 4, "The Project". Following the project implementation, the team met to discuss the effectiveness of the project. A written evaluation was composed summarizing the teacher observations. In addition, each student completed a self-assessment designed to determine their level of skill learning and motivation toward using technology as a learning tool.

Chapter 3

Literature Review

This review focused on current literature concerning integrating technology into middle school curriculum, teaching practice concerns related to implementing integrated technology projects, and the importance of evaluating the effectiveness of the technology enriched learning projects.

Integrating Technology into the Curriculum

Technology is everywhere. It is present in our homes, at work, in our recreation, and in our schools. Parents, employers, communities, and our nation recognize the essential role of technology in 21st century education (ISTE, 2001). Our nation has invested heavily in creating a necessary technology infrastructure in our schools. How will educators utilize this investment to prepare students to be successful participants in the 21st century?

Our education system must prepare students with the necessary skills to contribute to our technology-based society. Today's students must graduate with skills to contribute to an ever-changing workplace environment dominated by information technology. "Employers demand workers have the ability to (a) problem solve, (b) produce creative solutions, (c) be flexible, (d) work cooperatively in teams, (e) produce and deliver solutions effectively, and (f) have cognitive technology knowledge and critical thinking skills" (Gilberti, 1999, p.47). In Connecting Learning & Technology for Effective Lesson Plan Design (Seamon, 1999) explains that, "The workplace of the future requires the ability to acquire, organize, interpret, and evaluate information and use computers to process it" (p.1). Teachers can prepare students with these necessary workplace skills when technology is integrated into authentic learning projects where students work together on teams.

Learning projects that present middle school students with authentic, real-world problems that have technology infused into the learning tasks help the students acquire these necessary workplace skills. The learning focus moves from what a student knows to what a student is able to do (Seamon, 1999).

Standards-Based Project Selection

Teachers are responsible for selecting units that support both local and national standards. This includes standards for content areas as well as student technology standards.

At the national level, technology-rich student learning experiences are supported by the national organizations of each core content area. In mathematics, the National Council of Teachers in Mathematics [NCTM], 2000 has named technology as one of its six principles to be incorporated in every high-quality school mathematics curriculum. NCTM states that “Technology is essential in teaching and learning mathematics: it influences the mathematics that is taught and enhances students’ learning” (National Council for Teachers of Mathematics [NCTM], 2000, p. 24). The National Council for Teachers of English, NCTE, explains that students “will need to develop technological competencies undreamed of as recently as ten years ago”(National Council of Teachers of English [NCTE], 1996, p. 5). One of the ten thematic strands of the National Council for Social Studies states that “Social studies programs should include experiences that provide for the study of relationships among science, technology and society” (National Council for Social Studies [NCSS], 1994, p.28). And finally, in National Science Education Standards, it is stated that technology be utilized in curriculum for grades five through eight because “technology ...provides tools for investigation, inquiry, and analysis” (National Research Council [NRC], 1996, p.166).

Furthermore, the National Education Technology Standards (NETS) for Students (ISTE, 2001) establish six Technology Foundation Standards for Students (Appendix B).

Projects that infuse technology skills into relevant curricular content provide rich learning experiences for middle school students.

Teaching strategies

Integrated technology projects present the opportunity for teachers to consider non-traditional teaching strategies. The constructivist approach to learning is one teaching strategy that can be incorporated when teaching integrated technology units. In projects where students are expected to construct their knowledge through inquiry, the teacher becomes a facilitator rather than the deliverer of knowledge. Table 1 lists differences between the instruction and construction teaching strategies.

Table 1 Contrasting views of instruction and construction

	Instruction	Construction
Classroom activity	Teacher centered	Learner centered
Teacher role	Fact teller	Collaborator
Student role	Listener	Collaborator
Instructional emphases	Facts	Relationships
Concept of knowledge	Accumulation of facts	Transformation of facts
Demonstration of success	Quantity	Quality of understanding
Assessment	Norm referenced	Criterion referenced
Technology use	Drill and practice	Communication, collaboration, information access, expression

Note. From *Teaching with technology: Creating Student-Centered Classrooms* (p.14), by J. H. Sandholtz, C. Ringstaff, and D. C. Dwyer, 1997, New York: Teachers College Press. Copyright 2001 by Teachers College Press. Reprinted with permission by the author.

Both strategies can be used to create an effective learning environment. Sandholtz (1997) explains there are times when “instruction-- lecture, drill and practice-- is an appropriate way to introduce skills or concepts, build awareness, or reinforce some set of

actions that can be replayed habitually” (p.14). The traditional instruction strategy can be a more efficient use of time for teaching some skills in this unit. Sandholtz points out

When depth and understanding are the most desirable learning outcomes, ..., knowledge construction is a better strategy to help learners personalize and deeply internalize ideas, to create situations where skills and concepts can be applied in different contexts to solve problems, to explore or generate ideas, and to generalize and synthesize knowledge. (p.14)

The constructivist strategy is compatible when teaching integrated technology projects. Teachers are charged with the responsibility to select and use appropriate teaching strategies that enrich the students’ learning environment throughout the project.

Evaluation

Evaluating the effectiveness of technology is the next focus of this project. In the greater picture, questions need to be answered, such as, is the large public investment in expensive technology infrastructure having a positive effect upon student achievement? McNabb, Hawkes, and Rouk (1999) reported that current practices for evaluating the impact of technology in education need broadening. Teachers must build upon their capacity “to evaluate technology resources and to align their uses with the learning goals and content standards of the curriculum” (p. 3).

According to McGrath (1998) technology encourages varied methods of assessment. Measures other than standardized test scores can be used to determine how to measure technology’s effectiveness in schools. Other types of evaluations can supply information on how technology affects student attitudes toward learning. Information collected through simple observations and questionnaires provide additional information that can be used to assess the success of integrating technology into middle school curriculum (McNabb, Hawkes, and Rouk, 1999). Furthermore, McNabb et al. suggest finding answers to questions like:

1. What technologies do teachers and students use and why?
2. What is their attitude toward them?
3. How has technology changed how teachers teach?
4. How has technology affected the way teachers teach? (p. 5)

Classroom teachers evaluate their students on day-to-day, hour-to-hour, and sometimes minute-by-minute basis through observation. McNabb, Hawkes, and Rouk (1999) add that teachers “play key roles in measuring and documenting changes in student learning as they occur. Some of the best results in evaluating technology come from schools recognizing and harnessing the expertise teachers have in identifying technology-induced learning outcomes” (p. 9). Teacher observations and reflections help teachers know more about their students and about the contribution technology makes toward learning outcomes. This information aids the teacher in determining future lesson planning and decision-making.

Conclusion

Based on the preceding sections of this literature review, educators now consider integrating technology into their curriculum. Infusing technology into student learning tasks prepare students with meaningful workplace skills. Each of the national education organizations representing the core content areas for middle school instruction recognize and support the integration of technology within their national standards. Additionally, the National Educational Technology Standards for Students have identified technology foundation standards for students. These provide guidelines for planning technology-based learning activities in which students can achieve success in learning, and in life. Finally, this review provides a basis of support for teacher observations and reflections for evaluating the effectiveness of integration of technology into curriculum.

Chapter 4

The Project

In this chapter the project details are described. First, a description of the setting is given to provide the reader with background information about the logistics involved for implementing the project. Secondly, criteria pertaining to project selection are elaborated. In addition, a description follows that explains how each teacher implemented the project in their content area. Finally, the outcomes from the evaluation of the project are shared.

The Setting

The Columbus Middle School was established in the fall of 2000. There are approximately 250 students in grades six through eight. Each grade has four sections of students. There are four core teachers at each grade level in the disciplines of language arts, social studies, science, and mathematics. Our schedule is a modified eight block system. The core subjects are scheduled during block one and two each day. Each of these blocks are approximately eighty-eight minutes in length. This allows students to study all four core subjects in the mornings over a two-day cycle.

During each afternoon students are scheduled into four forty-five minute classes where they participate in exploratory studies. Eighth grade core teachers teach a variety of exploratory subjects during the top and bottom of block three. The teachers have an eighty-eight minute common preparation time during the top and bottom of block four. This schedule was designed to encourage team collaboration. The team met regularly one or more times a week for approximately forty-five minutes.

Columbus Community School District is a rather large rural school district in Iowa with a student population that is culturally and socioeconomically diverse. Since 1990, Iowa Beef Packers importation of Hispanic families has increased the district's enrollment of students, 40% of whom speak Spanish as their first language. Forty-five

percent of our total enrollment is Hispanic. Columbus Community School District area has the largest low income and poverty percentage for individuals under 18 and the highest percentage of female heads of households in Iowa. Slightly over 40% of our students qualify for free and reduced lunch.

Academically, our students face major educational needs. Data from standardized tests taken during the 2000-2001 school year show that 40% for the Columbus fourth, eighth, and eleventh graders are not proficient in reading and math. A disaggregation of the data shows that economically poor students and English Language Learners (ELL) or former ELL students are performing at a rate of one to two years behind their English speaking, more affluent classmates.

We received a Technology Literacy Challenge Fund Grant last year that allowed the establishment of a middle school iMac Lab. Twenty-two iMacs were placed in a lab with easy access to our eight grade core subject classrooms.

Project Selection

Several sources were considered in selecting this initial interdisciplinary, technology-based unit. The first consideration was that middle school teachers promote and plan student learning experiences that are based on inquiry that stimulates students to think about and communicate ideas (Carnegie Council on Adolescent Development, 1989). Secondly, national standards for student learning were examined. These included technology standards as well as content area standards. Our local student learning goals and our current technology plan were a significant consideration in this process.

The unit selected, "World Tour", (Sosenke, 2000) met five of the six ISTE technology standards for students (Appendix B). A majority of national standards are met through this project including: seven of the ten NCTM math standards (Appendix C); eight of the ten NCSS standards (Appendix D); nine of the twelve NCTE standards (Appendix E); and four of the seven NRC science content area standards (Appendix F).

Furthermore, local considerations include the 1999-2000 Columbus Technology Plan which states:

Technology must be integrated into the total instructional process in order to help us reach the goal of increasing student achievements. To use technology efficiently and effectively, the Columbus Community School District must establish curriculum and instructional plans that prepare all students for lifelong learning experience. The fully integrated use of new technologies will require fundamental shifts in learning activities and teaching strategies. (p. 1)

In Iowa, state education funds (Phase III Funding) are used to support professional development activities. The 2000-2001 Columbus Phase III Plan supports this unit as this document explains:

In Iowa, Phase III funds are used to support professional development activities. Our three strands of professional development are diversity, change, and technology. Teachers were encouraged to implement group collaboration projects that support advancement in one or more of the three strands.

Finally, our Columbus Learning Goals are met through this project as the goals state that students will:

1. Communicate effectively.
2. Think critically and solve problems.
3. Develop and apply study skills.
4. Use and apply technology skills.
5. Develop aesthetics appreciation.
6. Demonstrate basic mathematical skills.
7. Develop community responsibility.

8. Develop social competence.

“World Tour”, an interdisciplinary, integrated technology unit, was selected as the project because it met our expectations for student learning. It was an inquiry-based unit that met national standards as well as local expectations for middle school learning experiences.

World Tour Description

“World Tour” is an interdisciplinary, technology-enriched unit that requires two-to three-weeks to complete. In small groups students plan a world tour for a fictitious rock band they create. The goal is to maximize profits from the tour.

The students simulate critical decision-making skills of a management firm in the music industry. The students, like real-world managers, plan an eight city world tour, market the band, and maximize the profit from the tour.

Language arts activities.

In language arts classes, the students from each section were divided into teams composed of four students whenever possible. After researching real band members’ biographies on-line, the students created a word-processed biography. The creative document required students to synthesize the real biographies with their own biographical information to create a biography of their fictitious band member. Their group, then collaborated to create a fictitious band. Together, they named their band. Next, the teams created a word processed resume for their band. The purpose of the resume was to attract a fictitious manager that would plan their world tour.

Science/computer activities.

The science/computer teacher facilitated research about health concerns common to band members, such as vocal cord health. Word-processed documents were used to report their findings. Insights into the care and prevention of health issues such as stressed vocal cords were included in their reports.

Social studies activities.

The social studies teacher assisted the students in planning the tour itinerary. This included gathering data for world cities. Data had to be collected about city population, country and type of government, weather/climate, language spoken, facts about the culture, and at least one other interesting aspect about the cities their choice. The students selected eight tour cities based on these facts. No more than three tour cities could be located on any given continent. World maps were studied to determine their travel paths. Total distance to be traveled was considered when making decisions as that would affect their tour expenses.

Mathematics activities.

Another content area in which the students worked during this project was mathematics. I facilitated the students' learning by guiding them in creating three spreadsheets on Microsoft Excel. The first spreadsheet calculated current tour per diem expenses for each city in which the band performed. The web provided current real world data for this part of the project. The second spreadsheet calculated airfare costs for the entire tour. Once again, the students found actual airfare for their travel via several web sites. In the final spreadsheet, students created a spreadsheet that calculated the band's profit for the tour. For each spreadsheet the students learned about formatting options, changing numerical data into various forms (such as currency style and percentages), and using formulas that performed the necessary repeated calculations. Before each spreadsheet was created, the students critically examined data and made decisions to aid them in reaching their goal of profitability for their tour.

Following the project, the teaching team met to evaluate the effectiveness of the project. Teacher observations and a student self-evaluation assessment were used to write a project evaluation .

Project Outcomes

A self-assessment (Appendix G) was completed in my classroom following the conclusion of the project as part of the student learning assessment. The students assessed the level to which they acquired computer and research skills as well as their attitudes toward the use of technology as a learning tool. Table 2 presents the results of their self-evaluations.

The results strongly confirm that our students possessed positive attitudes toward technology uses that support lifelong learning. Ninety-five percent of the eighth grade students either agreed or strongly agreed that they enjoy using the computer as a learning tool (Statement 10). While ninety-four percent responded that using the web as a learning tool was enjoyable (Statement 9).

Table 2 Results for World Tour Evaluation

	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
Statement 1	36	47	13	4	0
Statement 2	36	56	5	2	0
Statement 3	31	36	26	7	0
Statement 4	46	35	16	4	0
Statement 5	47	33	18	2	0
Statement 6	58	27	16	0	0
Statement 7	52	31	15	2	0
Statement 8	58	36	5	0	0
Statement 9	78	16	4	0	2
Statement 10	80	15	2	4	0

Numbers indicate percentages of student response for that statement.

Eighty or more percent of the students agreed or strongly agreed that they possess the ability to successfully create a readable, computer-generated spreadsheet (Statements 1 and 2). Eighty-one percent of the students agreed or strongly agreed that they could use formulas to perform repeated calculations in a computer spreadsheet application.

Likewise eighty percent or more of the students also felt they were able to search websites to obtain current data necessary to make real-world decisions such as the ones required in this unit (Statements 5 through 8).

In addition to the student self-evaluation results, the teaching team evaluated this interdisciplinary, integrated technology project based on the success of the students' learning. A list of teacher-observed-findings included:

1. All students were engaged in the learning process.
2. The topic had great appeal to the majority of our students.
3. Working in teams fostered a positive learning environment.
4. The integration of technology had a positive effect on student learning.
5. Students extended and refined their knowledge in the content areas.
6. This authentic, real-world simulation made their learning meaningful.
7. Life-long skills of teamwork, accountability, responsibility, and self-monitoring skills were observed.

The teachers reported that the constructivist teaching strategy seemed very natural while teaching this project. When in the computer lab, the learning was interactive. Traditional roles were reversed as the student sometimes became the expert in the learning process and the teacher became the learner. The instructional emphasis became one of inquiry as the students modeled the critical thinking and decision-making of real-world managers. Student learning assessments were made based on the products they created rather than through a traditional pencil-and -paper test. Additionally, technology was used as a tool to communicate, assess information, and analyze data for authentic learning. The constructivist teaching strategy worked well with this integrated technology project.

As the teacher-researcher, I found that this interdisciplinary, integrated technology project engaged students in their learning. The students enjoyed using current technology in their learning experiences. All of the students were motivated to complete the learning tasks. This type of learning experience enabled the students to meet national standards and local expectations for middle school learning. In addition the students were

empowered through this unit to acquire necessary computer skills that prepare them with future workplace skills.

Chapter 5

Summary, Conclusions, and Recommendations

The purpose of this project was to determine whether or not implementing an integrated technology unit into middle school curriculum was important. In addition, the research investigated criteria for the selection of an integrated technology unit. The research also sought to determine the effectiveness of the integrated technology unit. The CMS selected and implemented an integrated technology unit, “World Tour”, based on national and local standards and learning expectations for middle school students. The teacher observation-based evaluations of the project indicated that positive learning effects were produced through this unit of study. The student self-evaluations confirmed the teacher evaluations as over 80% of the students expressed they acquired competency in computer skills. Furthermore, over 90% of the students agreed they enjoyed using computer technology as a learning tool.

Conclusions

The data from this research project produced evidence that this integrated technology unit had a positive learning effect upon the middle school students. The reviewed literature indicated that integrating technology into student learning experiences prepared students with future work skills. Integrated technology units also allowed students to become engaged in their learning. Furthermore, national education organizations, (NCTM, NCTE, NCSS, and NRC) supported the integration of current technology into student learning tasks (Appendices C through F). The selection of the unit should be based upon local and national standards for student learning. Additionally, constructivist teaching strategies were easily incorporated into the unit of instruction.

The evaluation portion of this project provided formative evaluation of student learning. Students enjoyed utilizing the same technology skills in their learning tasks that they employ in their daily lives. Our current middle school students have grown up in a

digital world (Gilberti, 1999). They should be expected to use these skills in their learning experiences at school.

Through this project, I learned that integrating technology into an authentic real-world learning experience prepared students with future work place skills and competencies. The students used the foundation skills and competencies reported in the SCANS report (SCANS, 2000). Throughout the project, students used (a) basic skills, such as reading writing, and computing; (b) thinking skills, such as visualization, reasoning, and the ability to solve problems, and (c) personal qualities, such as perseverance, politeness, self-esteem, and empathy (SCANS, 2000). For instance, the students used planning skills when they assessed information gathered about various world cities and made decisions about which world cities to tour. Likewise when the students chose an airline package that minimized their tour costs, they were using planning skills, one of the SCANS five competencies. They used SCANS information skills when they acquired current information from web sites to write biographies and evaluate cities. As the students created spreadsheets they learned how to communicate their calculations of tour expenses and profits in a readable format. Furthermore while practicing this skills, they were also meeting national and local standards for student learning. I believe this integrated technology unit prepared students with necessary skills to obtain meaningful work in the 21st Century.

Through my observations I know that students were motivated by incorporating computer technology into their learning tasks. The student self-evaluation results reinforced this opinion. The survey results supported and verified my observations of past learning experiences which incorporated technology. The interdisciplinary aspect of this project only added to its effectiveness in increasing our students' motivation to learn. The common team planning time that was built into our schedules facilitated the implementation of this project.

Recommendations for Future Practice

Middle school curriculum must constantly change in our fast paced information-based society to ensure we are preparing all students for successful participation in our world. Here is a list of recommendations for future practice:

1. Based on the success of this project, more integrated technology units should be incorporated into middle school curriculum. The middle school students were engaged in their learning through the integration of technology into an authentic real-world study of this nature. The topic was interesting and the skills utilized were applicable to their daily lives. Another reason further units should be taught is that the students were engaged in learning tasks that promoted skills and competencies necessary in future work place settings.

2. The Web should be utilized in integrated technology projects. The World Wide Web was a powerful educational tool in this project. The students conducted research that was based on current information provided on the Web. Students analyzed the data gathered from the Web to make necessary decisions that affected the profitability of their band's tour. In addition, the use of the Web as a learning tool was highly motivating to the middle school students.

3. Traditional and non-traditional teaching strategies can be used when implementing integrated technology units. The inquiry nature of interdisciplinary, integrated technology projects seemed to be compatible with the constructivist teaching approach. Throughout the project, classroom activities were learner centered and the teacher and student roles were one of collaboration. However, when introducing certain skills, a traditional teaching strategy seemed to be more efficient.

4. Evaluation is a necessary component of integrated technology units. The evaluation results are necessary to justify additional costs of future technology and use of instructional time. Evaluation results can be used to make future instructional decisions

5. More technology teacher training will be necessary to prepare teachers to teach future units. Teachers need to be flexible and willing to learn new technology skills. New technologies are being created all the time. Future units should utilize these new technologies as they become available to our school.

6. Additional funding for new technology infrastructure and staff development will be needed. Alternative sources for funding these expenses must be examined. However, as long as technology is integrated into projects that maximize students' learning, the costs will be justified.

Much has been written about how integrated technology units prepare students with future work skills and competencies since the SCANS report was published in 1991. Research into the benefits of integrating technology into the curriculum as compared to teaching technology skills has been an issue for the last 10-15 years. Recent literature supported the effectiveness of integrating technology into authentic, relevant student learning experiences. With the increase in computer infrastructure in our middle schools, it would be expected to see more units such as this one implemented into middle school curriculum in the future. Through the implementation of integrated technology projects, middle schools can engage, enable, and empower our students to be successful participants in the 21st Century.

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Appendix A
Excerpts from "World Tour" unit

World Tour

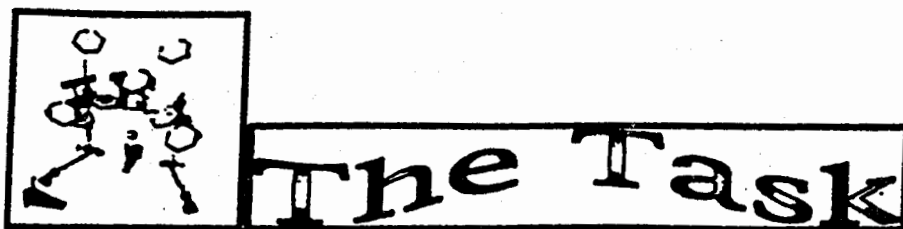
Thousands of bands try to make it big every year. If a band is talented and lucky enough to record their music, then it is likely they will want to take their band on a tour. Behind every successful music tour there are many people behind the scenes that help plan every aspect of the tour. In this Web Quest you will design and plan a tour from start to finish. Great bands have great managers who help make the tour a success.



The Task Start here to begin the assignment.

<http://www.parktudor.pvt.k12.in.us/WorldTour/WTindex.html>


7/24/00



You are partners in a management firm. You have just landed an important client. This up and coming rock group's single just made it to the top 10 list. The members of the group want to go on a world tour of eight cities to promote their album. As the managers, you are hired to plan the tour, market the band, and of course, maximize the profit from this tour. Remember, the more successful the tour, the more money you and the band make.

Move on to the Process.





The Process

There are 9 steps here. You must complete each step in order.

- 1. Provide Background Information**
- 2. Gather data and plan your itinerary**
- 3. Create your travel dictionary**
- 4. Create a health guide for bands**
- 5. Calculate your per diem**
- 6. Calculate your travel costs**
- 7. Calculate the profit from the concerts**
- 8. Find the net profit for the tour**
- 9. Summarize your results**

*** When you are asked to gather information click here**



Resources Page .

*** Look at the Collaboration Evaluation before you start so you can see how your group will be evaluated.**

5. Calculate your per diem (allowance for daily expenses which include food and lodging).

- **Use an internet source to find the per diem for each city.**



Resources Page

- **Have the following columns in your spreadsheet:**
 - Name of the city
 - Input the per diem for each city.
 - Input the number of days you are staying. You will be staying 2 days in 4 cities and 3 days in the other 4 cities. Choose carefully.
 - Calculate the total expenses for 10 people for the given number of days.
 - Calculate your total expenses for the eight cities.
- **Make up a schedule for your tour.** You band leaves on February 15. List your 8 cities and the dates you will arrive and depart from each of them.

Spreadsheet Part 1 Evaluation

Move on to the next step

Appendix B

“World Tour” National Educational Technology Standards for Students

“World Tour” National Educational Technology Standards for Students

2. Social, ethical, and human issues

Students practice responsible use of technology systems, information, and software.

Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.

3. Technology productivity tools

Students use technology tools to enhance learning, increase productivity, and promote creativity.

4. Technology communications tools

Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.

5. Technology research tools

Students use technology to locate, evaluate, and collect information from a variety of sources.

Students use technology tools to process data and report results.

Students evaluate and select new information resources and technological innovations based on the appropriateness for specific tasks.

6. Technology problem-solving and decision-making tools

Students use technology resources for solving problems and making informed decisions.

Students employ technology in the development of strategies for solving problems in the real world.

Appendix C

“World Tour” National Council of Teachers of Mathematics Standards

“World Tour” National Council of Teachers of Mathematics Standards

1. Number and Operations

Students can compute fluently and make reasonable estimates.

2. Algebra

Students can understand patterns, relations, and functions.

Students can use mathematical models to represent and understand quantitative relationships.

3. Geometry

Students can use visualization, spatial reasoning, and geometric modeling to solve problems.

4. Measurement

Students can understand measurable attributes of objects and the units, systems, and processes of measurement.

5. Data Analysis and Probability

Students can formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.

6. Problem Solving

Students can build new mathematical knowledge through problem solving

Students can solve problems that arise in mathematics and in other contexts.

8. Communication

Students can organize and consolidate their mathematical thinking through communication.

Students can communicate their mathematical thinking coherently and clearly to peer, teachers, and others.

Appendix D

“World Tour” National Council for the Social Studies Standards

“World Tour” National Council for the Social Studies Standards

I. Culture

Social studies program should include experiences that provide for the study of culture and cultural diversity...

III. People, Places, and Environments

Social studies programs should include experiences that provide for the study of people, places, and environments...

IV. Individual Development and Identity

Social studies programs should include experiences that provide for the study of individual development and identity...

V. Individuals, Groups, and Institutions

Social studies programs should include experiences that provide for the study of interactions among individuals, groups, and institutions...

VI. Power, Authority, and Governance

Social studies programs should include experiences that provide for the study of how people create and change structures of power, authority, and governance...

VII. Production, Distribution, and Consumption

Social studies programs should include experiences that provide for the study of how people organize for the production, distribution, and consumption of goods and services...

VIII. Science, Technology, and Society

Social studies programs should include experiences that provide for the study of relationships among science, technology, and society...

IX. Global Connections

Social studies programs should include experiences that provide for the study of global connections and interdependence.

Appendix E

“World Tour” National Council of Teachers of English Standards

“World Tour” National Council of Teachers of English Standards

1. Students read a wide range of print and nonprint texts to build an understanding of texts, of themselves, and of the cultures of the United States...
3. Students apply a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts.
4. Students adjust their use of spoken, written, and visual language to communicate effectively with a variety of audiences and for different purposes.
5. Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.
6. Students apply knowledge of language structure, language conventions, media techniques, figurative language, and genre to create, critique and discuss print and nonprint texts.
7. Students conduct research on issues and interests by generating ideas and questions, and by posing problems.
8. Students use a variety of technological and informational resources to gather and synthesize information and to create and communicate knowledge.
9. Students develop an understanding of and respect for diversity in language use, patterns, and dialects across cultures, ethnic groups, geographic regions, and social roles.
12. Students use spoken, written, and visual language to accomplish their own purposes.

Appendix F

“World Tour” National Research Council Standards

“World Tour” National Research Council Standards

Content Stand A...students should develop

Abilities necessary to do scientific inquiry

Understandings about scientific inquiry

Content Standard C...students should develop understanding of

Structure and function of living systems

Regulation and behavior

Content Standard E...students should develop

Abilities of technological design

Understandings about science and technology

Content Standard F...students should develop understanding of

Personal health

Populations, resources, and environments

Natural hazards

Risks and benefits

Science and technology in society

Appendix G

“World Tour” Self-Evaluation

World Tour Self-Evaluation

Circle the number that best describes your response to the following statements.

	Strongly Agree	Agree	Unsure	Disagree	Disagree
1. I can create a Microsoft Excel Spreadsheet.	1	2	3	4	5
2. I can format a spreadsheet so it can be easily read.	1	2	3	4	5
3. I can change numerical data so it is displayed in different forms such as currency style and percent.	1	2	3	4	5
4. I can command the computer to use formulas that perform repeated calculations.	1	2	3	4	5
5. I can find per diem data for cities using the Web.	1	2	3	4	5
6. I can locate mileage between cities using the Web.	1	2	3	4	5
7. I can use the Web to find current airfare.	1	2	3	4	5
8. I can use the Web to find city populations.	1	2	3	4	5
9. I enjoy using the Web as a learning tool.	1	2	3	4	5
10. I enjoy using the computer as a learning tool.	1	2	3	4	5

Appendix H
Copyright Permission Letter



TEACHERS COLLEGE · COLUMBIA UNIVERSITY
NEW YORK, NEW YORK

TO: Beverly R. Nielsen
627 Second Street
Columbus Jct., IA 52738

Your Reference Number: n/a

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Sandholtz, Judith H., Ringstaff, Cathy, and Dwyer, David C.
Teaching With Technology: Creating Student-Centered Classrooms
p. 14

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Appendix I
Project Permission Communication

Bev and Steve Nielsen

From: "Fanny Sosenka" <fsosenka@parktutor.pvt.k12.in.us>
To: <benielsen@fisco.com>
Sent: Tuesday, June 26, 2001 1:11 PM
Subject: Re: permission

Feel free to use my project - let me know if you have any questions.

fanny