



2010 U.S. Innovative Education Forum Application

Project Overview

Title: Project Phone Zone

Objective/Description:

Our 2009-10 Project Phone Zone consisted of two phases. A 9th grade, four-student science research team first selected cell phone radiation as their global problem to address in our school community. For more than two months they researched cell phone radiation and possible associated health risks, created online surveys of our junior high students' cell phone use and knowledge, measured and analyzed cell phone radiation in experiments they designed, and created presentations to educate peers and our community about ways to reduce possible risks of using cell phones. Because the project generated intense interest, a separate one-week phase evolved for all 9th grade physical science students who worked in teams of two or three to research, experiment, and present to peers in the classroom additional knowledge related to the mobile devices so relevant to their everyday lives.

The **objectives** of the project were to provide authentic experiences for students to: **1. learn about physics concepts of electromagnetic radiation; 2. connect physical science concepts to environmental, health, mathematics, economic, history, and geography content; 3. use and develop skills in reading, written and oral communication, creative and critical thinking, collaboration, and technology;** and 5. make choices resulting in ownership of project products.

Grade Level:

9th grade

Duration :

The student research team worked December through mid-February during approximately 15 class periods; 5 days leading activities for all junior high students (grades 7-9) during advisory and lunch periods; and many hours before and after school. In the second phase, all 9th graders completed their projects in five consecutive class sessions.

Technology Used:

Microsoft Windows, SkyDrive, Internet Explorer, Outlook Express, Word, Excel, PowerPoint, Publisher, Photo Editor, Media Player, Moviemaker; Photo Story, SMART Board, digital camera, Flip video, iMovie, Quicktime player, SurveyMonkey, EXTECH EMF meter, mobile computer lab and other computers, LCD projectors, wall-mounted monitors, school website, cell phones.

Team Overview

Authors:

Deborah Cornelison, 9th Grade Physical Science Teacher

Julie Wall, Technology Education Teacher, Grades 9-12

Contact Information :

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School:

Byng Junior High School

Location:

Ada, Oklahoma

School Website:

<http://www.byngschools.com>

Additional Information about School

BJHS is a rural public school with student enrollment of 340, grades 7-9. Twenty-two teachers (8 National Board Certified) meet several times during the school year in grade-level and vertical alignment teams. Our student body ethnic makeup is 56% Caucasian, 38% Native American, 4% Black, and 2% Hispanic, with 59% eligible for free/reduced lunch. We have SMART Boards, LCD projectors, and computers in each classroom, computer labs (including one mobile laptop lab), and mobile iPod labs. 2010-11 will be the third year of a federally funded GEAR-UP grant for our school focused on increasing the number of low-income students prepared to enter and succeed in post-secondary education. The targeted cohort will be 9th graders, and our overall school objective for the grant year will be to increase family and community involvement, following the year one and two objective of improving achievement through increased authentic learning activities.

Project Development

Idea Source and Design Steps:

The main project idea came from brainstorming with the students searching for a global problem to address locally using science, math, and technology. Deborah shared a journal article about human exposure from electromagnetic fields (EMF) in our everyday environment. Cell phones were listed as a source, and produced high EMF levels when the students tested several electrical devices. That hooked them on learning more about cell phone radiation.

After watching an online video of a 2009 U.S. Senate hearing on health risks of cell phone radiation, the student team continued research on the Internet, in newspapers, magazines, during phone and in-person interviews, and e-mail. Among many facts, they learned about 4 billion people worldwide use cell phones, and 14 nations have issued advisories about cell phone radiation. The U.S. has not. Many scientists believe long-term cell phone use increases brain cancer risk and other adverse health effects, while others say scientific evidence does not show a link. However, all say more research is needed, and advise reducing the possible risks.

Team Phone Zone's subsequent steps included hypothesizing, experimentation, data analysis, and solution implementation to educate students to minimize exposure to cell phone radiation. Their engagement of peers caused Deborah to design the week-long classroom project for all freshmen, using the Conceptual Change Model (CCM) to connect both project phases. Students used skills learned in computer technology classes. Julie and her advanced computer technology students worked with Deborah and the 9th graders during both project phases. The teaching team has collaborated during interdisciplinary projects for six years.

Required Resources:

Cell phones, which most students have with them all the time.

Low cost, low-frequency EMF meter (Measures EMF of battery current that increases when a phone increases power to transmit at higher radio frequency levels), approximately \$60.

Teacher with basic understanding of electromagnetic radiation and class time to facilitate the project. During the first phase, all BJHS students participated in surveys and the solution.

Teacher with expertise in computer technology and/or advanced students to mentor less experienced students with technology challenges, and class time to provide assistance.

Technology Resources:

Computers with Internet access, digital cameras (still and video), LCD projector and screen or interactive whiteboard, wall-mounted flat screen monitors.

MS Word, Excel, PowerPoint, Publisher, Photo Editor, Media Player, Moviemaker, PhotoStory, SkyDrive, school website, U.S. Army e-Cybermission website and other online sources.

Project Implementation

Implementation Outline:

Long-term research project for student research team:

1. Identify a global problem to address locally. Students chose cell phone radiation.

2. Literary research and expert contacts; summarize findings. Identify credible sources.
3. Formulate one or more hypotheses to test. Team Phone Zone's hypotheses concerned the possible risks to BJHS students from cell phone use; the variation in EMF emitted by cell phones due to phone type, geographical location, and usage habits; and the effects their solution may have on others taking action to reduce exposure to cell phone radiation.
4. Plan and perform experiments. This project included an online survey, measuring EMF near different phones in weak and low signal areas on campus in diverse exposure situations (such as making a call, texting, etc.), and measuring cell phone radiation in rural and city areas.
5. Data analysis and conclusion. Create tables and graphs, and explain what they indicate.
6. Plan and implement a solution. This project included a video with an original song, PowerPoint presentation, an animated slide show, brochure, photo story, and presentation board all used to educate students in person during presentations and via our school website.

One-week project for all students in groups of 2 or 3:

1. Conduct research on the topic and summarize findings not learned from research team.
2. Plan a short experiment using own cell phone(s) and record data.
3. Chose mode of presentation: Short video production, Excel table and/or graph to show and explain, or PowerPoint presentation.
4. Save project to SkyDrive before presenting to class.

Implementation Tips :

Research-based, interdisciplinary projects can be used with students to help them solve problems they observe in their communities everywhere. Teachers can help students find an issue that incites their curiosity, purpose, and excitement and understand the commitment required to complete a long-term project. Students may be particularly skilled in one area, but it is important they experience other aspects of the project. They grow by stepping out of their comfort zones. Ask for help from people in your community and those you may contact via e-mail or telephone, and find ways to involve all students and teachers in the learning process. After participating in the research team's activities, all other students were excited to learn more about cell phone radiation and share what they discovered during the class activity.

Interesting Mistakes :

EMF readings from some phones in a few situations exceeded the capacity of our meter, so students recorded the highest possible reading, noting it was actually greater. Also, cell phone radiation pulses, so the meter reading changes constantly. We recorded the highest reading in 10 seconds. Also, during the week-long project some students were told if they chose to make a PowerPoint presentation the minimum was three slides. Some made many more, which will result in a maximum number of slides included in instructions for future projects.

Project Alignment

Standards

National Science Education Standards (NSES), Content Standards, Grades 9-12:

Physical Science: Electromagnetic waves result when a charged object is accelerated or decelerated. Electromagnetic waves include radio waves (longest wavelength), microwaves, infrared radiation, visible light, ultraviolet radiation, x-rays, gamma rays. The energy of electromagnetic waves is carried in packets whose magnitude is inversely proportional to wavelength.

Science as Inquiry: All students should develop abilities necessary to do scientific inquiry and develop understandings about scientific inquiry.

Personal and Community Health: Hazards and the potential for accidents exist. Regardless of the environment, the possibility of injury, illness, disability, or death may be present. Humans have a variety of mechanisms—sensory, motor, emotional, social, and technological—that can reduce and modify hazards.

21st century Skill Development

Project Phone Zone integrates core subjects of the 21st Century Skills as the student research team focused on using of mathematics, science, and technology to solve the global problem of cell phone radiation as a possible human health risk at the local level. The week-long phase of the project completed by all 9th grade students addressed the same skills, while reinforcing and extending learning, for all students. Application of other core subjects also occurred in this interdisciplinary project as students researched, implemented, wrote, and presented their project. They learned cell phone radiation varies with geographic location (generally higher in rural than urban areas), and that the issue is intertwined with global economics and governmental involvement. They were interested to read about the relatively short history of cell phones, particularly amused at phone size differences of then and now. Science and mathematics were used in designing experiments and analyzing data. Art skills were used in designing a logo, creating a sign and posters, and preparing presentations. Music was involved when they wrote an original song with rhyming performances by several students on a video created by the student team. They also selected background music for a photo story. Every aspect of the project involved reading, writing and speaking to clearly communicate.

Project Phone Zone also enhances 21st Century themes for all BJHS students. Students gained awareness that local problems are often global issues. Cell phone radiation is a good example. They learned economic impacts of health hazards. Our project improves civic literacy in our school by modeling involvement for change. Team Phone Zone contacted a Maine legislator who introduced the first bill in the nation to require cell phone labeling about radiation, and forwarded her document to our state senator for review. Project Phone Zone broadens learning with meaning.

21st Century Outcomes

Learning and Innovation

Project Phone Zone inspires student growth in Learning and Innovation Skills. At each step, the research team collaboratively used critical thinking and problem solving to plan and do good science research based upon what they learned during literary searches. Creativity, innovation, and communication are required to synthesize an effective solution based on what their experiments reveal. They must clearly communicate with team members, our teaching team, and others. 'Team Phone Zone innovatively used their empirical data to conclude that our junior high students may be at long-term risk from cell phone radiation. Then, they created and conducted activities to educate our student body and change behaviors. During the second phase, all 9th graders built on the team's solution to extend and share learning in class.

Information, Media and Technology

Project Phone Zone helps students gain improved Information, Media, and Technology Skills. During student projects, they access much information via the Internet. They learn to search, select, and cite appropriate, credible sources relevant to their topics. When they find conflicting views, they learn to analyze the basis for each. For example, some sources say cell phone radiation is definitely a health risk, while others say no evidence yet establishes that link. Our students develop their ICT literacy skills as they learn to use computers and associated technology to create their online mission folders which contain written responses, attached files, and links to websites containing other parts of their projects. This was a great project using technology to investigate perhaps the common personal technology in the world—cell phones!

Life and Career

Project Phone Zone gives the research team real experience in practicing Life and Career Skills. Their leadership and people skills broaden as they interact with peers, faculty, and community members. They learn to be ethical, accountable, adaptable, and socially responsible as they work together to improve a problem that affects members of our community, such as radiation from everyday use of cell phones. They approach activities confidently and articulately, well-prepared by research. Their teamwork also enhances skills as each has certain jobs to do during the project, requiring each team member to be self-directed yet personally responsible to the others. Student teams also provide opportunities for peers to develop ethics and social responsibility by participating in the community improvement project. Team Phone Zone's activities served as a model for others to consider in developing and presenting class projects.

Project Results

Assessment Strategies

The student team's responses to the e-Cybermission prompts are invaluable in assessing student learning during Project Phone Zone. At every step, their writings reveal the extent of their integration of core content learning in mathematics, science, English, and reading, along with growth in 21st century themes, and learning and innovation skills. Their tables, graphs, experiments, and presentations also allow us to assess their technology skills. Ongoing formative assessment and revision occurs. The student team created and administered pre and post project online surveys to all junior high students, an objective measure of students learning from students. The e-Cybermission rubric is used as summative assessment for the research team's mission folder.

Our observations of all students and discussions are formative strategies we use to evaluate their life skills growth. Intense student interest is a positive affective indicator. A checklist and rubric were developed for the week-long second phase of Project Phone Zone to assess content, process, communication, and technology skills.

Student Products

A project mission folder submitted online to the e-Cybermission program with attached files is the ultimate product of the student research team. Our school website (www.byngschools.com) contains a Phone Zone link on the right side of the homepage to some of the products produced by the student research team: online surveys, a video, a PowerPoint presentation, another animated slide presentation of safe phone usage tips, and a photo story. Not shown there are a tri-fold brochure, several data tables, and written sections.

The products of the week-long phase involving all students were uploaded to MS SkyDrive. Most groups created a PowerPoint presentation, although a few made Excel tables and/or graphs to present and explain. We were surprised that no groups chose to use the Flip video camera to make a short movie. All groups also submitted research and experiment summaries.

Significant Learning

The online competition is the initial hook; however, we believe the most significant learning for all Phone Zone Project's students is that they actively experience and attain the necessary student outcomes for the 21st century. They gain knowledge, develop skills, and acquire abilities that benefit them now and in the future. Working as and with the research team, they make a meaningful difference for themselves and others. The combined phases of this project exemplify the stages of the Conceptual Change Model –from becoming aware of preconceptions, through testing and discussion, by making connections to their daily lives, and going beyond what the research team presented regarding cell phone radiation.

Student Achievement

Post-survey results of BJHS students showed they learned cell phone radiation facts during the research team's activities, changed opinions and behaviors, and will help spread the educational message. 86% of students correctly identified radiation emitted by cell phones, compared with only 2.3% in the pre-survey. After presentations, 57% to 94% of students surveyed correctly answered when asked about certain situations in which cell phones emit more radiation, with an overall average of 77% correct for 7th-9th graders. For the same questions, 9th graders had a higher post-survey average of 83.4%. Before the project began, more than 57% of all BJHS students surveyed did not think cell phones can be a health risk, which decreased to less than 22% (13.5% for 9th graders). More than 70% of all students (80% of freshmen) reported they will take steps to reduce cell phone radiation and also tell other people about the issue. The research team believes that these data strongly support their hypothesis that their solution will result in students using cell phones cautiously to reduce personal exposure to radiation and the possible associated health risks. Team Phone Zone received the e-Cybermission Southwest/Pacific Region 9th grade award for outstanding benefit to the community, \$2000 in U.S. Savings Bonds for each of the four students.

In addition, each small group in five 9th grade physical science classes satisfactorily completed their project, with many outstanding products.

Additional Information :

Please go to www.byngschools.com to see Project Phone zone student products. Scroll down the right side of the page and click below the Phone Zone logo (as shown below).



You may also place your cursor above the logo on this page and Ctrl +click to go directly to the Phone Zone information.

There you will see pre/post online surveys, a video of students performing the original song and explaining the issue (may take a few minutes to download), a PowerPoint presentation with research and experimental data , an animated slideshow of safe phone usage tips that played on monitors in our student center, and a Photo Story documenting project activities. All of these student-generated products were used to reinforce the theme of the research team's solution, "Proceed with Caution in the Phone Zone".