Why Your Students Should Study Technology

A presentation on:

- Engineering Education
- Design and Technology Education

...in the Elementary School
Why should your students study technology?

- Improved achievement
- Improved motivation
- Improved technological literacy
- Improved test scores

No need to add another program to a crowded curriculum. Integrate it.
Why should your students study technology?

✓ Improved achievement

Technology Education is fundamentally hands-on, it can improve achievement.

Korwin (1986) found that students studying technology through a hands-on approach achieved significantly better than students who were taught through traditional methods.

Saunders and Shepherdson (1984) found significantly better achievement in students who learned science through a hands-on method compared to students who learned science through lecture.

von Eschenbach and Ragsdale (1989) found significantly better achievement in second graders who were taught through hands-on instruction compared to students who were traditionally taught.
Why should your students study technology?

✓ Improved motivation

Because Technology Education is fundamentally hands-on and a natural integrator of the curriculum, it can improve motivation.

Brusic (1991) found that fifth graders who were taught through hands-on curriculum integration were significantly more motivated to learn than were students who were taught through traditional methods.

Childress (1994) found that students who were taught through curriculum integration did, in fact, attempt to apply science content in order to solve problems in technology.
Why should your students study technology?

- Improved technological literacy

Because Technology Education is the school subject that teaches students about the human made world it helps students become technologically literate.

- In this context, technological literacy does not refer to minimal achievement. The term literacy implies that students will be able to function effectively in a technological society.

- Students learn about the breadth of technology including computers and how to apply them, but it is more than just computers.

- They also learn about engineering and how to apply mathematics and science to solve real-world problems.
Why should your students study technology?

- Improved technological literacy

- Even adults think of technology as a “black box.” They don’t understand it.

- The gap is widening between information and true understanding.

- “It provides valuable opportunities for children to tackle practical problems which transcend arbitrary boundaries of specialized subject areas, while inviting rich use of imagination.” (Dunn & Larson, 1989, p. 13)
Why should your students study technology?

- Improved test scores
  - Students achieve better because of improved motivation and retention.
  - Students will have a reason to learn math, science, literature, social studies, writing, and reading comprehension.
  - State standards of learning for these subjects become the focus of technology instruction integrated with academics at the elementary level.
  - When students participate in hands-on learning, the opportunity appeals to a variety of learning styles, such as those of kinesthetic and visual learners.
What is Technology?

“Technology involves the application of knowledge, resources, materials, tools, and information in designing, producing, and using products, structures (physical and social), and systems to extend human capability to control and modify natural and human-made environments.”

What is it again?
Technology is...

...all the things people make and do to their natural environment in order to get the things they want and need.
What is Technology Education?

Technology education is a planned program for students (from K-adult) that “…focuses on the application of knowledge, creativity, and other resources to solve practical problems and thereby extend human potential.”

How is Technology Education related to Engineering and Design?

Engineering Education and Design Technology, like Technology Education, lead students to apply principles of design, mathematics, and science in order to solve real problems. Like technology education, both can be delivered in a hands-on approach at the elementary school.
How is Technology Education related to Engineering and Design?

Technology Education, Engineering Education, and Design Technology are natural curriculum integrators, thereby enabling students to learn reading, writing, speaking, mathematics, science, social studies, etc., in the same lesson through motivating hands-on, problem-centered contexts.
How is Technology Different than Science?

This is one of the most common questions that teachers ask.
1. The emphasis is different.

**TECHNOLOGY**
- Focuses on practice
- Concerned with “how to” or “what makes”
- Deals with doing and making
- Is immediately practical and useful

**SCIENCE**
- Focuses on theory
- Concerned with “what is” or “why”
- Deals with knowing and understanding
- Is theoretical and conceptual
2. The body of knowledge is different.

In TECHNOLOGY, we deal with human-made phenomena.

In SCIENCE, we deal with natural phenomena.
3. They are related and supportive.

People may use science for technological purposes and they may use technology for scientific purposes.
4. They have different purposes.

- The purpose of technology is to satisfy human needs and desires by designing and creating solutions to problems.
- The purpose of science is explain nature so that humans can understand their natural environment.
Now, let’s take a closer look at technology education at the elementary level.
So, how do you teach young children about technology?

You teach it by doing it.

Children become designers, engineers, inventors, and technologists in your classroom.

Two examples from the classroom:
- Safety Systems
- Black Inventors
Teaching Safety Systems

Use this downloadable book to teach the lesson on safety.

Safety Systems

by

Vincent Childress

Return
"Systems have parts or components that work together to accomplish a goal" (International Technology Education Association, 2000, p. 34).

What all first graders should know...
Safety as Content

What all first graders should know...

Safety at home:
- know when to dial 911
- don’t let strangers in
- have an escape route
- wear a helmet
- never get in a dog’s face

Safety in public:
- school bus
- don’t talk to strangers
- stay calm in a fire drill
Reading, Writing, Speaking

What all first graders should know...

- Read aloud independently with fluency and comprehension...
- Select and use new vocabulary...in both speech and writing contexts.
Curriculum Integration

Approach

• Safety and Systems provide a context for teaching reading, writing, and speaking.

• Use hands-on activity as a motivator.
System

A system has parts.

The parts work together.
Safety

Safety is being careful.

Safety is not getting hurt.

Not careful
Safety Systems Reader
Reading
Safety Systems Journal

Comprehension

Journal 1

A _______ ______ has parts.

The parts work _______ _______ _______ _______

Parts

Journal 2

_______ ______ is not getting hurt.

Safety is being _______ _______ _______ _______.
Safety Systems Design

Application of Technology

Students engineer safer bedrooms by inventing technology systems.
Safety Systems Diorama
Application of Technology
Journal 3

The parts of my bedroom safety system are:

________________________________________

________________________________________

________________________________________

________________________________________

________________________________________
Assessment

Evidence of Achievement

- Multiple Evidence on Systems and Safety
- Reading Comprehension
- Writing
- Speaking
Black Inventors Project

What do students need to know and be able to do?

• Students will understand that inventions and innovations are related to the needs of society (Standard 6, Benchmark B).
• Students will show how inventions and innovations are creative ways to make ideas become reality (Standard 10, Benchmark D).
• Students will understand what is read while researching black inventions.
• Students will write in complete sentences that are grammatically correct.
• Students will demonstrate their understanding of symmetry.
Black Inventors Project

Integration of Other Curriculum Competencies

• How to integrate a benchmark with other elementary school curriculum competencies

Students had to research black inventors and create innovations on a black inventor’s invention.

Accomplishing the innovation assignment required applications of:
• Reading Comprehension
• Writing
• Mathematics
Assessment

How do you know that a student achieved a benchmark?

• Multiple evidence

Innovation Model

Inventors Log

Rubric
Reading Comprehension

How do you know that a student comprehends what is read during the black inventor research?

• How do you know what Web sites they went to?
• How do you know what the Web site said?
• What if you cannot find a good Web site or book suited to the third grade reading level?

Develop your own Web site, or…
Black Inventors Web Site

A starting place for research

http://www.ncat.edu/~childres/blackinventors.html
Student Innovations

Inventor Log

Writing and Designing
Supplies

Modeling Supplies

• Poster board
• Paper mailing tube or other tube shapes
• Assorted dowels
• Popsicle sticks
• Play dough
• Paper modeling dough
• Modeling clay
• Dixie cups (small bathroom size)
• Paper cups (assorted)
• Cellophane wrapping (colors)
• Glue
• Wooden wheels or other assorted shapes
• Aluminum foil
• Brads, tacks, and staples for paper
• Binder clips
• Post-It notes

• Shoe boxes
• Rubber bands
• String
• Wire mesh/screen (assorted)
• Poster paints (assorted colors)
• Tape (assorted)
• Doll clothes (assorted)
• Hot glue sticks (teacher use only)
Tools

Tools that only the teacher may use
- Portable electric drill
- Twist drills (bits)
- Hot glue gun
- Hack saw
- Exacto knife

Tools that students may use
- Safety scissors
- Paper hole punch
- Paint brushes
- Tape dispenser
- Paper stapler
Student Innovations

A better mop

A better stoplight

A better dough kneader

A better lamp
You Can Do It

If these teachers could integrate technology into the curriculum, you can too.

Get help from your administrator, experienced teachers, and:

- Innovation Station listserv
- Technology Education for Children Council
- International Technology Education Association
- Children’s Engineering Council
- Institute of Electrical and Electronics Engineers
- American Association for Engineering Education

See the extensive list of additional web-based resources on the next slide.
Resources to help teach technology, engineering, and design at the elementary level.

Technology and Children
http://www.iteawww.org/F2.html

ITEA’s Member Freebees and the TTTe
http://www.iteawww.org/mbrsonly/

ITEA materials that help with standards based instruction in the Publication Catalog
http://www.iteawww.org/F.html

The Technology Education for Children Council (an affiliate of the ITEA)
http://www.ncat.edu/%7Echildres/tecchome.html

ITEA’s Bright Ideas
http://www.iteawww.org/brightideasform.html

HITs and KITs
https://www.iteawww.org/HitsKitsOnLineForm.html

ICON
http://icontechlit.enc.org/

The Children’s Engineering Laboratory
http://faculty.cmsu.edu/teched/children's_lab.htm

Kids’ Design Network
http://www.dupagechildrensmuseum.org/servlet/kdn.Challenges

Children’s Engineering Educators
http://www.childrensengineering.com/
Resources to help teach technology, engineering, and design at the elementary level.

Innovation Station listserv
http://www.iteaconnect.org/LearningCommunities/InnovationStation/IS.html

Discover Engineering through Reading

City Technology
http://citytechnology.ccny.cuny.edu/

Technology Education for the Elementary Grades

Arts and Creativity for the Elementary Child
http://www.hehd.clemson.edu/THRD/310/310.htm

Article on Project Based Learning featuring Terry Thode
http://www.edutopia.org/php/article.php?id=Art_290&key=037

Cathy Ney’s Christiansburg Elementary School
http://www.mcps.org/ces/index.html

American Society for Engineering Education
http://www.engineeringk12.org/educators/
References


Korwin, A. R. (1986). Determining effects on cognitive and affective development of eighth grade students with a hands-on technology-based activity. Master’s thesis, Bowling Green State University, Bowling Green, OH.


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The Innovation Station listserv is a free teaching and learning virtual community on elementary school technology education, engineering education, and design and technology provided by the International Technology Education Association.

To join the Innovation Station listserv, visit: http://www.iteaconnect.org/LearningCommunities/InnovationStation/IS.html

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