



# Why Your Students Should Study Technology

A presentation on:

- ✓Engineering Education
- ✓Design and Technology Education  
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.”

- From Technology Education in the Classroom (1995) by Senta A. Raizen, Peter Sellwood, Ronald A. Todd, and Margaret Vickers, p. 1.



**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.”

- From Mission 21 Teacher’s Resource Book, Level III (1992) by Sharon A. Brusic and James L. Barnes, p. 16.



# 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 to 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

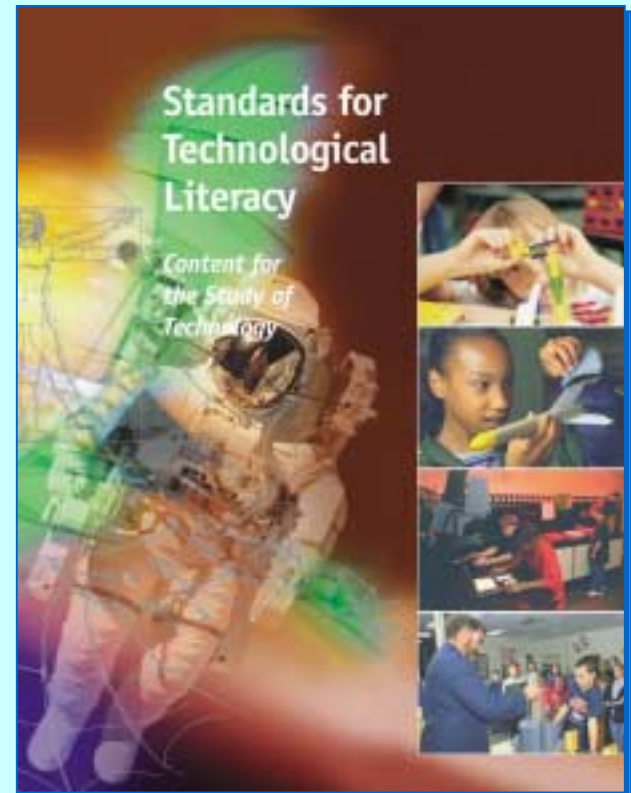
Vincent Childress



# Systems as Content

What all first graders should know...

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



# 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 Overhead

## Word Attack



### System

A system has parts.



### Parts

The parts work together.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



### System

# Safety Overhead

## Word Attack



### Safety

Safety is being careful.



Safety

Safety is not getting hurt.



Not careful

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# Safety Systems Reader

## Reading



# Safety Systems Journal

## Comprehension



### Journal 1

A \_\_\_\_\_ has parts.



The parts work \_\_\_\_\_.



### Journal 2

\_\_\_\_\_ is not getting hurt.

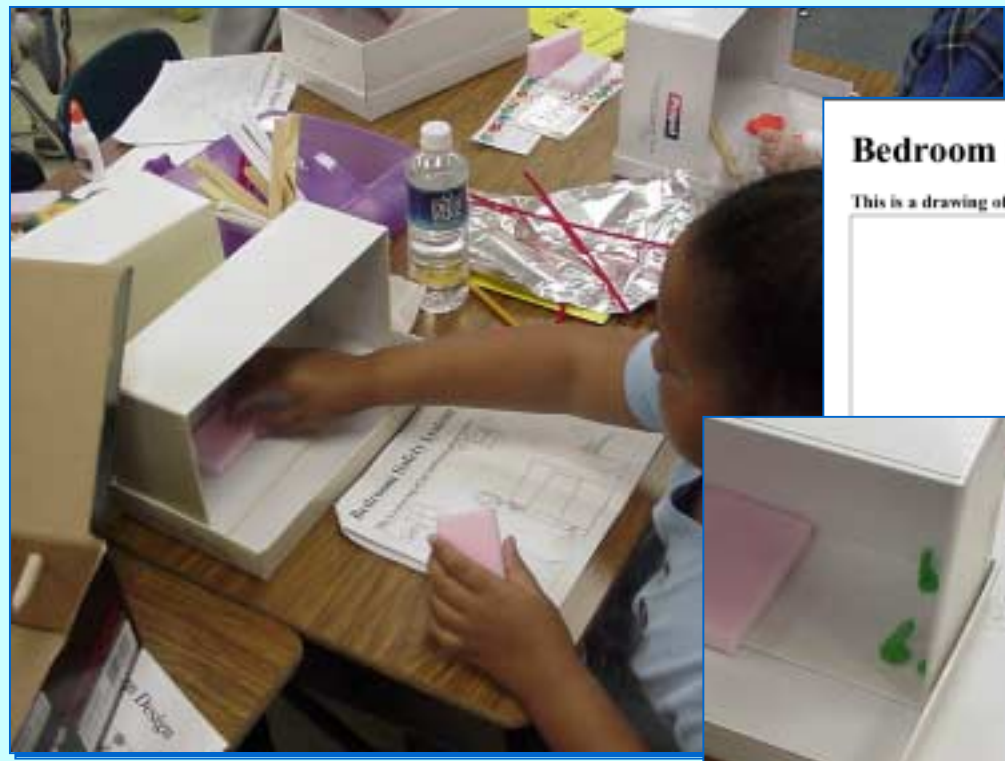


Safety is being \_\_\_\_\_.



# Safety Systems Design

## Application of Technology



**Bedroom Safety System Design**

This is a drawing of my bedroom safety system.



**Students engineer safer bedrooms by inventing technology systems.**

# Safety Systems Diorama

## Application of Technology



# Safety Systems Journal

## Writing



### Journal 3

The parts of my bedroom safety system are:

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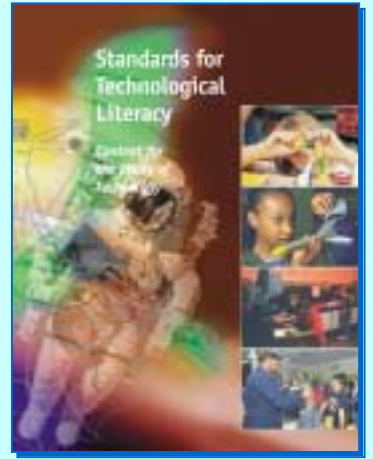
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# Assessment

## Evidence of Achievement



- Multiple Evidence on Systems and Safety
- Reading Comprehension
- Writing
- Speaking



**Journal 1**  
A \_\_\_\_\_ has parts.  
The parts work \_\_\_\_\_  
Parts

**Journal 2**  
\_\_\_\_\_ is not getting here.  
Safety is being \_\_\_\_\_

**Bedroom Safety System Design**  
This is a drawing of my bedroom safety system.

**Journal 3**  
The parts of my bedroom safety system are  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

# Download Resources

<http://www.ncat.edu/~childres/teccresrs.html>



# 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.

[Return](#)



# 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



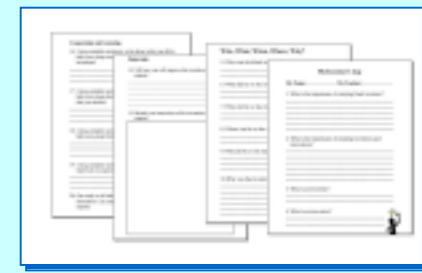
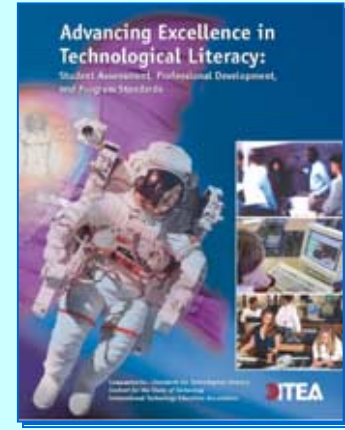


# Assessment

## How do you know that a student achieved a benchmark?

- Multiple evidence

### Innovation Model



Inventors Log

Assessment	Professional Development	Program Standards	Program Standards
<p><b>Assessment</b></p> <p>Assessing student learning and achievement through multiple evidence sources.</p>	<p><b>Professional Development</b></p> <p>Providing opportunities for teachers to learn and grow through various activities.</p>	<p><b>Program Standards</b></p> <p>Establishing clear expectations for student learning and achievement.</p>	<p><b>Program Standards</b></p> <p>Ensuring that the program meets the needs of all students and the community.</p>
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Rubric



# Reading Comprehension

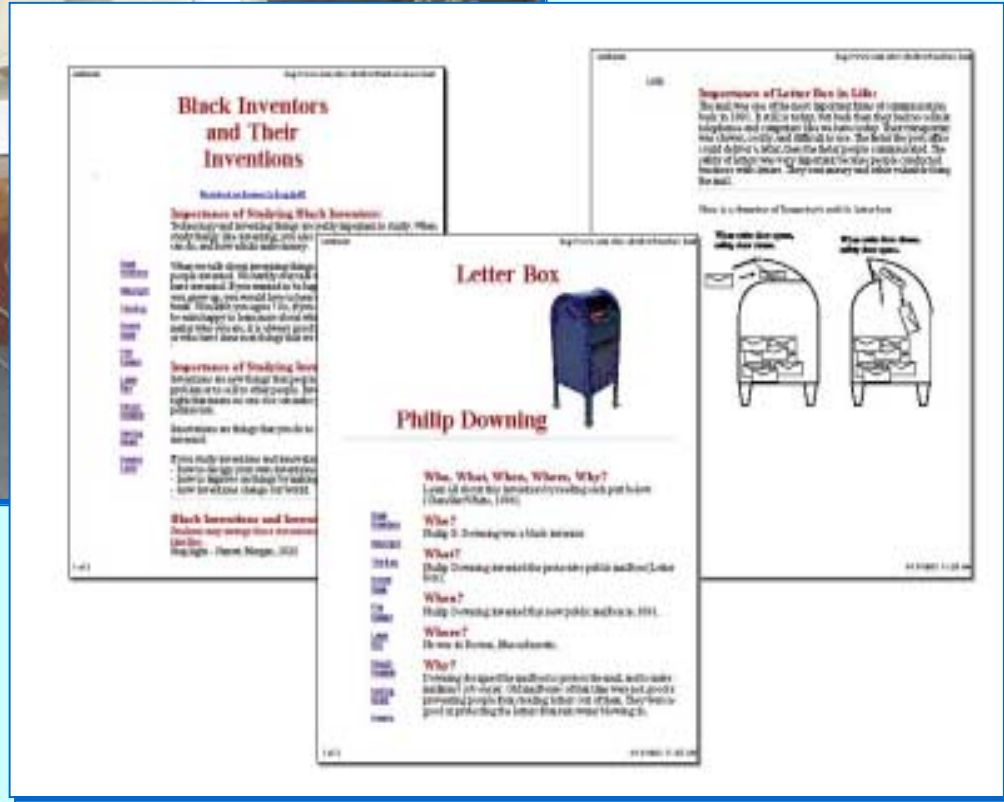
**How do you know that a student comprehends what is read during the black inventor research?**

- 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

**Black Inventors and Their Inventions**

**Importance of Studying Black Inventors:**  
 Studying and learning things are really important to study. When you study things, you are learning and you are growing. You are also learning about the world and how things work.

**Importance of Studying Science:**  
 Science is an important thing to study. It helps you understand how things work and how to solve problems. It is a way to learn about the world and how to make it a better place.

**Black Inventors and Science:**  
 Black inventors have made many important contributions to science and technology. They have helped us understand the world and how to solve problems. Some of the things they have invented are the telephone, the airplane, and the computer.

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**Letter Box**

**Philip Downing**

**Who, What, When, Where, Why?**  
 Letter boxes are used to hold mail. They were invented by Philip Downing in 1815.

**Who?**  
 Philip Downing, a black inventor.

**What?**  
 Philip Downing invented the first public letter box in 1815.

**When?**  
 Philip Downing invented the first public letter box in 1815.

**Where?**  
 He was in Boston, Massachusetts.

**Why?**  
 Downing invented the first public letter box because he was tired of carrying mail to and from his house. He wanted a way to get mail to and from his house without having to carry it himself.

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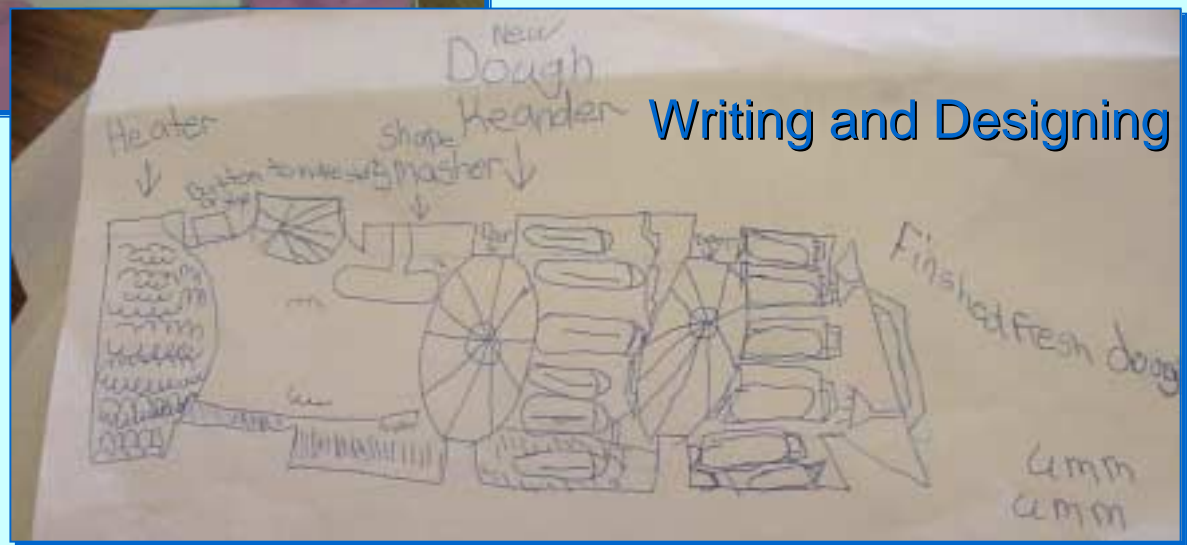
**Importance of Letter Box in Life:**  
 The mail box is one of the most important things in our lives. It helps us stay connected to our friends and family. It is a way to get news and information. Without a mail box, we would not be able to communicate with each other. It is a very important part of our lives.

There is a number of inventors with their own box.

Who can use their own box?  
 Who can use their own box?

# 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](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

<http://www.eweek.org/2002/Library/reading.shtml>

City Technology

<http://citytechnology.ccnycuny.edu/>

Technology Education for the Elementary Grades

<http://www.cs.bsu.edu/homepages/kirkwood/index.html>

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](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/>

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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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