

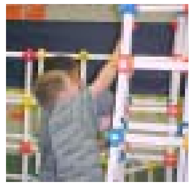


The Children's Engineering Journal

A Journal of the Virginia Council for Elementary School Technology Education

Why Teach Children's Engineering?

By Patricia Fazzi, VCESTE President

Why should an elementary teacher teach children's engineering? Two words: It's fun! A child will learn faster when he or she is having fun. Brain research has proven this fact. Watch children master difficult video games or learn all the words to songs. How many times have you seen these behaviors in children who have difficulty reading?

As a second grade teacher, I have always looked for activity-based lessons that keep children learning while I teach in small skill groups. It is not easy to keep twenty children occupied while teaching a reading or math lesson to a small group, especially when some children are not independent readers. Sure, I can hand out hundreds of math problems or work sheets. Or I could have them copy charts that I have used year after year. But that does not help the child who has to practice those math problems and does not understand hot to do them How can we wonder why children burn out in school if that is what we are doing? We are competing with some pretty sophisticated and entertaining playthings that these children have had since they were born.

Children's engineering experiences have real meaning. The children feel as though they are part of the real world of work, where a worker can be fired from a construction crew and fined if he or she does not leave the work area safe for others. The worker can also be fined for violations of noise regulations in the construction the construction area. Doesn't that sound authentic? Through engineering projects children feel respected as they solve problems, work together, and become independent thinkers. These projects are essential in all grades to help a child make the connections to become a confident learner. And don't forget that the projects are hard work and fun!

This article is dedicated with my sincerest apologies to all the children I worked with before I knew about children's engineering.

Curriculum Guide to be Field-tested

By Kathleen F. Stansbury, Children's Engineering Journal Editor

The curriculum development team of the Virginia Council of Elementary School Technology Education in conjunction with several local school divisions and the Virginia Department of Education, Technology Education Service, are developing a curriculum resource guide for the study of design, technology, and engineering.

The guide will highlight technology activities in grades K-5. Developed by a team of teachers who are leaders in the field of elementary school technology education, the guide is designed to aid the teacher in all aspects of a lesson. Details of lesson criteria, lesson plan, and assessment tools for each activity are included.

A preview of the guide will be showcased at the Children's Engineering Convention. The guide will be field-tested during the spring. The final publication will be available for statewide distribution in June 2003.

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Virginia Council for Elementary School Technology Education

President:
Patricia Fazzi
Cooper Elementary School
Hampton City Public Schools

Curriculum Development:
Linda Harpine
Marcia Hickey
Ginger Whiting
Retired Active Curriculum Writers

Convention Planning:
Russell Bennett
Richmond City Public Schools

Bill Cawley,
Tucker-Capps Elementary School
Hampton City Public Schools

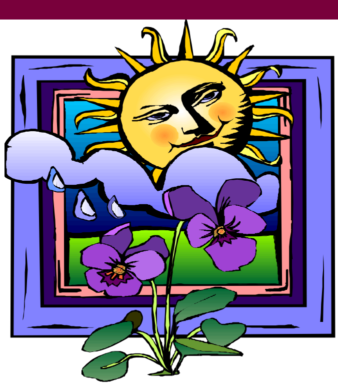
Inservice Workshops:
Linda Harpine

Journal Editor:
Kathleen F. Stansbury
Virginia TSA

Technology Education Specialist:
George R. Willcox
Virginia Department of Education

www.vtea.org/ESTE

Special thanks to Cooper Elementary School, Hampton, VA for pictures of students creating an Indian longhouse which was used in the banner.



Growing Children's Engineering In Your Garden: A Principal's Perspective

By William P. Cawley, Principal, Tucker-Capps Elementary School. Hampton, Virginia

As the instructional leader for the building, the principal must be instrumental in the support of Children's Engineering for it to succeed. But, like any other worthwhile innovation, Children's Engineering must be grown — to use a current business term — in the school. If mandated, it probably will not succeed. So in order to grow Children's Engineering in your building—if I may continue this plant analogy— I recommend the following elements:

• Soil, or a healthy, sound, and nurturing work and learning environment. You need to survey your building. Have you created a trusting climate where adults and children are allowed to make mistakes and learn from them? Do adults treat each other as well as their students with care and respect? This type of environment is essential to institutionalize the Children's Engineering problem-solving loop and risk-taking.

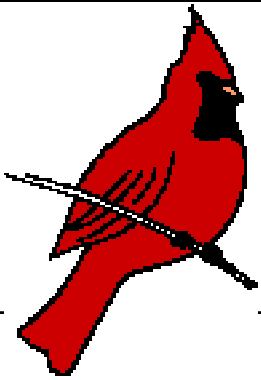
• Seeds, or flexible teachers who are willing to learn new skills and take challenges. You need teachers who are willing to take themselves off of the classroom stage and place themselves in the classroom as facilitators of open-ended, problem-solving adventures. Of course, the more committed teachers you have, the faster your program will grow. But, if you can identify one or two, you can begin to build a critical mass. Don't worry how big your beginning is—just begin.

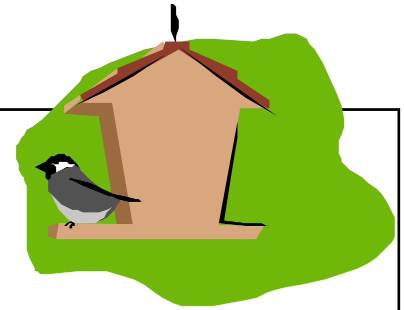
• Water, or the resources necessary to make Children's Engineering succeed. These resources may include money necessary to attend conferences and take classes. But, just as important is time. Do you support common planning time for your teachers? Time is needed for planning, strategizing, visiting, and organizing. In elementary school, this element may be even tougher to provide than money. But, it is critical and it can be done. You must be creative.

• Sunlight, or support from a higher source. This one is tricky. Depending on where you work, your school division may have a hands-off policy toward individual school innovations. However, with today's level of accountability, most principals will need to convince "higher-ups" that teachers can teach standards while practicing Children's Engineering. You must convince them that Children's Engineering is not a change in the school's curriculum, rather it is a strategy that integrates curriculum areas through technology. The difference is huge!

If you can put all of these elements in place, you still must worry about outside forces such as wind, hail, or hungry animals ravishing your garden. I won't try to place names here, but there are many people—inside and outside your building who are adverse to change. You can help these people understand the rationale for Children's Engineering. It may help them to know that Children's Engineering does not "add something else to their plate." It should allow them to teach more efficiently and effectively. Do not underestimate these forces. It is sometimes amazing how much influence (positive or negative) one or two people can have on a faculty.

One last caveat — there is an old adage: "Go slow to go fast". Simply put, it means take your time, be patient, and do it right. It is better to move slowly and grow your garden in stages, than to go too fast, making mistakes requiring you to go back to "replant" what went wrong. In the long run, you will see faster change if you move strategically and reflectively. In the words of Abraham Lincoln, "I may walk slowly, but I never walk backwards."




Earth-Friendly Birdhouses

You have been reading and talking about animals and their habitats in class. You know that they have special needs. You have also been talking about resources and know that conserving resources by recycling, reusing, and reducing waste is important. Now you will have a chance to put what you know to use.

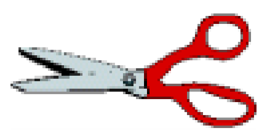
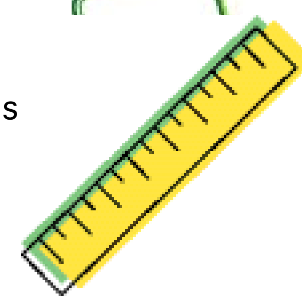
Design Challenge:

Design and build a birdhouse that will attract a bird in your neighborhood. The bird you plan the house for should be about the size of a tennis ball.

Criteria:

Your birdhouse must

- ◻ have a door that is big enough for a golf ball to fit through.
- ◻ have a perch inside.
- ◻ have a perch outside the door.
- ◻ be able to hang from a tree or other support for 5 minutes with a golf ball inside.
- ◻ keep birds safe from rain and wind.
- ◻ be squirrel and cat proof.

Materials: What can you use?

- string
- craft sticks
- straws
- meat trays
- flat pieces of cardboard
- Styrofoam
- pipe cleaners
- jumbo brads
- jumbo paperclips
- flat milk carton sides
- poster board
- 24 inches masking tape
- hole punch
- glue
- general classroom art supplies that your teacher might provide

~ Not all supplies need to be used. ~

SOL Target Standards:	Science: 1.5, 1.7, 1.8, 2.4, 2.5, 2.7	English: K.2, K.3	
Supporting SOL Standards:	Science: K.6, K.10	English: 1.1, 1.2, 1.3, 2.2, 2.3	Math: K.12 , 1.2, 2.12

Go to <www.childrensengineering.com> for ideas for implementation.

Technology Buddies:

Kindergarten and Middle School Students Working Cooperatively

Mrs. Susan Barnes, MA, Instructor, Dept. of Early Childhood Education, James Madison University

While cooperative learning, collaborative learning, and partnerships in education are familiar terms and concepts to educators, "technology buddies" is not so common. Buddy programs are not new to schools. In fact, book buddy programs, wherein older students read to younger ones, have been around for a long time. The "technology buddy" project was developed to provide a setting which would allow the young technology students to participate more actively and interact in the learning process, thus providing a more robust learning experience for them.

The Students and the School involved in the project

Harrisonburg is a small city nestled in the Shenandoah Valley of Virginia with a population of about 43,000 people. Situated in Rockingham County, one of the top twenty agricultural counties in the United States, it has deep agrarian roots. Today's Rockingham County economy is supported by industry, education, and tourism. Virginia's technology corridor is centered just north of Harrisonburg and the need for technologically literate personnel is urgent. Spotswood Elementary School is one of four elementary schools in the city, with Thomas Harrison Middle School being the only school at the middle level. The student population is diverse, with English being a second language for over one third of the students. Over twenty-four different languages are spoken in the city school system of about 4,500 students.

"Technology Buddy" Project Design

The technology buddies participating in this program were one class of fifteen kindergarten children ages five and six and eight middle school students ages fourteen and fifteen. The middle school students were all members of the Technology Student Association (TSA), a co-curricular program in Virginia technology education classes. Members have experience with computers and electronic technologies as well as with design technology, tools, and materials. Eight creative, enthusiastic TSA members were willing to participate in the technology buddies program which met after school hours. The group of buddies consisted of boy and girls, one male teacher and one female teacher. Small groups were designated by the teachers and usually included one middle school student and a pair of kindergartners. The buddies met one time each week for six weeks for about forty-five minutes each session. Activities took place in the classroom, in the cafeteria, and outside, depending on the space requirements of the lesson. Before each session, the lead teacher would prepare a project box for each small group, which held essential supplies for the particular project and a design brief giving the details of the project.

The first technology buddies meeting took place about half-way through the school year. During the first part of the year, the kindergarten students had been introduced to and began practicing many new skills. For most of these young children, kindergarten was their first formal school experience and they needed guidance in basic social skills, especially how to work in a group. The kindergarten teacher incorporated many strategies to get students accustomed to cooperative interactions, including brainstorming and learning teams. These methods taught the young children that their classmates' ideas as well as their own were important and deserved to be heard. Students gained experience being responsible for different roles or assignments, such as distributing supplies or collecting and recording data generated during class experiments. These lessons and experiences prepared the students to work in the small groups with the middle school buddies without requiring the constant intervention and direction of an adult.

A Sample Technology Buddies Program Session

Session 1: Design An Escape Vehicle

(Adapted from an activity designed by Dr. James L. Barnes for UAW/Ford Motor Company, 1992)

Purposes:

1) For students to meet each other and to become comfortable with one other

2) For students and teachers to become familiar with the skill level of students from another age group

Materials:

-LEGOs ® divided into project boxes

-name tag (optional)

Procedure: The lead/host teacher welcomes everyone and invites each participant to tell the group his or her own name and favorite mode of transportation. After everyone is introduced, the lead teacher tells the students that during the following weeks, they will be solving some design problems related to various forms of transportation. Students are then presented with the first design brief and project box and break into small groups to solve the design problem. After building the vehicles, small groups come together to share their inventions.

Design Brief: Invention: The Escape Vehicle

You and your partners are flying over the Blue Ridge Mountains in a helicopter when suddenly your engine fails and you are forced to land on the mountain. You all survive, but everyone has a broken wrist and can only use one hand. Many of the helicopter parts are damaged or lost in the crash. Your group's job is to build another vehicle or vessel to take you all safely down the side of the mountain. You may only use the parts found in your project box. Everyone must keep one hand behind their backs at all times.

Extensions:

At the computer, students use drawing or CAD programs to draw their escape vehicle and enhance it with options not available to them with the LEGOs®.

Teaching With Multiple Intelligences:

Linguistic Intelligence – telling the group about the escape vehicle and how it works
Logical-Mathematical Intelligence – deciding which blocks to use for vehicle parts
Spatial Intelligence – putting the vehicle together so that the pieces lock
Bodily-Kinesthetic Intelligence – sitting together so that everyone can reach the blocks
Personal Intelligence Directed toward Other Persons – working with others cooperatively
Personal Intelligence Directed toward Oneself – using imagery to visualize the vehicle to build

Technology Concepts:

Mechanisms, simple machines, technological method

Human Adaptive Skills:

Problem solving, cooperative learning, interpersonal skills

Virginia Standards of Learning:

Math K.10, K.17: Comparing and Sorting; Science K.4: Physical Properties (color, shape, size, position, speed); English K.1, K.2, K.3: Oral Language (creative dramatics, speaking, listening, conversation); Social Studies K.3: Geography (positional words), K.8: Citizenship (responsibility)

Titles of Successive Sessions

Sessions 2-3: Building and Testing Bridges
Session 4: Building Paper Airplanes
Session 5: Building Plastic Bottle Rockets
Session 6: The Launch

Conclusion*: *How these activities met the needs of the students involved

Using design and technology provides an excellent medium to address all of the intelligences to improve effectiveness in problem solving tasks. There are many objectives driving the school curriculum. Primarily, kindergarten students need to learn basic pre-reading skills, such as the alphabet and phonemic principles. Also, students must develop an understanding of the concepts of number and measurement, and how to make meaningful scientific observations. Middle school students are exploring career choices and social responsibility as well as developing leadership skills. The technology buddies program offers opportunities for middle school students to gain experience working with people of different ability levels and to share their expertise with other members of their community. Technology buddy activities are great interdisciplinary, cross-curricular lessons that lend themselves well to extension into all content areas, especially language arts, science, and mathematics. In the future, it will be the understanding and application of this type of organizational system that will ensure knowledge transfer (Barnes, 1989).

References

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Virginia Standards of Learning

Parent's Perspective

By Jerry Ridgeway, Parent

As a parent I support education that engages students in what they are learning. As a technology education teacher, I support education that has a hands-on component. Before my involvement in my son's elementary experiences, however, I had no idea how technology education would take shape within elementary education. I was pleased to learn that technology education could be an integral part of elementary school education.

Generally in the classroom, hands-on activities were used to enhance and support the subject matter the students were learning in class. I was always impressed with the interest the students showed in what they were learning. The students also could always answer any questions I had about their work and showed great pride in their accomplishments.

Hands-on activities can be used to teach specific concepts in many instances. What better way to teach measurement than through a hands-on project of some type? Teaching about electricity is not complete without having students wire a simple circuit. The six simple machines come to life when they are combined into a device that students have built.

As a parent, I have seen how technology education excites elementary students about learning. I know that hands-on activities help students learn better and retain more. I am very thankful that in my school division, we have elementary teachers who support technology education in their classrooms. In today's world, we need to use every method at our disposal to help our children learn all the things they need to know and technology education can be an integral part of this process.

Student's Perspective

By Matthew Ridgeway, Former Student, Ottobine Elementary School

I am in my second year of technology education and like it because of all the hands-on activities. Middle school, however, was not my first experience with these hands-on activities. At Ottobine Elementary, I participated in many technology-related activities. In kindergarten, I created a tooth-puller; in second grade, I explored electricity and created a model football field with working lights; and in third grade, I made a model of a typical Roman town using cement for some of the structures, such as an aqueduct.

When I made a tooth-puller in kindergarten, I discovered how to use levers in a machine. In second grade, while creating my football field, I learned about connecting electric wires to a switch and then to a light bulb. When constructing my aqueduct, I had to use found materials (half a toilet-paper roll cemented between two milk cartons) to create arches. I also measured the dimensions for my buildings and the layout of my town. In general, these problem solving and hands-on activities in elementary school stretched my creativity and introduced me to different engineering principles.

Kindergarten Students at Copper Elementary School in Hampton, Virginia created and designed their habitat.

TSA and THE GREAT TECHNOLOGY ADVENTURE

The Great Technology Adventure, an interdisciplinary technology program for students in kindergarten through sixth grade, was introduced by the Technology Student Association (TSA) in August 1992. Organized through a nationwide student association, it was the first national technology program in the United States that focused exclusively on the technology learning needs of elementary-age children. Its purpose was then and is now to promote technological literacy in this age group.

Through various avenues, with technological literacy always the focus, the program seeks to enhance teaching and learning in the elementary classroom. TSA believes the Technology Learning Activities Guide helps in this endeavor by being a resource for teachers who are trying to integrate technology into the elementary curriculum and by promoting critical thinking and problem solving through creative activity with students. The guide contains a variety of materials to assist teachers, but the real focus of the guide is the technology learning activity (TLA). There are twenty-seven TLAs in the guide. Designed for classroom use, they feature diverse and motivating challenges that increase technological literacy in students; connect to recently established national technology content standards; and enhance and increase the relevancy of such objects such as math, science, language arts, and history, and promote the use and understanding of technology as integral elements of the school day.

National technology content standards were recently published in *Standards for Technological Literacy: Content for the Study of Technology* by the International Technology Education Association. The standards define what children should know and be able to do in order to be technologically literate. TSA included these standards in their entirety in the guide as a resource and also to feature them in each of the guide's TLAs. The standards referenced for each TLA are suggestions only, provided in the hope that teachers will find the connections helpful as they encourage technological literacy in their students.

For any questions about national TSA affiliation (through The Great Technology Adventure) or the guide, contact Hillary Lee, hlee@tsaweb.org

Jump In With Both Feet!

By Linda Davis, 2002-2003 VTEA Elementary Technology Teacher of the Year, Kiln Creek Elementary School, Hampton, Virginia

"A Design Technology workshop? Sure, I'd like to go. After all, as the computer resource teacher, I can always use new ideas for student projects."

That was my reaction to my assistant principal when she told me about a technology workshop in Hampton. Little did I know the impact that workshop would have on my teaching career. You see, I came to realize that computers are only a part of technology. All of those projects I've had my students doing all these years could be incorporated into a program referred to as "Children's Engineering," if I only approached things in a new way.

What tips do I have for those who would like to use Children's Engineering in your classroom? Jump in with both feet! You can start with next to nothing. My students were excited when I asked them to bring "stuff" from home. We've collected shoe boxes, fabric scraps, craft sticks, chenille stems, bathroom tissue rolls, spools, buttons, plastic tubs, milk cartons, and other assorted "stuff." What will all this wonderful junk be turned into? That's the amazing part -- only your students' imaginations will tell.

Our projects now begin with a design brief -- a construction challenge based on a story we've read, a project idea, or even a "what if?" situation. Some challenges are rather simple -- like making a pop-up card. Others are more involved and include a complete portfolio plan. For a portfolio, students include plans for construction, lists of materials for the project, sketches of the proposed product, modifications to the original, and drawings of the completed product. Finally, students help design the assessment rubric, which include SOL content for Science and/or Social Studies, as well as Math and English.

It may sound a little complicated, but the results for the students are worth the extra effort. These types of activities help increase retention, reasoning, and cooperative working skills. In my experience, when students are more engaged in their learning, behavior problems decrease.

As a beginning, how about asking your students to design and create with one of these ideas?

~ A pop-up card as an invitation
~ A new vehicle to get Cinderella to the ball
~ A home for all three pigs
~ A container for Johnny's apple seeds
~ A floating conveyance for Columbus to use in his presentation to King Ferdinand and Queen Isabella
~ An invention which combines 2 or more simple machines
~ A bridge to get from a rural community to a suburban one

Good luck and have fun with learning!

The Children's Engineering Journal

Virginia TSA
VSU
PO Box 9045
Petersburg, VA 23806

Phone: 804-524-6809
Fax: 804-524-6807
Email: cej@vtea.org

Visit us on the web at www.vtea.org/ESTE

If you would like to contribute an article to the next edition of The Children's Engineering Journal, please submit a WORD or WORDPad document to cej@vtea.org.

Workshop Opportunities

By Marcia Hickey, Children's Engineering Educators, LLC

The goal of Children's Engineering Educators, LLC is to help K-5 teachers gain the skills and confidence to bring children and engineering (design and technology) together. Technology is involved in everything human-made or human-altered. What an awesome word with awesome implications for today and the future.

The founders of Children's Engineering Educators (CEE) have been classroom teachers and understand when teachers say they don't need one more thing added to their curriculum. By integrating design and technology into their classroom, these teachers found that being a facilitator and not a "teacher" helped the children come up with creative solutions to the investigations. Plus, by focusing on a targetet Standard of Learning selected according to the needs of the students, their curriculum was less, not more, complicated.

CEE will come to your school to provide training — confidence building — to bring engineering, design, and technology into your classroom. They will share the design process, portfolio usage, and assessment tools. A series of workshops such as card engineering, levers and linkages, pulleys and gears, structures, electricity, light, and more easily fit into all grade-level curriculums. They have hands-on activities for the teachers to do and take back to try with their students.

Using design and technology activities in the classroom allows the students to manipulate learning and to communicate what they have learned through real life experiences. Children are more apt to remember skills when asked to apply them in meaningful situations. Problem-based learning helps them to see that through design and technology, they can initiate, control, and master learning. The founders of Children's Engineering Educators believe that when children transfer learning through application, mastery is near certain.

For more information, contact Marcia Hickey at:
mhickey@childrensengineering.com
or visit us on the web at:
www.childrensengineering.com.