Inside This Edition:

President’s Message  Page 1
Tinkering: A Path to Engineering for Children  Page 2
STEM-H in Virginia  Page 4
Designs Briefs  Page 6
Virginia Children’s Engineering Convention  Page 9
President’s Message

Charlotte Holter, President VCEC

Wanting to know how the universe works is fundamental to human nature, but needing to know has become necessary in our technological world. Part of that strategy includes understanding “engineering design” and how vital this concept is to progressing forward.

The Virginia Children’s Engineering Council promotes the ITEEA (International Technology and Engineering Educators Association) Standards for Technological Literacy (2000). These standards are deliberate about applying the process of design through technology education, even to elementary students. Creating an environment for elementary students that is conducive to the type of learning that produces 21st century thinkers and advances “design” thinking is imperative at this age.

A study about talking and designing performed by Gustafson, et al. (2007) describes the type of atmosphere a child’s classroom should have in order to problem solve.

“Teachers can enrich children’s design technology experiences by helping children to: expand their design horizons beyond satisfying their own personal needs and wants, realize that design operates within certain constraints, place realistic dimensions on their designs, visually generate and represent their ideas on paper and perhaps with the assistance of a computer graphics program, understand key elements of design (e.g., line, shape, mass, texture, color), understand the processes of design (e.g., considering alternatives, engaging in opportunistic design), and collaborate with others (p. 32).”

All teachers can enrich children’s design engineering experiences by simply modifying their curriculum to incorporate practices that promote problem solving. This practice alone with new strategies that involve thoughtful design solutions will ensure authentic learning in our children.

Consider joining us at our next Virginia Children’s Engineering Convention in historic Williamsburg, VA on February 19-20, 2015. The convention will provide opportunities for you to obtain new ideas and instructional strategies that contribute to developing student’s technologically literacy. Renowned Ioannis Miaoulis, President and Director of the Museum of Science, Boston, will be the keynote guest speaker. We hope you can join us!

References:


Note: The cover photograph “Treehouse Engineering” was provided by Bobbie Arbogast, Rockingham County Public Schools.
Tinkering: A Path to Engineering for Children

Arthur W. Bowman, Professor of Biology, Norfolk State University

Most people have a notion of what tinkering means. It is often thought of as interacting with some object or even a concept, often out of curiosity, with to affect change and/or improvement. One dictionary defines it as “an attempt to repair or improve something in a casual or desultory way, often to no useful effect. To this definition, I would add “the purpose of shear exploration and the joy of finding things out,” and probably remove “desultory way.” Adding shear exploration allows the liberty of investigating to learn in an authentic manner. This investigation is most likely driven by their own native curiosity, or as I like to call it, their wonderment.

All too often school lessons are rather scripted. These lessons have well-defined outcomes that determine if the learner has satisfactorily mastered the information. For many encounters in life, the pursuit is more serendipitously derived and driven by intrigue (let’s call it wonderment). All children start life as natural scientists, simply wondering about their immediate surroundings, and trying to figure out what the world is like. There is no attempt to improve, change, or fix anything; only the desire to satisfy their insatiable wonderment. Then something very interesting starts to happen as parents, teachers, and other individuals begin to introduce the new kid on the block to the world of other-derived expectations. In the educational environment, these are often referred to as learning outcomes.

Learning outcomes are obviously important in the purposeful planning and effective delivery of instruction. However, caution should be exercised when the majority of what determines the success of learners is their ability to perform at some acceptable level of content mastery of extrinsically determined learning outcomes. With this approach, schools are masterful in creating educational winners and losers, and even winner and loser schools or entire school divisions. This extinguishing of the individual’s wonderment and natural inclination to just tinker is most critical in the area of Science, Technology, Engineering, Mathematics (STEM), and especially for young children that are now required to suppress their natural wonderment to be successful in school.

Engineering’s very nature makes tinkering an essential characteristic and skill to possess. What is the design process! It is an exploration of possibilities and suggesting an infinite number of “what ifs”, that sometimes results in an improved product and creating something that has never existed?

Continued on page 4
In all instances, authentic learning has occurred. Therefore, to really help your students learn STEM, and especially the E of STEM, provide opportunities for them to “tinker” in a non-competitive (not determining who has the best outcome), unscripted manner, that celebrates the pursuit of knowing. Needless to say, safety must always be considered first with hands-on lessons and tinkering. However, letting students disassemble appliances, such as toasters, vacuum cleaners, cell phones, or watches might provide just the type of tinkering experience that will awaken their native wonderment.

To find exciting additional resources supporting engineering for children, Google “tinkering and children.” Some educators even suggest that girls do not pursue engineering and other STEM careers, because these possibly do not have as many opportunities to tinker as boys do. A recent book The Tinkers: The Amateurs, DIYers, and Inventors who make America Great, by Alec Foege, is a great place to start considering how to adopt tinkering as an instructional strategy that supports engineering for children.
So what exactly is STEM-H?

STEM-H is a good paying job. It’s a vital component of our early education system. It’s a way of thinking which inspires creativity and fosters success. STEM-H shows us the keys to the future. In short, it’s kind of important.

Luckily, Governor Terry McAuliffe has made advancing STEM-H education and workforce training a high priority. In an executive order that he signed in August 2014, the Governor made increasing the number of STEM-H sub-bachelor’s credentials a chief goal.

You see, contrary to popular belief, not all STEM-H jobs require a college degree. In fact, we’re currently focusing on career and technical certificates and community college programs that can produce a STEM-H-educated workforce for the 21st Century.

But what about the H?

The H stands for “health,” and no cutting-edge workforce is complete without highly-qualified healthcare professionals ready to serve at-risk and in-need communities.

So why do I need your help? Because too many of our STEM-H jobs in the Commonwealth are being filled by people from other states and countries. And yet a recent study by the Brookings Institution found that around 32,000 STEM-H jobs remain unfilled in the three largest metropolitan areas in Virginia (Northern Virginia, Richmond, and Virginia Beach). With 200,000 people currently unemployed in the state, it’s painfully obvious that there is a skills mismatch.

Last year, only 5,000 students earned engineering degrees from Virginia schools. As a result, businesses are struggling to find the talent they need to fill crucial positions.

And that’s where you come in.

You are the front line; the mentors and the dream builders. Your commitment, passion and dedication in the classroom can influence a child to completely reconsider mathematics, science, technology and engineering as potential career choices. Your support as an educator is also invaluable in persuading more women and minorities to go into STEM-H fields. With your direction and their passion, the workforce mismatch would be a thing of the past.

So I encourage you to think outside the box. Contact a company to work with your students. Reach out to local technical centers and higher education institutions to provide instruction. Request a tour of a local facility for a hands-on experience with STEM-H careers. Do what you must to inspire.
We are working hard on a coordinated approach aimed at raising student awareness of STEM-H jobs as early as elementary school, increasing STEM-H curriculum opportunities for K-12 students through public-private partnerships, and scaling successful local and regional STEM-H programs to other areas of the Commonwealth.

By working together towards this common goal, I am confident we can grow the kind of 21st century workforce that will make Virginia competitive with the other 49 states in the nation and the other 200 countries around the world.

And it all starts with you.

If you would like to help raise awareness that will solidify Virginia’s economic and academic future, please don’t hesitate to email me at megan.healy@governor.virginia.gov.
Design Brief

Time Capsule Design Brief
2nd Grade Ancient Egypt (SOL 2.1)
Krista Miller, Rockingham County

Background: People sometimes place special and unique items in a time capsule and then bury it for others to find many years later. These items tell those who find it about the past.

We have been studying about the customs, traditions, architecture, inventions, and written language of the Ancient Egyptians.

Challenge: You will design and create a time capsule. This container must then be filled with models of at least four important items from the Ancient Egyptian culture.

Criteria:
Your container must:
- Open and close securely
- Hold at least 4 miniature models of items that were important to the Ancient Egyptians
- Be decorated on the outside to resemble an Ancient Egyptian artifact
- Have a secret message written in hieroglyphics on the outside

Materials:
- Cardboard
- cardstock or file folders
- string
- pipe cleaners
- brass fasteners
- craft sticks
- recyclables
- buttons
- glue

Tools:
- markers
- scissors
- pencil
- ruler
- glue gun
- hole punch
- push pin
- paper drill
- safety goggles

*NOTE: This project can be modified or adapted to accommodate other cultures studied.
Design Brief

Surprise, Mr. Wolf!
SOL - Language Arts 2.8, STL - Standard 11
Kelley Davis, 2nd Grade, Page County

**Background:** Everyone knows the story of The Three Little Pigs, but have you heard of the Wolf’s Coming? The forest animals are all running and hiding from the big, bad wolf...but why? After predicting and drawing conclusions in class, we finally learned the real reason: it’s a surprise birthday party for Mr. Wolf!

**Challenge:** Your challenge is to design and build a birthday cake for Mr. Wolf. The cake must be large enough to contain one pig who will “pop out” to surprise him. You will use a pneumatic lever to help the pig pop out of the cake. Don’t forget to write a special birthday message to our friend: Mr. Wolf.

**Criteria:**
- use a pneumatically operated lever to help the pig “pop out” of the cake
- have a moving part
- contain one stuffed pig
- include a birthday message
- be neat and colorful

**Materials:**
- 1 balloon
- 4 paper fasteners
- 1 syringe
- 4 pipe cleaners
- 1 foot of tubing
- 8 craft sticks
- 1 stuffed pig
- glue stick/white glue
- construction paper
- scrap paper
- crayons/markers
- limited craft materials

**Tools:**
- scissors
- hot glue gun
- ruler
- hole punch
- crop-o-dile
Design Brief

Pizza Box Story Order

VA SOL English 4.5
Linda Doherty, Rockingham County

Background: We have been learning about plots and the importance of the sequence of events in a story.

Challenge: Design and create a pizza to tell the plot of the story by retelling 6 important events in the story in the order in which they occurred. The pizza will fit in the pizza box provided.

Criteria:
- Your pizza must fit in the pizza box.
- You must put the title, author, and your name on the cover of the box.
- Your pizza must have 6 equal pieces.
- On a separate piece of paper, list 6 important events of the story in the order which they occurred.
- Each slice of the pizza must tell one of the events.
- The six slices must re-tell the plot of the story.
- The events must be in the order which they occurred.
- You may use words and illustrations to tell the events.
- Your pizza must be colorful.
- Your pizza must have at least one moving part illustrating one event.

Materials:
- white copy paper
- glue
- tape
- cardboard
- paper fasteners
- fabric
- construction paper
- craft sticks
- pipe cleaners
- broken down cereal boxes
- buttons

Tools:
- scissors
- hole punch
- glue sticks
- ruler
- markers
- colored pencils
- crayons
19 Years of Professional Development Programs Focused on Design, Engineering, and Technology for Developing Technological Literacy for Grades Pre K-5

Join Us
Explore teaching strategies for integrating children’s engineering into your existing curriculum and standards.

Reinforce the Virginia Standards of Learning through hands-on designing, building, and problem-solving activities.

Attend workshops conducted by experienced K-5 classroom teachers.

Network with teachers who share your interest in the need for every child to study and use technology.

Visit educational exhibits, and examine available materials from technology vendors.

Keynote Speaker
Dr. Ioannis (Yannis) Miaoulis has been president and director of the Museum of Science, Boston since 2003. Originally from Greece, Dr. Miaoulis came to the Museum after a distinguished association with Tufts University. There, he was dean of the School of Engineering, associate provost, interim dean of the University’s Graduate School of Arts and Sciences, and professor of mechanical engineering. An innovative educator with a passion for science and engineering, Miaoulis championed the introduction of engineering into the Massachusetts science and technology public school curriculum in 2001, making the Commonwealth first in the nation to develop a K – 12 statewide curriculum framework and assessments for technology/engineering.

For more information contact
Charlotte Holter, President
(540) 828-6081, cholter@rockingham.k12.va.us
Marcia Hickey, Convention Coordinator
mdhickey@comcast.net
Dr. Laguna Foster, Convention Promotion
lagunafoster@gmail.com
Dr. Lynn Basham, VDOE Representative
804 786-4210, lynn.basham@doe.virginia.gov

Conference Registration Includes
• Afternoon break and dinner on Thursday
• Breakfast, luncheon, and one break on Friday
• Recertification points for Virginia teachers
• Free hotel parking

Registration Fee: $150.00 – must be postmarked by, January 12, 2015
(non-refundable after January 31, 2015)

Learn How Children’s Engineering Promotes
• Virginia Standards of Learning mastery
• National Standards
• Critical and creative thinking
• Problem solving
• Hands-on learning
• Decision making
• Cooperative learning skills
• Differentiated instruction
• Motivated and self-confident learners and
• Respect for the individual learning styles of children, including the needs of gifted and special needs children.

DoubleTree by Hilton
50 Kingsmill Road
Williamsburg, VA 23185

Virginia Children’s Engineering Council (VCEC)  Web site: (http://www.childrensengineering.org)
Technology Education Service, Virginia Department of Education
Join the Excitement...Children’s Engineering!

Critical Thinking and Problem Solving

Collaboration

DESIGN

Team Work

Innovation

Science Technology Engineering Mathematics

It’s Academic and Fun...STEM!