DISCUSSION GUIDE SHEET - The Overlooked STEM Imperatives: Technology and Engineering

What is Technology?

- Technology is how people modify the natural world to suit their own purposes (our ability to do things)
- Greek word *techne* - means the act of making or crafting
- Technology is: 1. Knowledge (knowing); 2. Objects (things or artifacts); 3. Processes (doing); and 4. Volition (desire to do something)
- "the innovation, change, or modification of the natural environment in order to satisfy perceived human wants and needs" - Standards for Technological Literacy, ITEA, 2003

What is Technological Literacy?

- “the ability to use, manage, evaluate/assess, and understand technology” - Standards for Technological Literacy, ITEA, 2003
- The North Central Regional Educational Laboratory (NCREL) defines technological literacy as, "Knowledge about what technology is, how it works, what purposes it can serve, and how it can be used efficiently and effectively to achieve specific goals."

What is Engineering?

- "Engineering is the profession in which a knowledge of the mathematical and natural sciences gained by study, experience, and practice is applied with judgment to develop ways to utilize economically the materials and forces of nature for the benefit of mankind" - ABET - Accreditation Board for Engineering and Technology, 2002
- There are strong philosophical connections between technology and engineering and the engineering profession has begun to work with educators of technology to develop alliances for infusing engineering concepts into K–12 education
- Alliances will provide a mechanism for greater appreciation and understanding of engineering and technology

Technology Education vs. Educational (Instructional) Technology

<table>
<thead>
<tr>
<th>Technology Education</th>
<th>Educational Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>A school subject</td>
<td>A teaching method</td>
</tr>
<tr>
<td>Teaches about technology</td>
<td>Teaches with technology</td>
</tr>
<tr>
<td>Deals with technological knowledge and concepts</td>
<td>Deals with instructional hardware and software</td>
</tr>
<tr>
<td>Goal: Technological literacy</td>
<td>Goal: Improving teaching and learning</td>
</tr>
</tbody>
</table>

Technology vs. Science

<table>
<thead>
<tr>
<th>Technology</th>
<th>Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study of the human made world</td>
<td>Study of natural world</td>
</tr>
<tr>
<td>Created by people</td>
<td>Discovered by people</td>
</tr>
<tr>
<td>Invention and innovation</td>
<td>Observation and description</td>
</tr>
<tr>
<td>Ask “How?”</td>
<td>Asks “Why?”</td>
</tr>
</tbody>
</table>

Standards for Technological Literacy, ITEA, 2003  National Science Education Standards, National Research Council, 1996

Resources

International Technology and Engineering Educators Association (ITEEA) - www.iteaconnect.org (note: formerly ITEA, name change March 2010)
- Children’s Technology and Engineering - www.iteea.org/Publications/t&c.htm
- The Technology and Engineering Teacher - www.iteea.org/Publications/ttt.htm
- Engineering by Design – www.iteaconnect.org/EbD/ebd.htm

American Society for Engineering Education (ASEE) - www.assee.org
- eGFI: Engineering Go For It: www.effi-k12.org
- PRISM - www.prism-magazine.org/ (Flagship publication for the American Society for Engineering Education)

THINK ABOUT AND SHARE YOUR BEST IDEAS ON HOW WE CAN INSURE THAT ALL ELEMENTARY SCHOOL STUDENTS HAVE OPPORTUNITIES TO EXPERIENCE TECHNOLOGY AND ENGINEERING? (Think-Pair-Share activity)
A Brief History of Upstate South Carolina Stem Education

- **Spring 2006**, a group of educators expressed concern regarding the state of Science, Technology, Engineering, and Mathematics (STEM) education in South Carolina. A taskforce was created to take action on STEM initiatives. The taskforce included the Partnership for Academic and Career Education (PACE), educators from the seven school districts in Anderson, Oconee, and Pickens counties (AOP), Tri-County Technical College (TCTC), and Clemson University (CU).

- **September 14, 2006**, an all-day seminar titled “STEM Education: Improving Collaboration in Anderson, Oconee, and Pickens Counties” was held at Clemson University. The co-chairs of the task force that planned this seminar were Bill Havice, Ph.D., DTE, Professor and Associate Dean in the College of Health, Education, and Human Development, Clemson University and Jerry Marshall, Ph.D., Head of the Mathematics Department, Tri-County Technical College. The objectives for the fall seminar were 1) develop a clear definition of STEM education and technological literacy and establish goals for improved collaboration, 2) address the current status of technological literacy at all educational levels, 3) begin to create a community of partners among educators at all levels for the purpose of strengthening the infrastructure that supports STEM education in Anderson, Oconee, and Pickens counties, and 4) showcase some recent local successful endeavors at providing quality experiences in STEM education with examples from primary, secondary, and post-secondary levels. Bill Havice gave a presentation titled “Technological Literacy for All: A Definition and Standards’ and Barry Burke from the International Technology Education Association Center to Advance the Teaching of Technology and Science (ITEA-CATTS) presented on “Advancing the Teaching of Technology and Science.”

- **August 4 - 6, 2008**, a symposium titled “The Anderson, Oconee, Pickens Symposium on Teaching and Learning STEM Standards for the 21st Century” was held at the Tri-County Anderson campus, with one hundred (100) educators from the AOP area in attendance. Col. Patrick Forrester (US Army, Retired), National Aeronautics and Space Administration (NASA) active astronaut opened the symposium with a presentation on “The View from Space – STEM is Important.” The rest of the event was guided by experts from ITEA - CATTS.

- **March 2009**, Bill Havice and Jerry Marshall had an article titled, “Symposium Promotes Technological Literacy through STEM.” Published in The Technology Teacher (pg. 27-29). The article provided a report on the summer 2008 STEM symposium.

- **August 3 - 5, 2009**, another symposium titled “The School District of Pickens County (SDPC) Symposium on Teaching and Learning STEM Standards for the 21st Century” was held at the Tri-County Technical College (TCTC) Anderson campus. Todd Bennington, Vice President of Operations, BorgWarner Drivetrain Group, Seneca, SC opened the symposium with a STEM presentation titled “A Winning Combination.” The remainder of the event was guided by experts from the ITEA – STEM Center of Teaching and Learning (ITEA - STEM*CTL). The symposium focused on the ITEA standards for technological literacy. The project was designed to promote the improvement of STEM education for ALL students at ALL levels. (55 participants)

- **March 20, 2010**, Jerry Marshall and Bill Havice spoke at the 72nd annual conference of the International Technology and Engineering Educators Association (ITEEA) in Charlotte, NC. Havice and Marshall’s presentation was titled "Building Partnerships for Future Research: A STEM Initiative Case Study." They shared regarding recent Upstate South Carolina STEM education activities. The presentation focused on the need for T and E of STEM in modern education. This was highlighted by the recent name change of the International Technology Education Association (ITEA) to the International Technology and Engineering Educators Association (ITEEA).

- **August 2 - 4, 2010**, a professional development experience titled “The Anderson, Oconee, Pickens Institute on Integrative Science, Technology, Engineering and Mathematics (STEM) Teaching and Learning” was held at BorgWarner Drivetrain Group, Seneca, SC. Todd Bennington, Vice President of Operations, BorgWarner Drivetrain Group, Seneca, SC opened the Institute with a warm welcome. Col. Patrick Forrester, active astronaut, gave a keynote address titled “The Importance of STEM Education.” A team of experts from the ITEEA - STEM*CTL facilitated many of the group activities of the Institute. (85 participants)

- **September 10, 2010**, Bill Havice and Jerry Marshall made a presentation regarding STEM Education in the Upstate at the South Carolina Science Leadership Association (SC SELA) meeting held in Columbia, SC. Bill displayed and discussed pictures of children engaged in integrative STEM activities in the elementary school classroom. Jerry talked about the need to engage South Carolina students at an early age to ensure that they stay determined to graduate from high school, go into post-secondary education, and on to meaningful careers.

- **September 15 – 17, 2010**, Bill Havice, Jerry Marshall, and Rick Murphy, Coordinator for the Pendleton Regional Education Center, were invited to present on some of the recent STEM education activities in the Upstate of South Carolina at the STEM*CTL Fall Leadership Forum in Baltimore, MD.

- **August 1, 2011** (in planning stage) South Carolina Statewide Summit on STEM Education – “Creating a Culture for Collaboration in STEM Education: Business, Industry, Schools, and Families.”

**THINK ABOUT AND SHARE YOUR BEST IDEAS FOR PROMOTING STEM EDUCATION IN OUR ELEMENTARY SCHOOLS?**

(Small groups brainstorming and then reporting best ideas to whole group)