Imagine a country where ~70% of the population is illiterate.

What would life be like?
70% of Americans are Scientifically Illiterate*

*Duncan, MIT Technology Review, N.p., Feb. 2007.*)
STEM Literacy for an Engaged Citizenry
Scientific Literacy - Neil deGrasse Tyson
“Kennesaw State University will be a world-class comprehensive university recognized for its excellence in education, discovery, innovation, technology, and community engagement at all levels from local to global. The KSU experience will empower the members and graduates of the university community to have the vision, ability, and courage to transform the future.”
Figure 1. Recent and Projected Growth in STEM and Non-STEM Employment

- **STEM employment**
- **Non-STEM employment**

<table>
<thead>
<tr>
<th>Year</th>
<th>STEM</th>
<th>Non-STEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-10 growth</td>
<td>7.9%</td>
<td>2.6%</td>
</tr>
<tr>
<td>2008-18 projected growth</td>
<td>17.0%</td>
<td>9.8%</td>
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</tbody>
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Federal Science, Technology, Engineering, and Mathematics (STEM) Education 5-Year Strategic Plan

- **Improve STEM Instruction**: Prepare 100,000 excellent new K-12 STEM teachers by 2020, and support the existing STEM teacher workforce;
- **Increase and Sustain Youth and Public Engagement in STEM**: Support a 50 percent increase in the number of U.S. youth who have an authentic STEM experience each year prior to completing high school;
- **Enhance STEM Experience of Undergraduate Students**: Graduate one million additional students with degrees in STEM fields over the next 10 years;
- **Better Serve Groups Historically Under-represented in STEM Fields**: Increase the number of students from groups that have been underrepresented in STEM fields that graduate with STEM degrees in the next 10 years and improve women’s participation in areas of STEM where they are significantly underrepresented; and,
- **Design Graduate Education for Tomorrow’s STEM Workforce**: Provide graduate-trained STEM professionals with basic and applied research expertise, options to acquire specialized skills in areas of national importance, mission-critical workforce needs for the CoSTEM agencies, and ancillary skills needed for success in a broad range of careers.
STEM in the news

What are gravitational waves?

Zika outbreak and microencephaly
# KSU-Discipline Specific Area D Assessment

<table>
<thead>
<tr>
<th></th>
<th>LO1 Critique the validity of scientific investigations</th>
<th>LO2 Apply scientific reasoning to novel situations</th>
<th>LO3 Use quantitative reasoning to answer scientific questions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exemplary</strong></td>
<td>7%</td>
<td>8%</td>
<td>15%</td>
</tr>
<tr>
<td><strong>Accomplished</strong></td>
<td>50%</td>
<td>54%</td>
<td>44%</td>
</tr>
<tr>
<td><strong>Developing</strong></td>
<td>35%</td>
<td>25%</td>
<td>15%</td>
</tr>
<tr>
<td><strong>Beginning (or not completed)</strong></td>
<td>8%</td>
<td>13%</td>
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<td><strong>Exemplary</strong></td>
<td>54%</td>
<td>52%</td>
<td>41%</td>
</tr>
<tr>
<td><strong>Accomplished</strong></td>
<td>35%</td>
<td>18%</td>
<td>28%</td>
</tr>
<tr>
<td><strong>Developing</strong></td>
<td>5%</td>
<td>10%</td>
<td>18%</td>
</tr>
<tr>
<td><strong>Beginning (or not completed)</strong></td>
<td>2%</td>
<td>15%</td>
<td>8%</td>
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<td><strong>Exemplary</strong></td>
<td>30%</td>
<td>10%</td>
<td>28%</td>
</tr>
<tr>
<td><strong>Accomplished</strong></td>
<td>35%</td>
<td>45%</td>
<td>23%</td>
</tr>
<tr>
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<td>10%</td>
<td>10%</td>
<td>20%</td>
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<td>25%</td>
<td>35%</td>
<td>30%</td>
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36% of KSU Students are just beginning or still developing the ability to “Apply scientific reasoning to novel situations” after 2 semesters of Area D science (disciplinary or non-disciplinary)

38% of KSU students are just beginning or still developing the ability to “Use quantitative reasoning to answer scientific questions”
The American Association of Colleges and Universities (AAC&U) Scientific Thinking and Integrative Reasoning Skills (STIRS) will serve as the guiding set of standards for our QEP implementation.

I. First-year STEM literacy modules
II. STEM Literacy Lecture Series-College Specific
III. STEM Integrated Experiences
As part of AAC&U’s Liberal Education and America’s Promise (LEAP) initiative, the VALUE rubrics contribute to the national dialogue on assessment of college student learning.

The LEAP campaign is organized around a robust set of "Essential Learning Outcomes".
College graduates in all fields of study should be able to:

- discuss how evidence can be used to advance knowledge
- apply an evidence-based decision-making approach,
- identifying elements which frame and drive decision making for problems in the sciences, social sciences, and/or humanities;
- analyze the operation of complex systems using evidence and systems thinking; and
- analyze ethics issues which are inherent in research and use of evidence.
First-year STEM Literacy Modules

- Incorporating scientific and quantitative reasoning into the first year curriculum
- Successful model collaborations; University College and:
  - College of Science & Mathematics
  - Southern Polytechnic College of Engineering and Engineering Technology
STEM Literacy Lecture Series

- Successful professionals from within colleges whose experiences integrate with STEM disciplines.
- Integrated with curricular structures
- Discipline-specific exemplars
Each curricular structure then chooses how to integrate their degree with the STIRS framework and assesses using a particular LEAP rubric
- AAC&U Value-rubrics

Experiences such as
- STEM-related Internships or Co-ops
- Undergraduate STEM-integrated research
- Community-based learning with STEM components
QEP Steering Committee

STEM Entry
- 1st Year Modules
- Area D Integration

Lectures
- Across Colleges
- Disciplinary exemplars

STEM Integrated Curricula
- Discipline capstones
- Assessment
“A person has STEM literacy if she can understand the world around her in a logical way guided by the principals of scientific thought. A STEM-literate person can think for herself. She asks critical questions. She can form hypotheses and seek data to confirm or deny them. She sees the beauty and complexity in nature and seeks to understand.”

-Dr. Richard Larson of MIT
Questions?
“If you are not scientifically literate, you are disenfranchising yourself from the democratic process and you don’t even know it!”

Neil deGrasse Tyson
“Anno, whose own acclaimed video work addresses the plight of port cities affected by rises in sea level, notes that CCA is at the institutional forefront of integrating Art + Design into environmental sustainability issues. ‘We have the Eco-Tap courses, inspired faculty, field studies across all disciplines, and sustainability task forces and policies,’ she says.”

“The STEAM movement adds another powerful voice as Sesame Street begins to sing its praises: the iconic educational program has announced that its 43rd season will focus on integrating the Arts into its existing STEM focus, most specifically in a new 11-minute episodic segment called ‘Elmo the Musical.’”
74 percent of Americans know that the Earth revolves around the Sun
48 percent of Americans know that human beings evolved from earlier species of animals
- NSF Science Literacy Poll
88 percent of scientists say GMOs "generally safe" to eat; 37 percent of the public agrees.
86 percent of scientists believe vaccines should be required in childhood, compared to 68 percent of the public.
94 percent of scientists say climate change is a "very serious" or "somewhat serious" problem; 65 percent of the public agrees. 87 percent of scientists blame humans; 50 percent of the public does too.
- Pew Research Center
STEM and STEM-related Colleges at KSU

- College of Computing and Software Engineering
- College of Science and Mathematics
- Southern Polytechnic College of Engineering and Engineering Technology
- College of Humanities and Social Sciences
- WellStar College of Health and Human Services
Carl Sagan wrote in 1997, “Ignorance reigns in our society at a moment when science is on the cusp of doing amazing and wonderful things, but also dangerous things. Ignorance is not an option.”