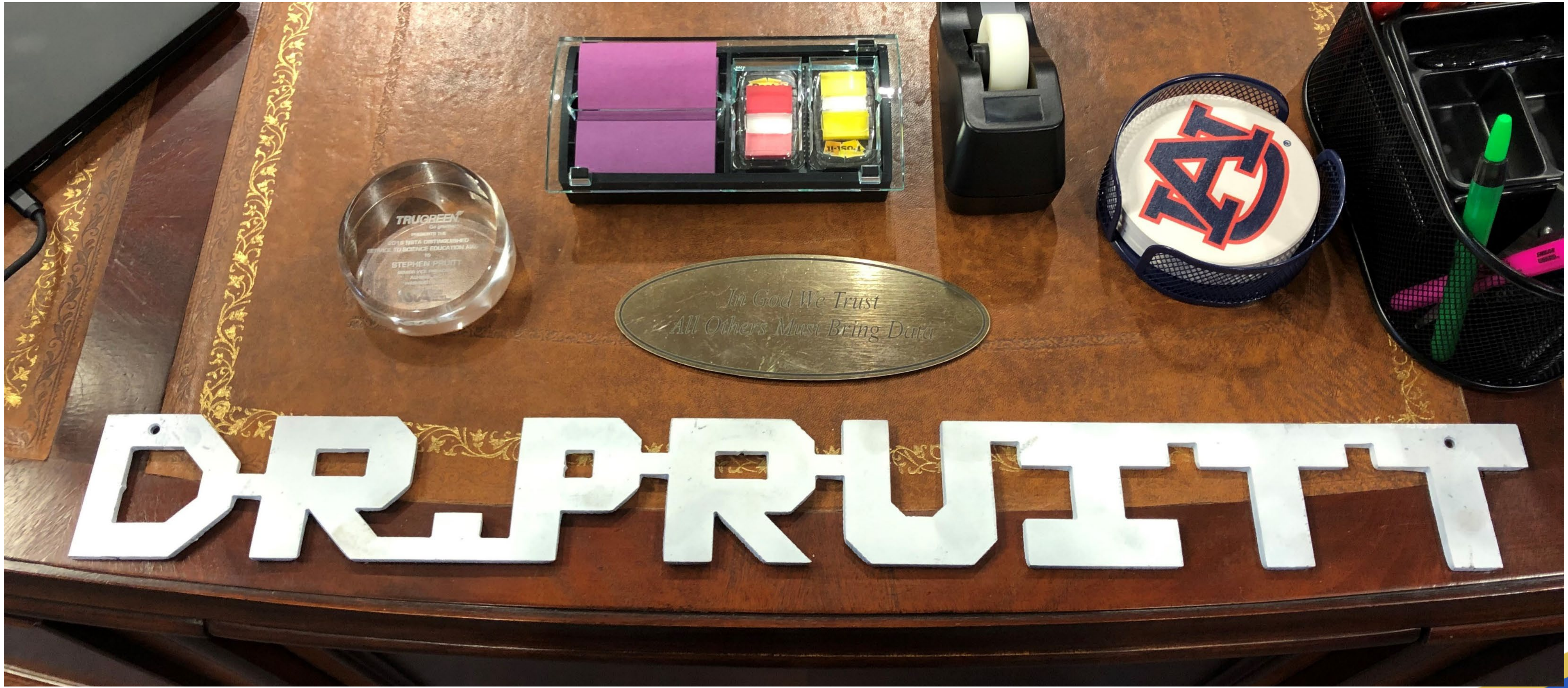
SREB

STEM Literacy

Stephen L. Pruitt, Ph.D.
SREB President

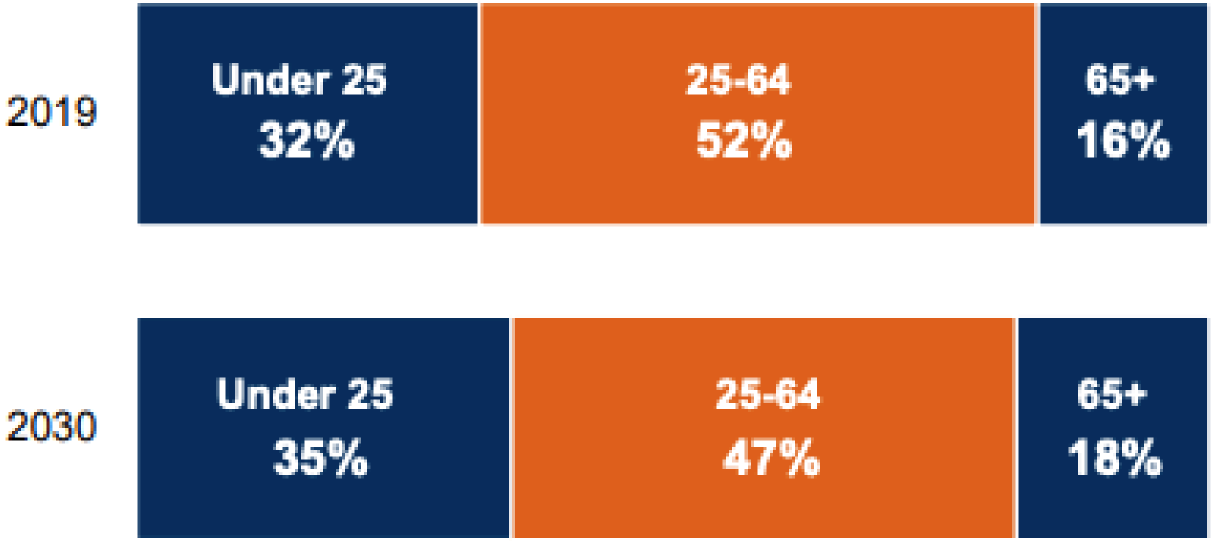
75th Anniversary

Push This Button



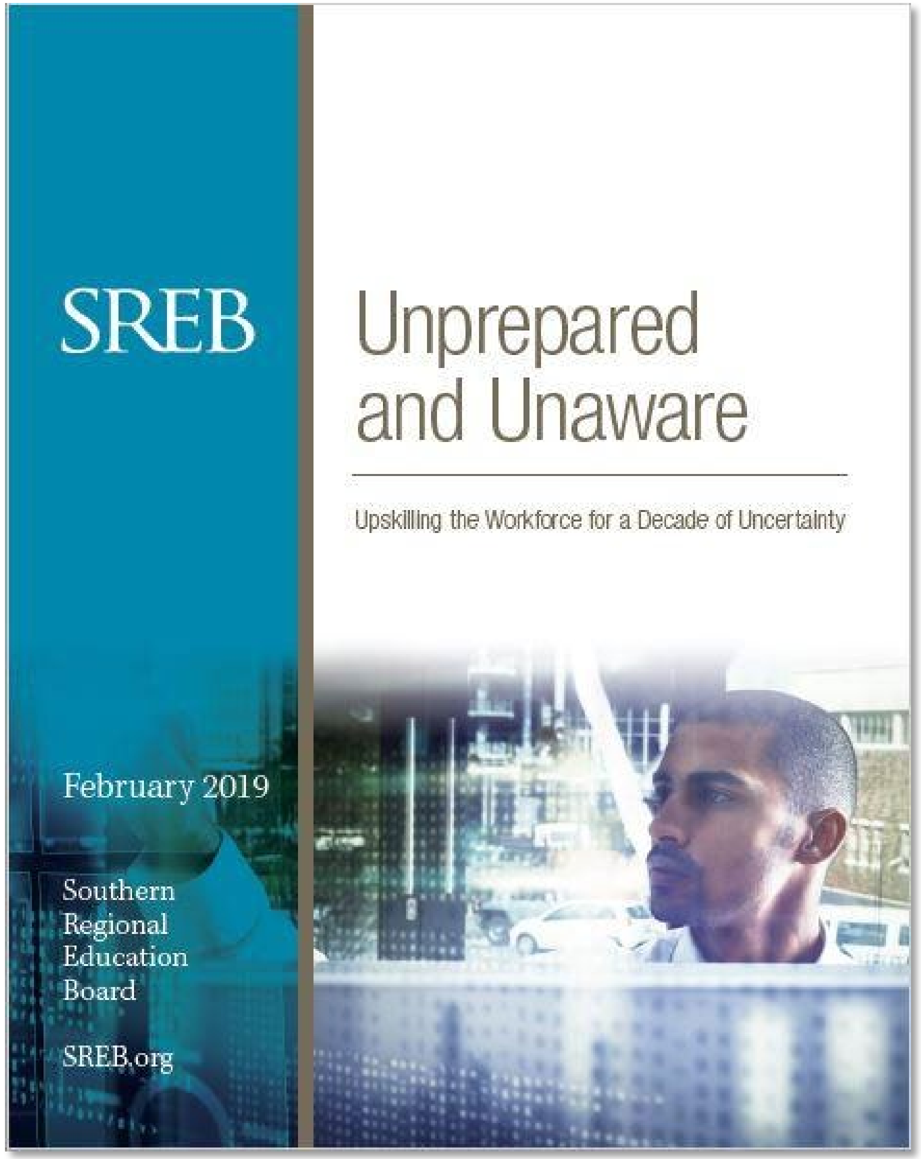
A More Dependent Population

By 2030, for every 53 dependent people in SREB states there will be just 47 working-age adults to provide for them.



Notes: Working-age is 25 to 64. Percentages may not add to 100% due to rounding.

Source: SREB Fact Book, U.S. Census Bureau



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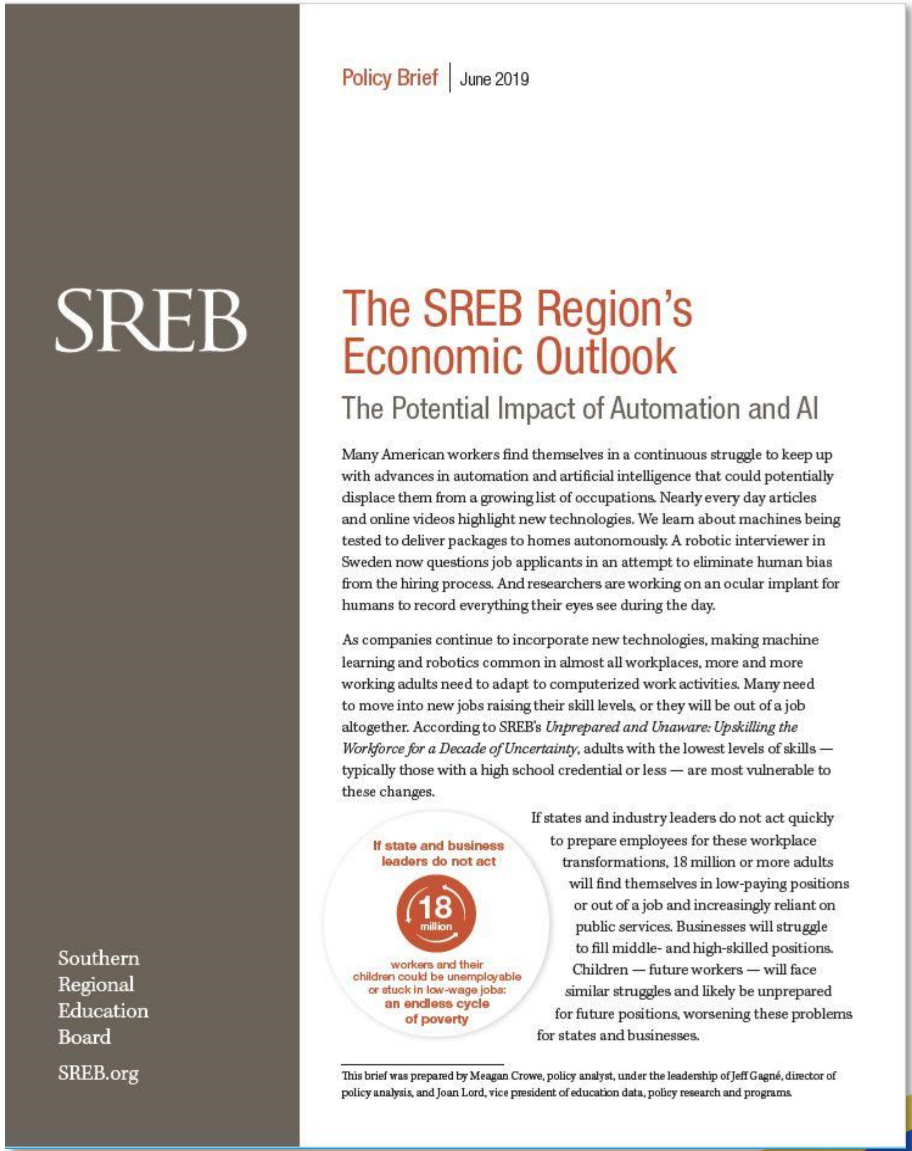
Unprepared and Unaware

Upskilling the Workforce for a Decade of Uncertainty

February 2019

Southern Regional Education Board

SREB.org



Policy Brief | June 2019

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The SREB Region's Economic Outlook

The Potential Impact of Automation and AI

Many American workers find themselves in a continuous struggle to keep up with advances in automation and artificial intelligence that could potentially displace them from a growing list of occupations. Nearly every day articles and online videos highlight new technologies. We learn about machines being tested to deliver packages to homes autonomously. A robotic interviewer in Sweden now questions job applicants in an attempt to eliminate human bias from the hiring process. And researchers are working on an ocular implant for humans to record everything their eyes see during the day.

As companies continue to incorporate new technologies, making machine learning and robotics common in almost all workplaces, more and more working adults need to adapt to computerized work activities. Many need to move into new jobs raising their skill levels, or they will be out of a job altogether. According to SREB's *Unprepared and Unaware: Upskilling the Workforce for a Decade of Uncertainty*, adults with the lowest levels of skills — typically those with a high school credential or less — are most vulnerable to these changes.

If state and business leaders do not act

18 million

workers and their children could be unemployable or stuck in low-wage jobs: an endless cycle of poverty

If states and industry leaders do not act quickly to prepare employees for these workplace transformations, 18 million or more adults will find themselves in low-paying positions or out of a job and increasingly reliant on public services. Businesses will struggle to fill middle- and high-skilled positions. Children — future workers — will face similar struggles and likely be unprepared for future positions, worsening these problems for states and businesses.

This brief was prepared by Meagan Crowe, policy analyst, under the leadership of Jeff Gagné, director of policy analysis, and Joan Lord, vice president of education data, policy research and programs.

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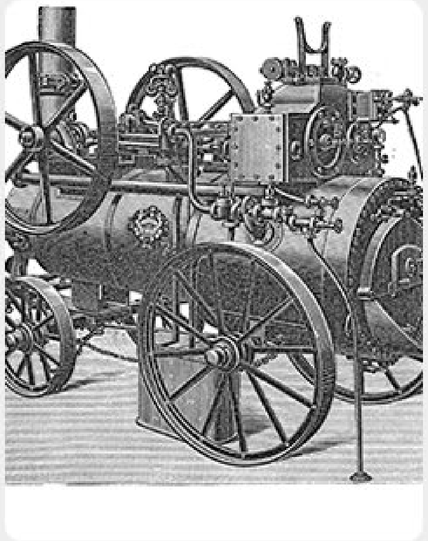
4th Industrial Revolution

FIRST

Mechanical Production

steam, water

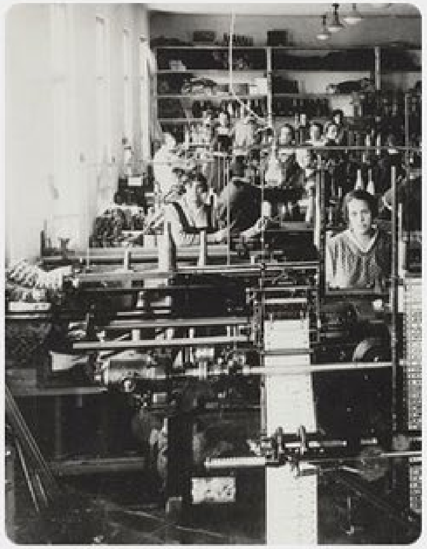


1784: First power loom

SECOND

Mass Production

electricity



1870: First assembly line

THIRD

Digital

IT, Electronics

1969: First programmable logic computer

FOURTH

Cyber physical systems

physical, digital, biological

Today: Robots learning from humans

Changing Approach

Engineering Challenge

Engineer and construct a platform that supports the mass of a full bottle of in a stable position as far above the table top as you can.

Materials:

1. *Two sheets of paper*
2. *One full water bottle*

STEM Challenge

Engineering challenge: Build a stable paper tower to support a water bottle

1. Engineer and construct a platform that supports the mass of a full bottle of in a stable position as far above the table top as you can. (Materials: Two sheets of paper and one full water bottle)
2. Develop a model (free body diagram) to show the forces acting on the water bottle to cause it to be stable on the tower.

Group Discussion

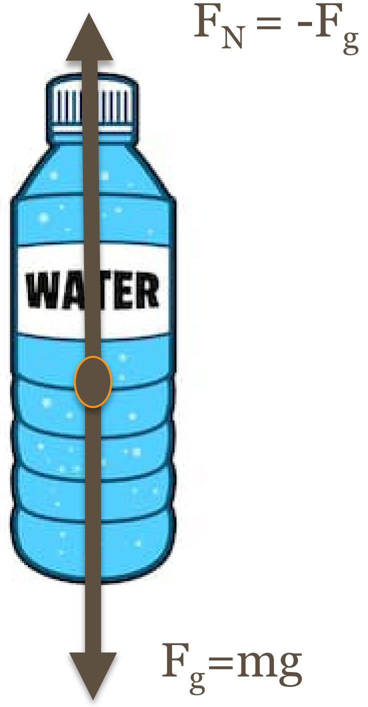
3. Use conceptual and mathematical models to communicate differences in the net forces between the systems that caused the phenomenon.

Individual Performance (SSW)*

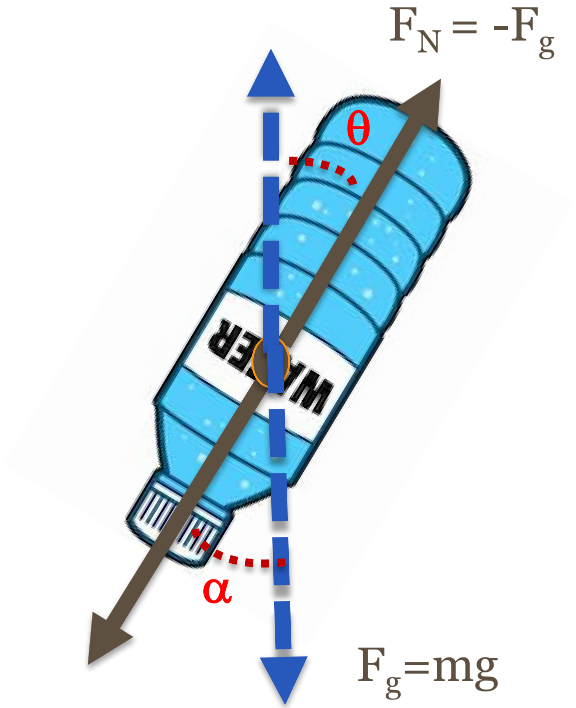
4. Revise the design of the tower and write an explanation for how the sum of the forces acting on the water bottle system are more stable.

Free Body Diagram

If the bottle is completely vertical, force of gravity is equal to the normal force. Since the ends of the bottle are vertical, there are no additional calculations needed to properly model the balanced forces.



Free Body Diagram

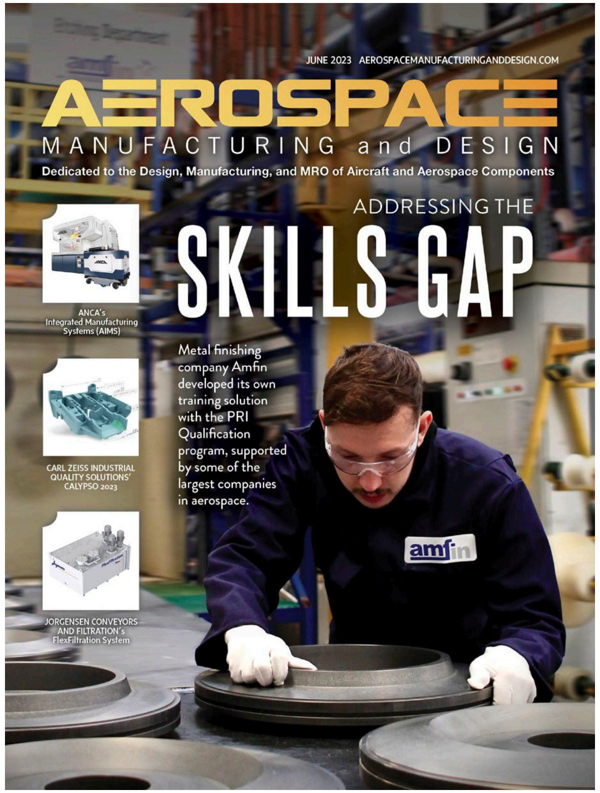


If the bottle is tilted, force of gravity is still equal to the normal force. However, forces acting on a bottle at an angle must be considered in the model. Since the bottle is not moving, the forces are balanced, but we must explain those balanced forces by converting forces acting at an angle to vertical forces.

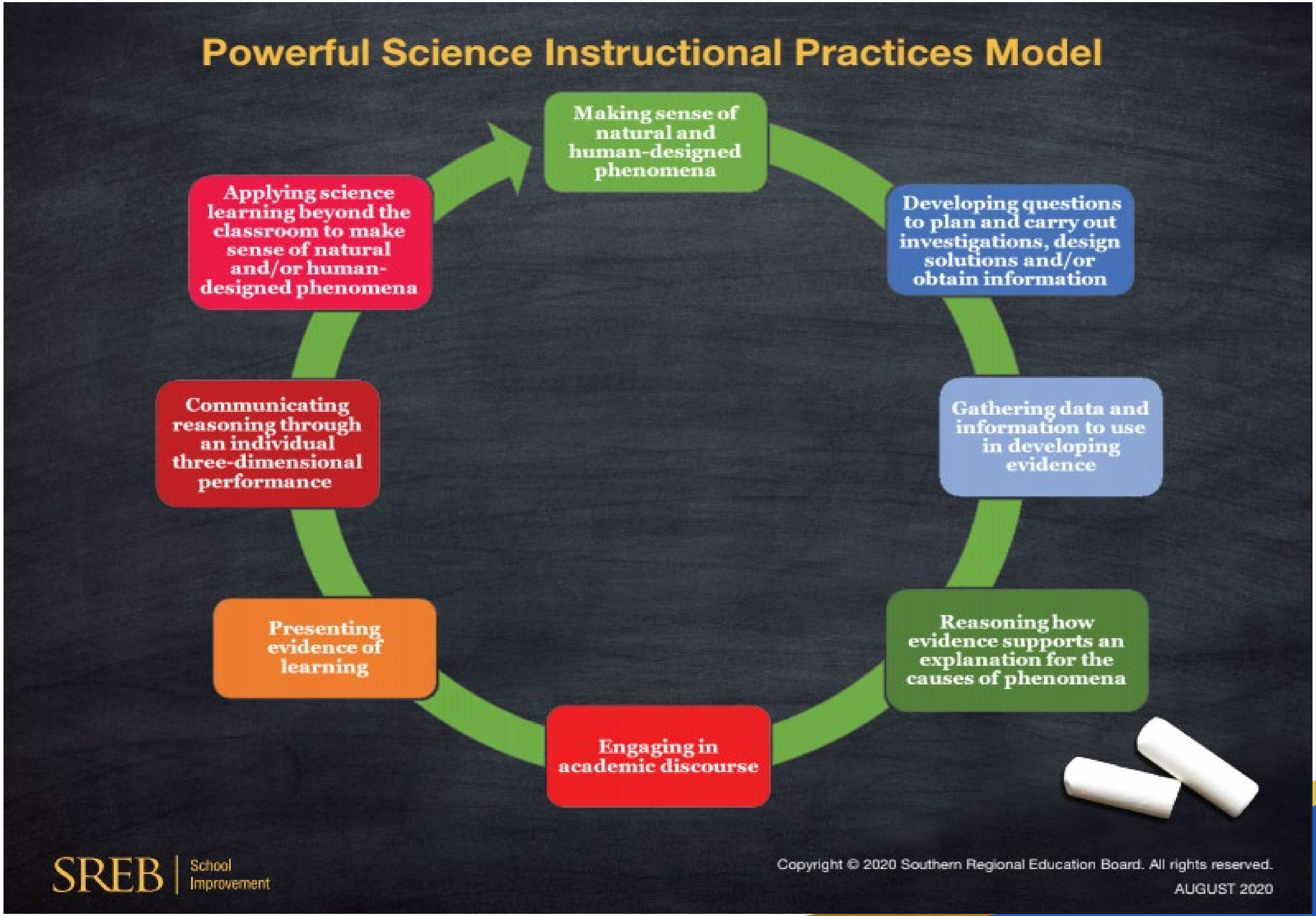
$$F_N + F_g = 0$$
$$F_N = F_g + \sin\theta F_g$$
$$F_g = -F_g + \sin\theta F_g$$

Applying science Learning Beyond the Classroom

Provide students with a forum to share phenomena that are related to the transfer of energy in a system.



sreb.org/powerful-instructional-practices



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Engage Students in Making Sense of Phenomena

Introduce the phenomenon by asking students to extinguish the candle using only copper wire.

Developing questions to plan and carry out investigations, design solutions, and/or obtain information

1. Students develop questions to gather data and information to use as evidence to support the cause and effect their design on extinguishing the candle.

Gathering data and information to use in developing evidence

3. Students design, build, and test their device.
4. Students organize data in a data chart to find patterns as they revise and retest their device.

Reasoning how the evidence supports and explanation for the cause of the phenomenon

5. Students use models to describe the effect of their designed solutions.

Engaging in Academic Discourse

Class Discussion:

Questions to initiate Discussion:

Q: How did you make the experiment a fair test?

Q: How were you able to make the tests more reliable?

Q: How does the mass or amount of copper used effect efficiency?

Q: How does the shape of your design effect efficiency?

Q: What else could be used to increase efficiency?

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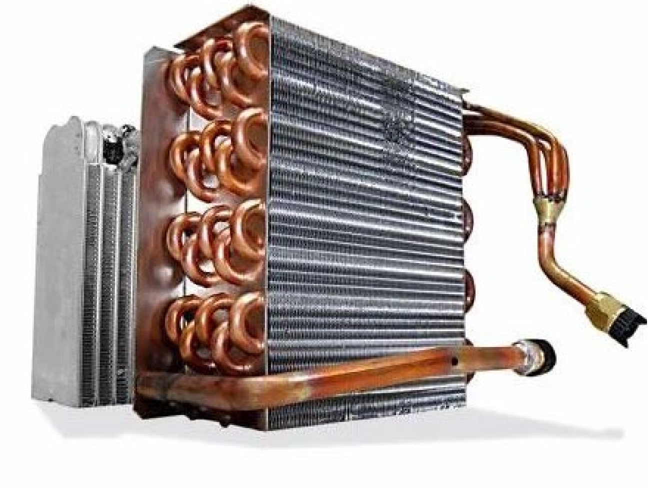
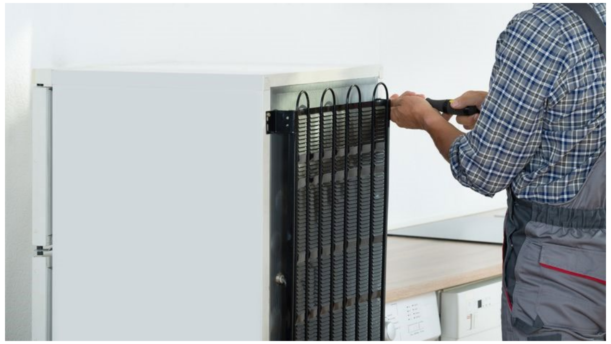
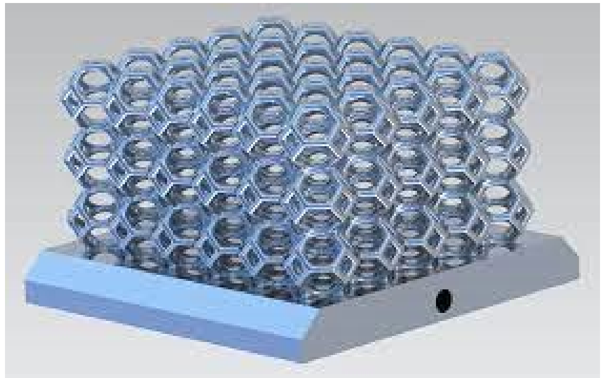
Provide students with a forum to share phenomena that are related to the transfer of energy in a system.







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