اللقاء التقني الثالث عشر

13th Saudi Technical Exchange Meeting

April 29 - 30 , 2008 — ٢٣-٢٤ربيع الثاني ١٤٢٩هـ

K F U P M, Dhahran — جامعة الملك فهد للبترول والمعادن . الظهران

Under the Patronage of H.R.H

Prince Muhammed Bin Fahd Bin Abdulaziz

Governor, Eastern Province

The Electrical Engineering Profession and its Role in Sustaining Development in the Kingdom

دور الهندسة الكهربائية في التنمية المستدامة للمملكة

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[redacted]

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Charles M. Vest, President-elect

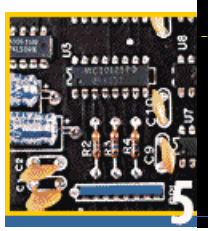
[redacted]

[redacted]

[redacted]

Great Engineering Achievements of the 20th Century

1. Electrification
2. Automobile
3. Airplane
4. Water Supply and Distribution
5. Electronics
6. Radio and Television
7. Agricultural Mechanization
8. Computers
9. Telephone
10. Air Conditioning
11. Highways
12. Spacecraft
13. Internet
14. Imaging
15. Household Appliances
16. Health Technologies
17. Petroleum and Petrochemical Technologies
18. Laser and Fiber Optics
19. Nuclear Technologies
20. High-performance



National Science Foundation
WHERE DISCOVERIES BEGIN

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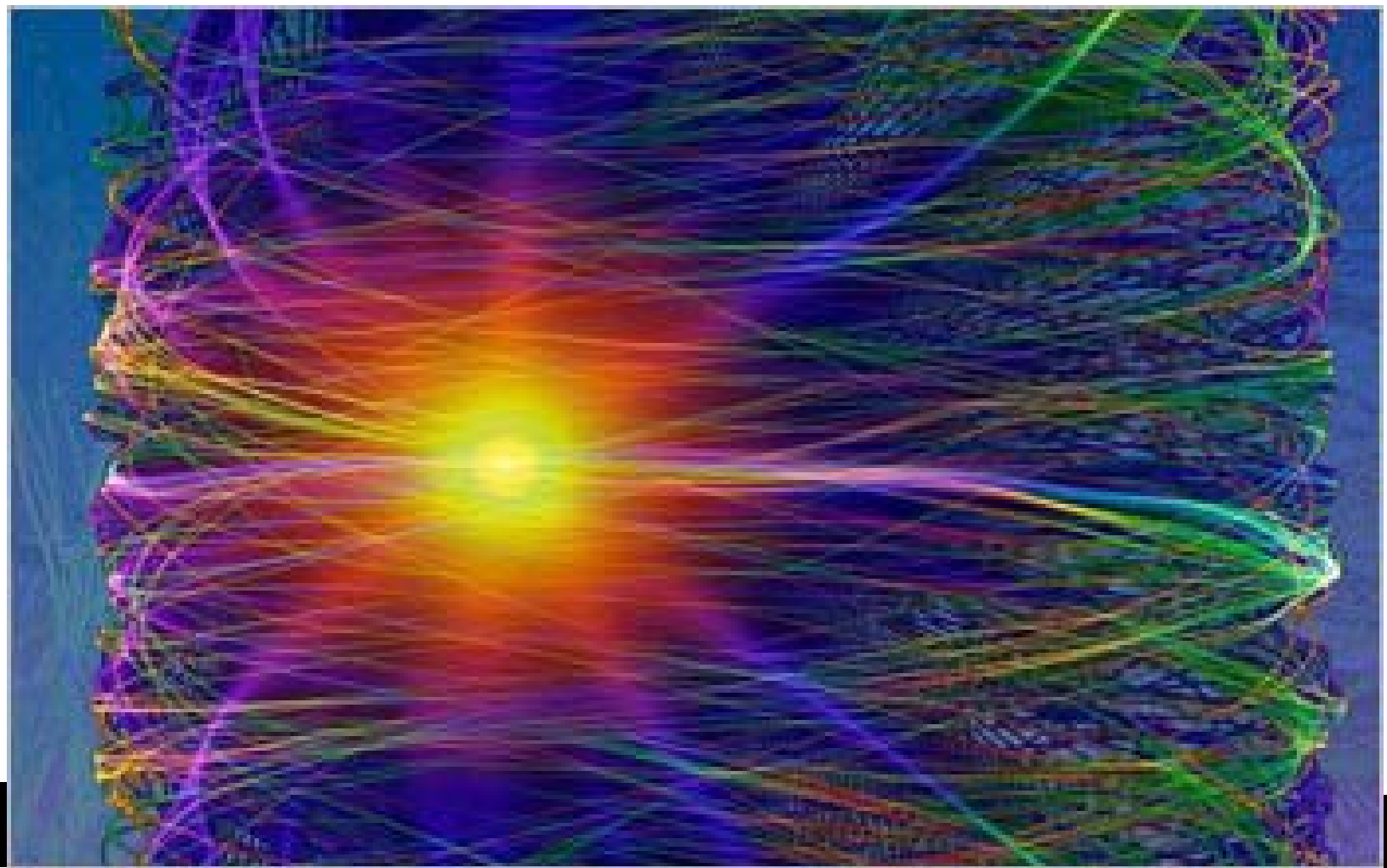
Credit: *Eric J. Heller, Harvard University*



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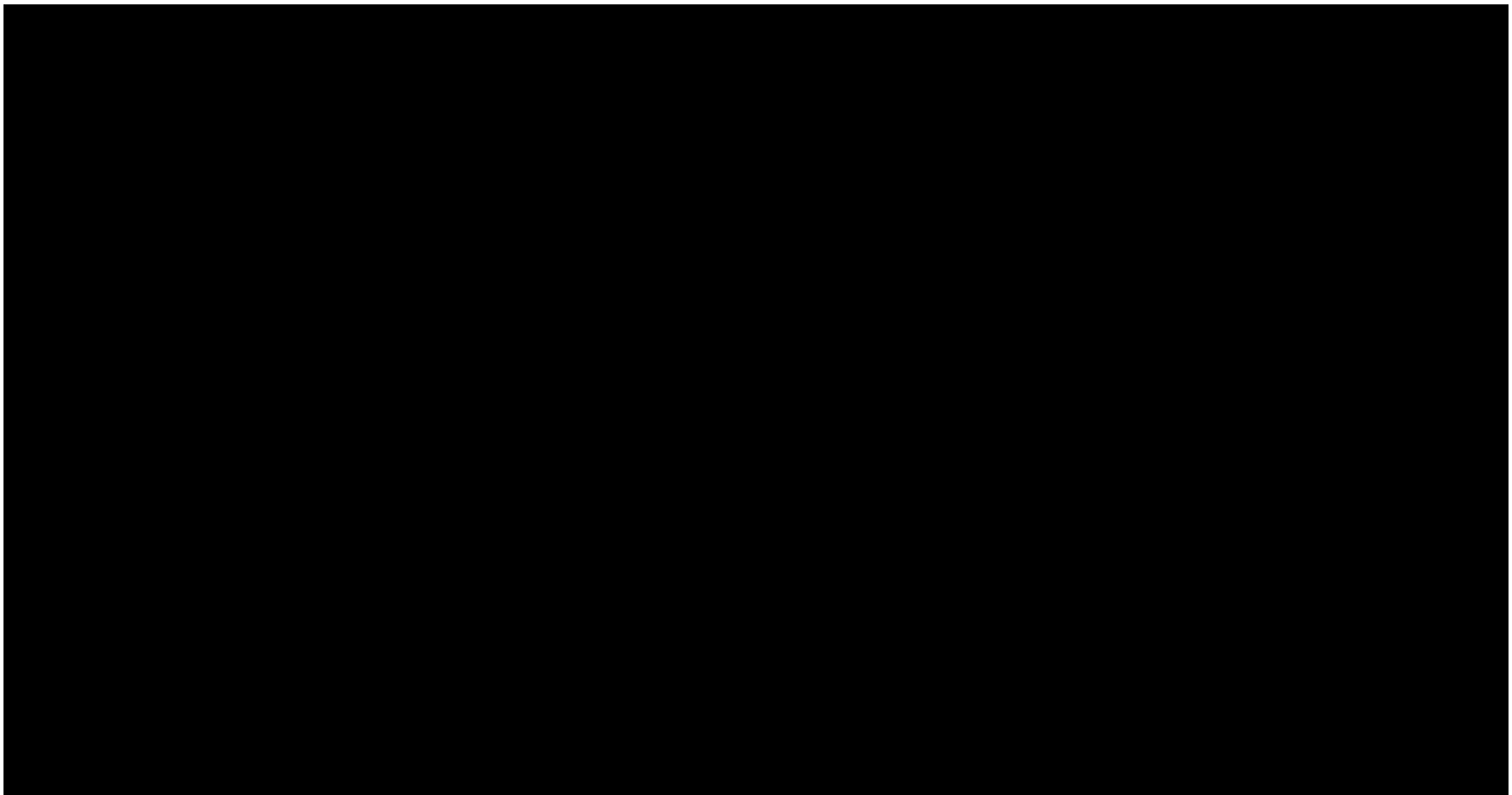


Science and Engineering Statistics

www.nsf.gov/statistics

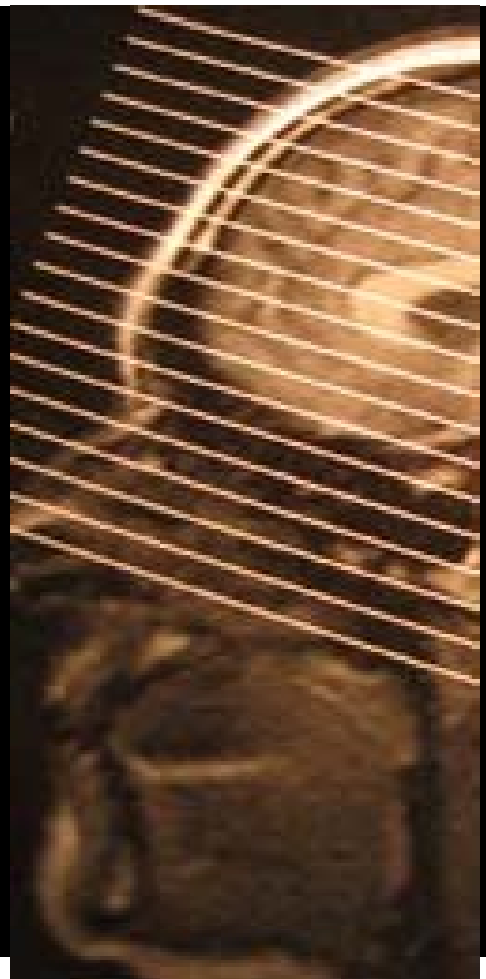
Some Trends in the Global S&T Labor Force

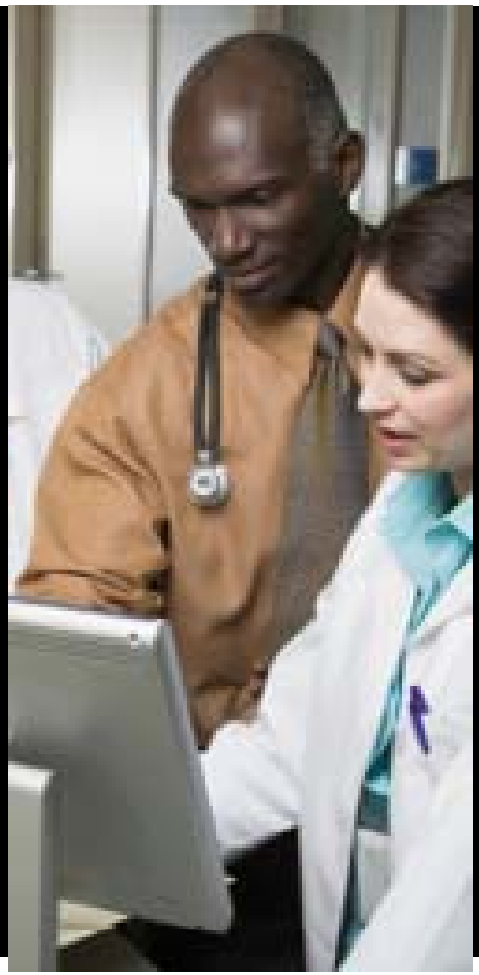
mregets@nsf.gov

NATIONAL ACADEMY OF ENGINEERING
OF THE NATIONAL ACADEMIES

Grand Challenges for Engineering in the 21st Century

1. Make solar energy economical
2. Provide energy from fusion
3. Develop carbon sequestration methods
4. Manage the nitrogen cycle
5. Provide access to clean water
6. Restore and improve urban infrastructure
7. Advance health informatics
8. Engineer better medicines
9. Reverse-engineer the brain
10. Prevent nuclear terror
11. Secure cyberspace
12. Enhance virtual reality
13. Advance personalized learning
14. Engineer the tools of scientific discovery





systems


VPL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How do we meet the Grand Challenges for Engineering in the 21st Century?

1. Make solar energy economical
2. Provide energy from fusion
3. Develop carbon sequestration methods
4. Manage the nitrogen cycle
5. Provide access to clean water
6. Restore and improve urban infrastructure
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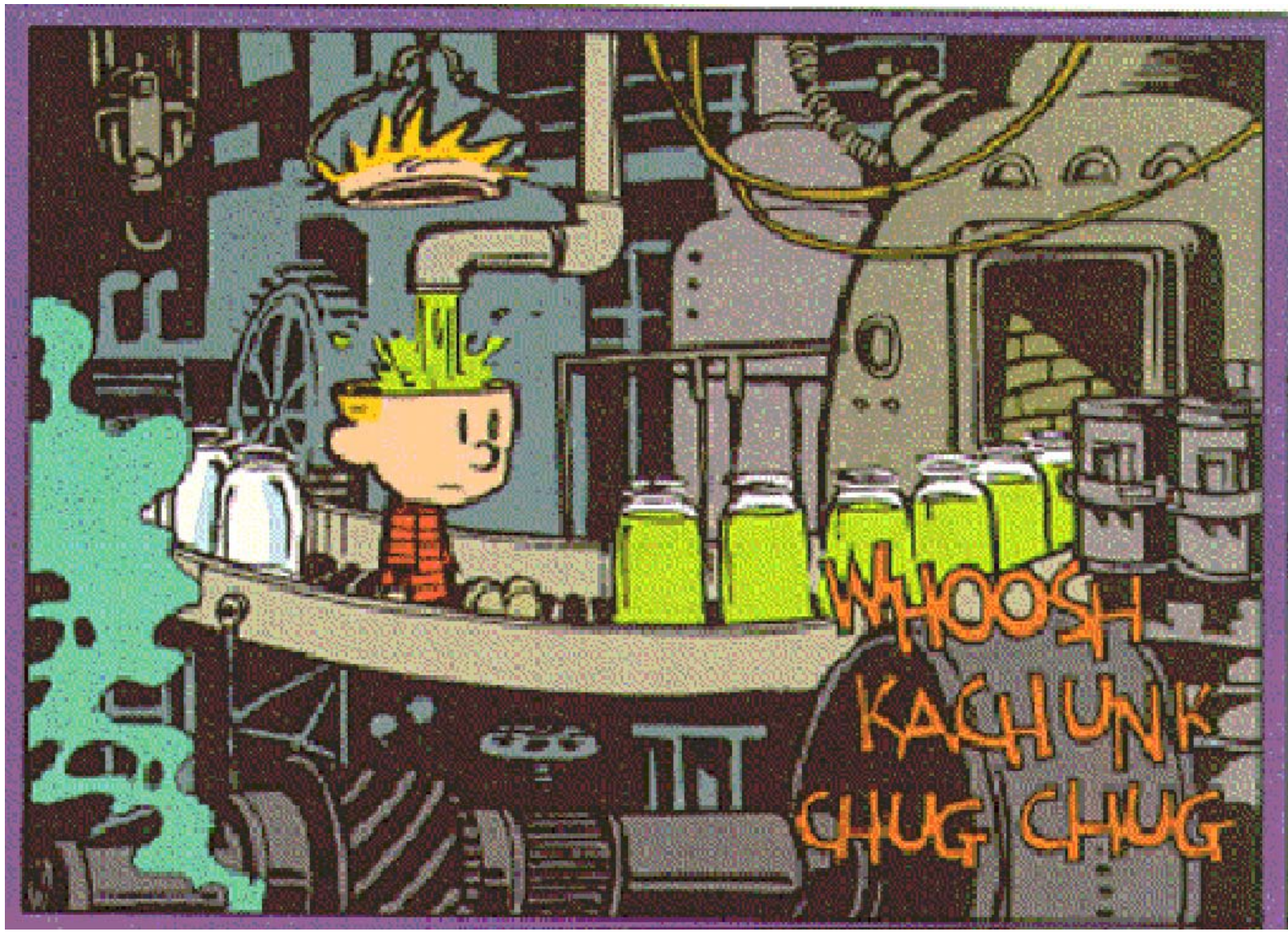
IEEE Education Society

EDUCATION

Typical Classroom 5000 Years Ago

WESTERN MICHIGAN UNIVERSITY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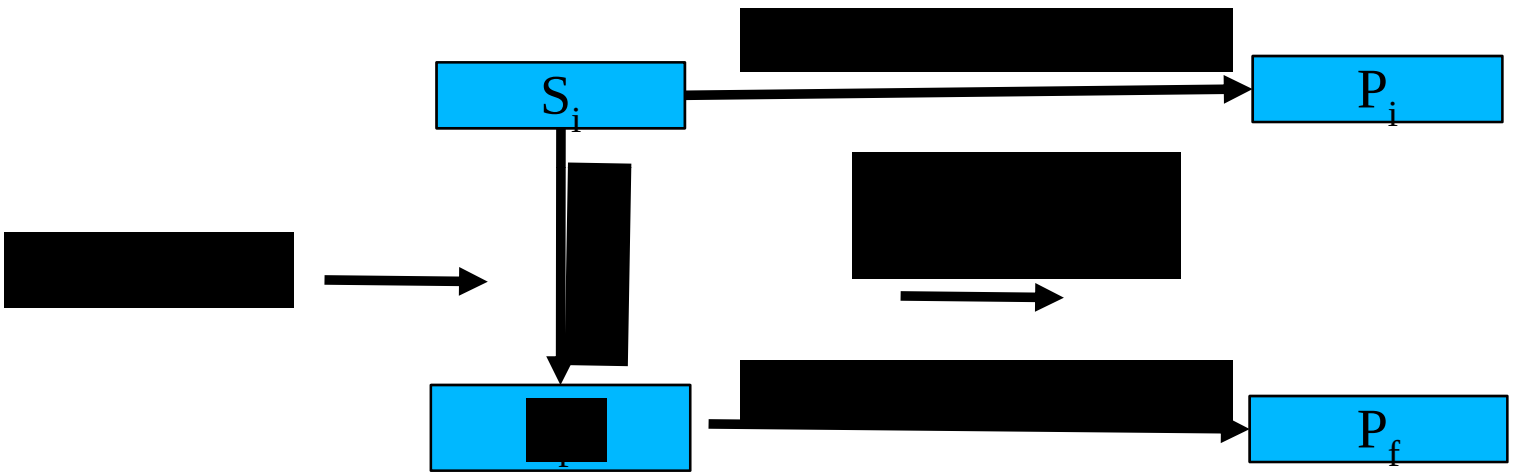

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IEEE Education Society

NRC | The National Research Council

- *How People Learn: Brain, mind, experience, and school.*
- *How People Learn: Brain, mind, experience, and school: Expanded Edition.*
- *Knowing What Students Know: The Science and Design of Educational Assessment.*
- *How Students Learn: History, Mathematics, and Science in the Classroom.*

NRC | The National Research Council

- **Students come to the classroom with preconceptions**
- **To develop competence** in an area of inquiry, students must:
- **A "meta-cognitive" approach** to instruction can help students

- Bloom's taxonomy: **levels of cognitive achievement**

- Instructor and students' **notions of understanding** may be mismatched

- **How people learn and solve problems**

- All three strongly coupled to each other

- **Crucial difference between expert and novice problem solving**
- **Experts**
- **Novices**

NRC The National Research Council

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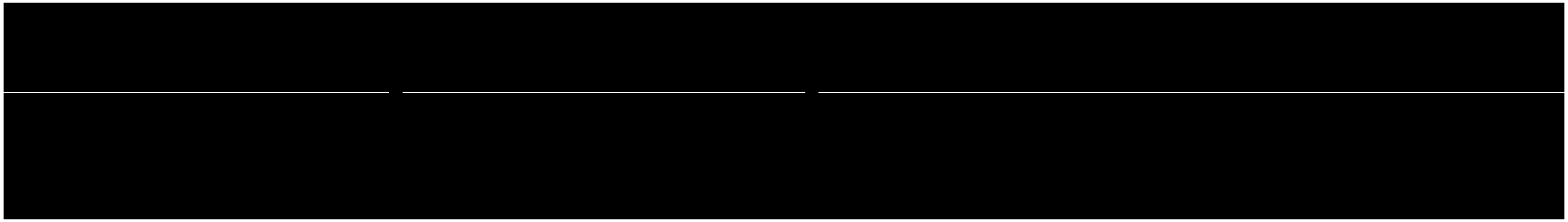

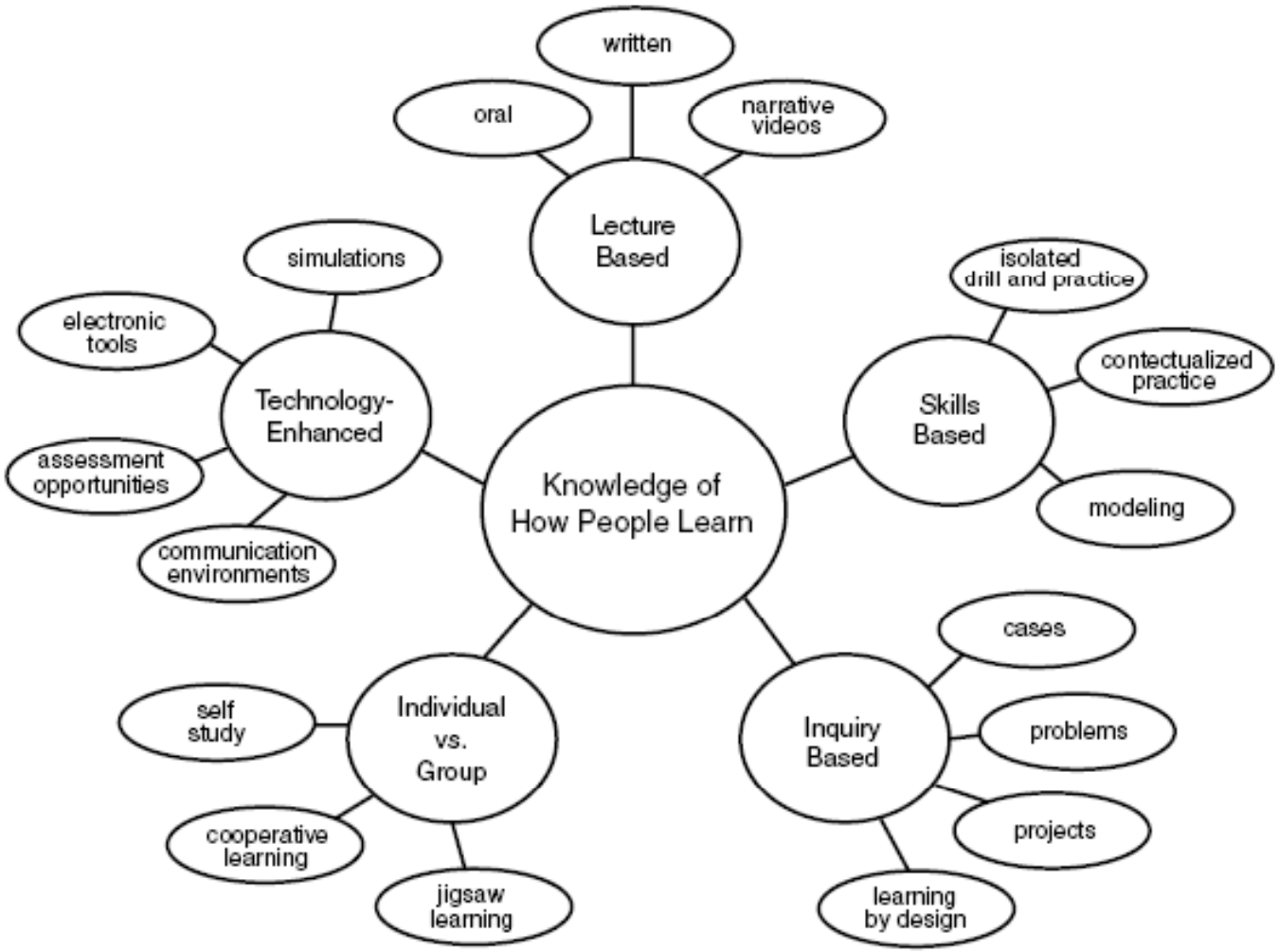
written
oral
narrative videos
Lecture Based
simulations
electronic tools
Technology-Enhanced
assessment opportunities
communication environments
isolated drill and practice
contectualized practice
Skills Based
modeling
Knowledge of How People Learn
self study
Individual vs. Group
cooperative learning
jigsaw learning
cases
problems
Inquiry Based
projects
learning by design

NRC | The National Research Council

- **Learner-centered & Knowledge-centered classroom environments**
- **Learning is influenced by the context**
- **A community-centered approach**
- **Formative assessments**

NRC The National Research Council

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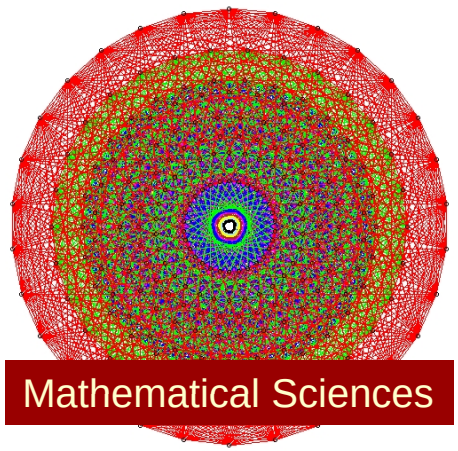
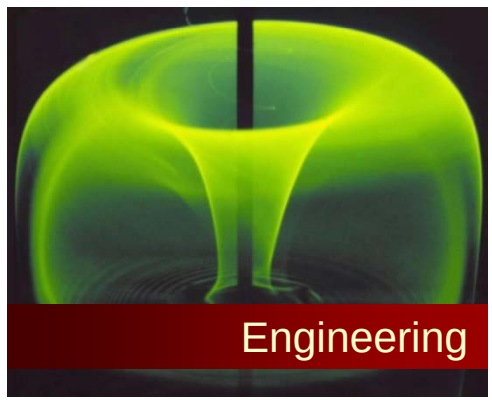
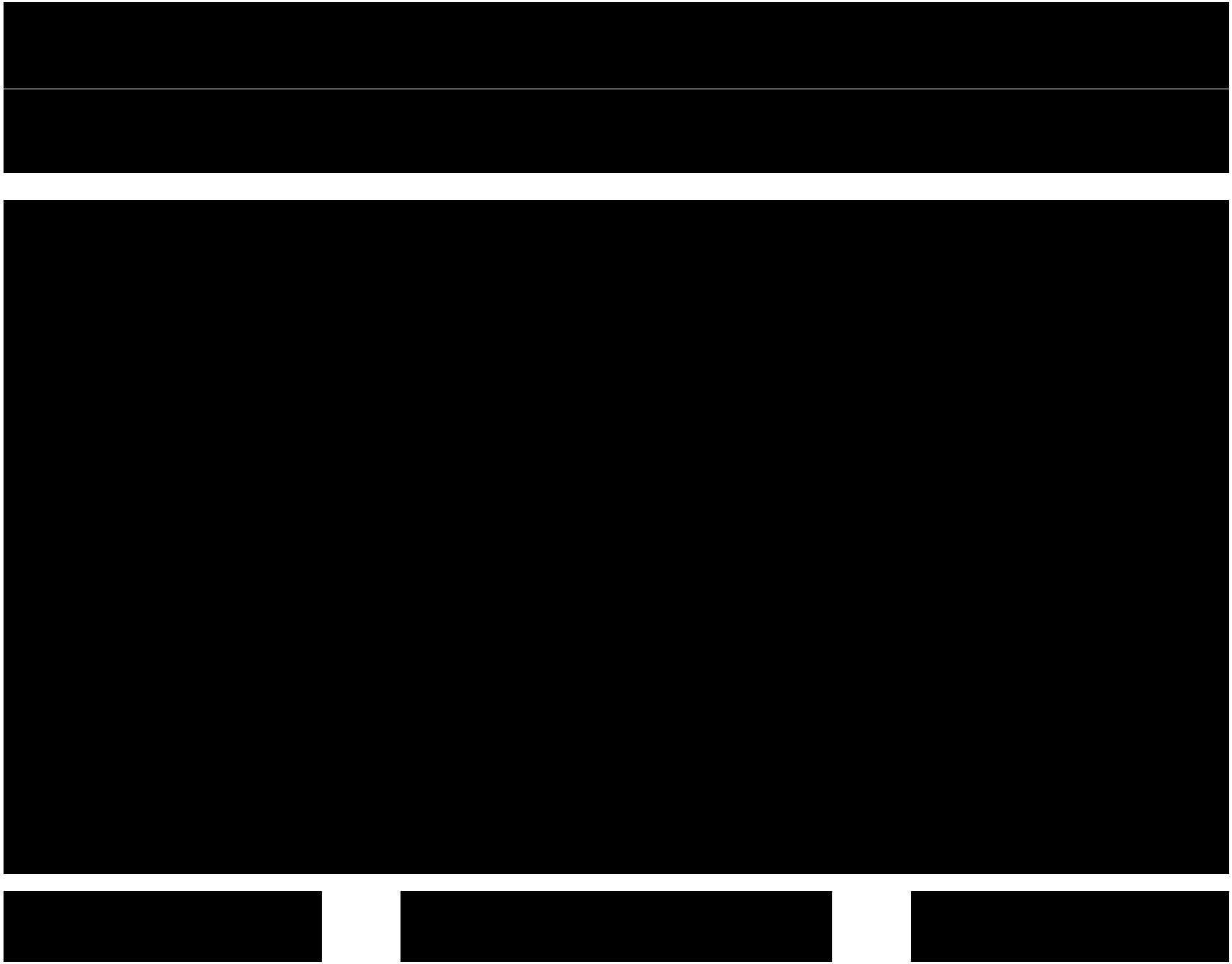
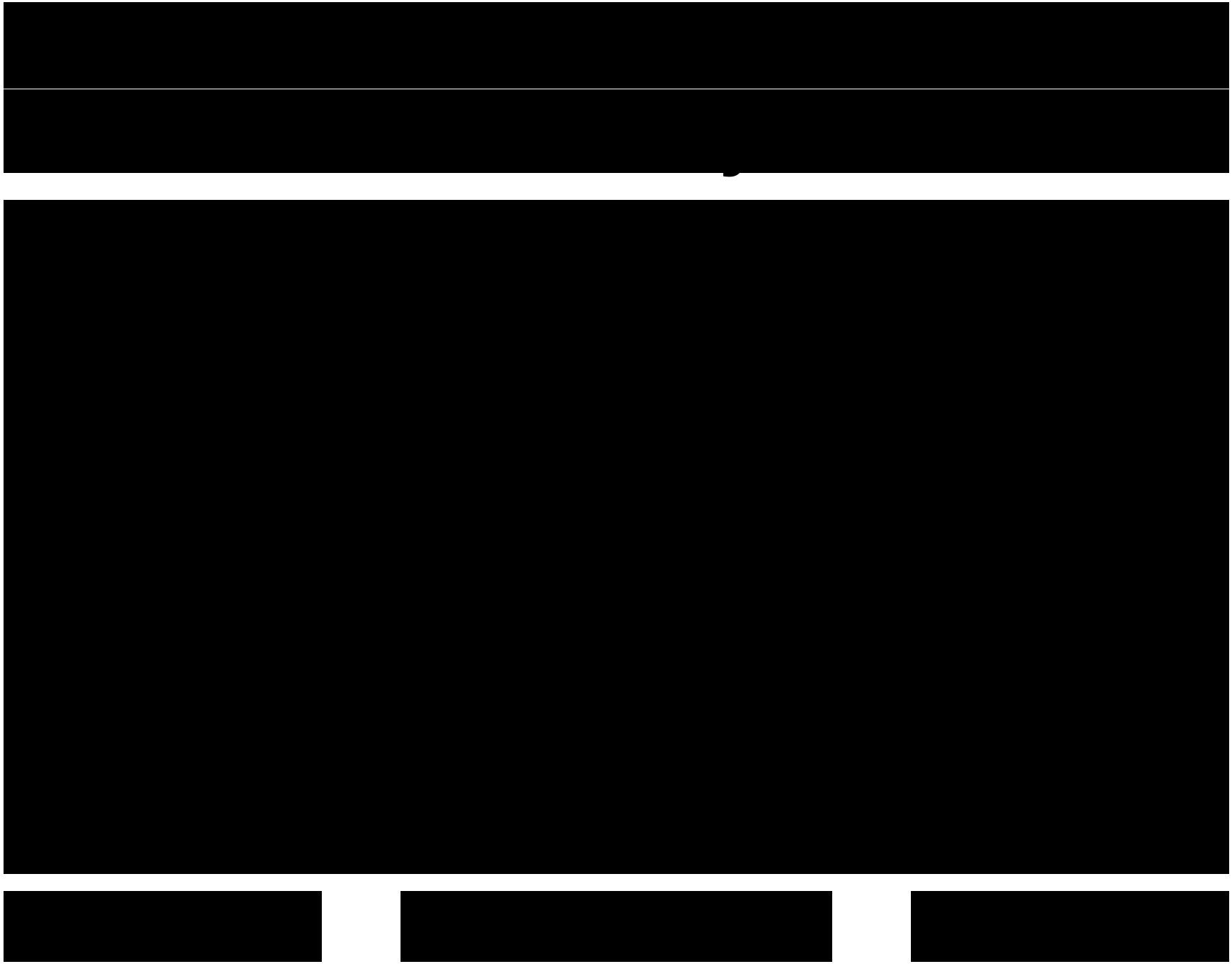
National Science Foundation
WHERE DISCOVERIES BEGIN





Transformative Research & Education





- Active Learning
- Student Peer Approaches
- Technology for Interactive Learning

- **Experiential Learning for Undergraduates**

- **Assessment of Outcomes**

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- *The Engineer of 2020*
- *Educating the Engineer of 2020*
- *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future,*
- *Transforming America's Scientific and Technological Infrastructure: Recommendations for Urgent Action*,
- *Engineering Change –A Study of the Impact of EC2000*
- *American Competitiveness Initiative – Leading the World in Innovation*

The Engineer of 2020 *Educating the Engineer of 2020*

Vision

new roles for engineers

innovation

differing disciplines common goals

- Transform engineering education

collect data

- Focus on students now in the pipeline
- Focus on the future workforce
- Focus on innovation for the future

- Key Findings: Changes in Engineering Programs
- Key Findings: Differences in learning outcomes
- Key Findings: Links Between EC2000 and Learning Outcomes
- Key Findings: Employer Views

funding for innovation-enabling research

private sector investment

K-12 math & science education
understanding how students learn

workforce training system

best and brightest high-skilled global worker

IEEE Education Society

IEEE Education Society

IEEE Education Society

IEEE Education Society

- the advancement of the theory and practice of electrical and computer engineering and of the allied arts and sciences,

IEEE Education Society

- Educational Methods, Educational Technology, Instructional Materials, History of Science and Technology, and Educational and Professional Development Programs

Engineering Education

SUMMARY

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- NAE, NAS, NRC Websites

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