

Grand Challenges Network



WHY NOW?

This is a critical time on our planet. Our age has seen an explosion of experts and thinkers in hundreds of disciplines, most of them unknown not long ago. Each field is creating huge amounts of specialized knowledge, which ricochets instantly around the world. The conundrum of attempting to make meaning of this vast array of knowledge - while not becoming overwhelmed or distracted - has become paramount.

How can we help our young people navigate the world they live in and the world they will inherit?

In 2011, a project led by the Smithsonian Institute initially identified a framework to organize and energize inter-disciplinary efforts that could stimulate intellectual exchange among universities, governments, and non-profit organizations; to

facilitate internal and external partnerships, programming and outreach; and to bring people together to exchange ideas, generate new opportunities and brainstorm strategies that benefit us as a whole.

ERC has adopted that framework as a tool for project creation, integrated learning, re-imagining and modernizing our curriculum, and sparking and informing school redesign. These four “**Grand Challenges**” provide a compelling curriculum framework and also offer an approach that unleashes students' natural curiosity, their desire to address and solve problems, their quest for answers, justice, and fairness, and a better world. They help us put the thrill and the mystery back into learning.

Read on to learn how to leverage the power of the ERC Grand Challenges™ in your school.

**UNDERSTANDING
AND SUSTAINING
A BIODIVERSE
PLANET**

**UNLOCKING THE
MYSTERIES OF
THE UNIVERSE**

**UNDERSTANDING
THE AMERICAN
EXPERIENCE**

**VALUING WORLD
CULTURES**

GET STARTED

...with students

- Find intriguing past and present current events within the Grand Challenge framework and explore them using inquiry practices and the Grand Challenges and the Curiosity Key
- Identify ways in which you, classmates and the community can take action on important issues, develop knowledge, and foster community discussions in a helpful and democratic way
- Choose a topic and create a Learning Mural based on existing knowledge and emerging questions
- Ask outside-of-school mentors and project coaches for ideas that connect and spark curiosity, possible research, project design

...with colleagues

- Choose a topic and collaborate on a Learning Mural based on existing knowledge and emerging questions
- Re-envision existing curricular units through the Grand Challenges provocations
- Use disciplinary knowledge to provide students 'just-in-time' resources and tools
- Co-design out-of-school learning opportunities that foster and extend student inquiry

EXAMPLE LEARNING MURAL

This learning mural was inspired by the ERC Grand Challenges post '[Choosing a World Without Mosquitos: CRISPR](#)'

For more on learning murals, see Larry's post on '[Making Planning Visible](#)'

The mural is a hand-drawn collage of text and diagrams centered on the word "MOSQUITOS". It includes the following elements:

- Top Left:** "What do Native Americans use as repellent?", "What is the science of bug repellent?", "how does DEET work?", "Create natural repellent using historical + modern methods".
- Top Right:** "Where do they live?", "life cycle", "range/niche", "classification", "Climate change", "migration", "habitat", "ecosystem".
- Right Side:** "Maps! by temperature by season... by time of day by location of water...", "CDC public health data", "are there inequitable patterns of mosquito-borne diseases? why?", "What species rely on them?", "skype with a researcher? research these species?".
- Center:** "MOSQUITOS" in a circle, with a list: "books", "podcasts", "taxonomies", "research", "conferences", "environmental gaps", "conference papers".
- Bottom Left:** "prevention methods", "who gets treated from mosquito-borne diseases?", "How do diseases pass from mosquitos to humans?", "today", "historically", "genomics of different methods", "blood-borne pathogens", "Zika", "Develop a game/app that integrates knowledge about mosquito life cycles, flight patterns and for food sources".
- Bottom Center:** "SHOULD HUMANS ERADICATE THEM?", "How do photographs of mosquitos shape our perception of them?", "anatomy", "aesthetics", "aerodynamics! How do they fly?", "create a large model!".
- Bottom Right:** "Are mosquito populations evolving?", "politics of mosquito abatement", "should urban planning take mosquitos into account? how so/ not?", "CRISPR", "what might make life on more beautiful to the human eye?".

Red lines connect these elements to external text boxes:

- Develop culturally sustaining perspectives:** Points to the top-left section.
- Use real-world data sets:** Points to the top-right section.
- Learn industry-recognized skills:** Points to the bottom-left section.
- Engage with issues of social justice:** Points to the bottom-left section.
- Navigate ethical dilemmas:** Points to the bottom-center section.
- Create, design, and engineer physical and digital artifacts:** Points to the bottom-center section.
- Work with authentic resources + texts:** Points to the bottom-right section.
- Connect with experts:** Points to the bottom-right section.
- Build disciplinary knowledge:** Points to the bottom-right section.

CURIOSITY KEY

Relevance

Why does this matter?
Why am I interested in this?

Evidence

What is the source? Is it credible?
Where can others explore this?

Curiosity Key

Perspective

Whose POV of view is this?
Are there others?

Connection

Is this related to something else I want to know about?
To something we've studied?

Students develop skill and comfort using the inquiry mindset of the Curiosity Key to delve into topics and develop lines of inquiry.

In teams and individually, the questions of the Curiosity Key scaffold relevant, critical problem solving over time.

ERC GRAND CHALLENGES NETWORK™

The ERC Grand Challenges Network seeks to...

- Provide regular provocations to educators, students, and collaborators for reflection, project design, and activism (through email and website)
- Generate trajectories of learning that invite students to pursue the creation of knowledge
- Connect educators, students, and collaborators as they leverage the power of the Grand Challenges in their classrooms and schools



Schools and classrooms using the Grand Challenges look different from one another. Yet, from rural to urban, small to large, these schools are all committed to supporting meaningful student work and unleashing the power of inquiry, authentic intellectual work, and real projects.

Grand Challenges Network Schools collaborate during the school year and summer to generate ideas, pursue relevant topics, work with experts, and present their work to their communities.

Join us today by signing up on our Grand Challenges Network newsletter and emailing larry@educationresourcesconsortium.org.

Unlocking the Mysteries of the Universe

- Understand the formation, geological diversity, and dynamics of the Earth, the Moon, and other rocky bodies in our solar system.
- Explore how diverse peoples throughout history have interpreted the cosmos and its role in their lives.
- Understand how stellar processes change clouds of gas and dust into stars and planets, including the Earth, and how life emerged here and perhaps elsewhere.
- Better understand the early epoch of inflation of the universe, the nature and role of dark matter in the evolution of the universe, and the properties of the dark energy that is speeding up the expansion of the universe.
- Discover how galaxies form, cluster, and interact; how super-massive black holes grow, and how galaxies evolve with cosmic time.
- Comprehend extreme explosive phenomena in the universe, with foci on gamma-ray bursts and the birth of neutron stars and black holes in supernovae, whose huge explosions create the basic elements from which life is formed.

Understanding the American Experience

- Conduct research on historical migrations and diasporas to and within America and on the contemporary movements of people, art, artifacts, and cultural expressions that connect various world cultures to the American experience.
- Use material culture and documentary collections to research and interpret national milestones and achievements; American life and national identity, cultural expression, the environment and changing landscape, and achievements in science and technology; political and military struggles; economic, scientific, technological, and cultural innovations; and artists and leaders that have defined the United States and the character of its people.
- Interpretation of the diverse communities of the United States, particularly African American, Latino, Asian Pacific American, and Native American, as well as the cultural interrelationships among these communities.
- Use biography and stories of individuals such as leaders, inventors, artists, and cultural exemplars to help understand the evolving nature of the American character.
- Conduct research on contemporary American life and creativity.

Understanding and Sustaining a Biodiverse Planet

- Improve understanding of and access to the biology and natural history of species – information that is lacking for the vast majority of species on the planet.
- Increase knowledge of the evolutionary and ecological history of species and ecosystems, and the processes responsible for population declines and extinction.
- Develop concepts, theories, tools, and models that contribute directly to halting biodiversity loss, managing species and their habitats, restoring ecosystems, and mitigating threats to the environment.
- Understand how species interactions, climate change, habitat fragmentation, diseases, environmental contaminants, and invasions of exotic species affect the survival of species and the functioning of ecosystems.
- Improve knowledge of the relationships between cultures and biological diversity over time in order to better sustain both.

Valuing World Cultures

- Shed light on the interconnections among world cultures.
- Study historic and contemporary cultural and artistic heritage, with emphasis on the heritage, arts, indigenous knowledge and expressive systems, and contemporary art and design.
- Add to knowledge of migrations, diasporas, and interactions of cultural groups.
- Deepen our understanding of significant global political and historic patterns and events and their impact on our ecology and environment.
- Augment knowledge about the processes leading to the loss of cultural diversity – tangible and intangible heritage.