LEADING THE WAY TO EFFECTIVE PRACTICES IN STEAM TEACHING AND LEARNING

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The Innovation Collaborative is:

- A coalition of national institutions representing the arts, sciences, humanities, and higher education.
  - NAEA is a founding member of the Collaborative and has a representative on the Collaborative’s Board of Directors.
  - STEM organizations represented in the Collaborative include: Association of Science-Technology Centers, Exploratorium, NASA Jet Propulsion Lab, National Science Teachers Association, among others.
  - Dedicated to identifying and disseminating information about the ways effective integration of the arts, sciences, humanities, engineering, and technology reinforces teaching and lifelong learning in classroom and out-of-school (informal) settings.
EFFECTIVE PRACTICES PROJECT K-12

The first national effort to develop a framework for what constitutes effective practices that promote creative and innovation thinking at the intersections of the arts, sciences, and humanities.
THE EFFECTIVE PRACTICES PROJECT WILL:

• Invite teachers, schools, and institutions to submit sample STEAM lessons;
• Identify and aggregate commonalities among effective lessons;
• Test findings in classrooms;
• Use them to develop educational materials and professional development; and
• Disseminate these models of effective practice.
PILOT PHASE

PURPOSE:
• Test the submission template and process and identify initial patterns of commonality.

PROCESS:
• Invited submissions of exemplar lessons from specific practitioners.
• Identified principle investigator: Hope E. Wilson, University of North Florida.
• Noted commonalities and differences among submissions.

IMMEDIATE OUTCOMES:
• Refined submission process.
• Simplified template.
• Clarified key terminology (eg. higher level thinking strategies).

DECISIONS FOR THE LONG-TERM:
• Process for evaluating submitted lessons will be iterative; thus rubric for assessing effective STEAM practices will evolve based on lessons reviewed.
• The resulting rubric will be viable for a variety of projects across disciplines.
• Evaluator will consult with the Collaborative’s research thought leaders, advisory group of university experts, and practitioner panel with teacher representatives from each discipline.
UNDER THE LENS:
INVESTIGATING THE WORLD AROUND US

Model Lesson by Samantha Melvin
Investigations of the world around us through the use of different lenses, both literal and figurative, in order to see it more clearly. Students will collaborate to visualize and communicate their findings.

**Materials:**
- LCD Microscopes (we use Celestron model)
- Magnifying loupes
- Sample slides
- Nature samples (butterfly wings, flowers, insects)
- Drawing paper/journal
- Pencils & colored pencils
- Clay (we use Longhorn White)
- Clay tools
- Kiln for firing
- Glaze
- Access to digital camera
- Access to Voicethread app/website
Visual Arts, Science, ELA & Technology
Supporting the learning *across* the curriculum

- How do artists/scientists investigate?
- How do artists/scientists transfer knowledge?
- How do artists/scientists create models?
- How do artists/scientists communicate their ideas?
- How do artists/scientists test their ideas?
CONNECTING THE LEARNING

Champion Creatively Alive Children (2010)
Microscopes & loupes funded through a generous grant from Crayola and NAESP.

Next CCAC deadline: June 2016!
http://www.crayola.com/for-educators/ccac-landing/grant-program.aspx
What is the artist/scientist supposed to do?

NATIONAL CORE ARTS STANDARDS

Creating
- Anchor Standard #1. Generate and conceptualize artistic ideas and work.
- Anchor Standard #2. Organize and develop artistic ideas and work.
- Anchor Standard #3. Refine and complete artistic work.

Performing/ Presenting/ Producing
- Anchor Standard #4. Analyze, interpret, and select artistic work for presentation.
- Anchor Standard #5. Develop and refine artistic work for presentation.
- Anchor Standard #6. Convey meaning through the presentation of artistic work.

Responding
- Anchor Standard #7. Perceive and analyze artistic work.
- Anchor Standard #8. Interpret intent and meaning in artistic work.
- Anchor Standard #9. Apply criteria to evaluate artistic work.

Connecting
- Anchor Standard #10. Synthesize and relate knowledge and personal experiences to make art.
- Anchor Standard #11. Relate artistic ideas and works with societal, cultural and historical context to deepen understanding.

http://nationalartsstandards.org
Elementary Standards

Students in kindergarten through fifth grade begin to develop an understanding of the four disciplinary core ideas: physical sciences; life sciences; earth and space sciences; and engineering, technology, and applications of science. In the earlier grades, **students begin by recognizing patterns and formulating answers to questions about the world around them.** By the end of fifth grade, students are able to demonstrate grade-appropriate proficiency in gathering, describing, and using information about the natural and designed world(s).


Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." **Recurring themes are pervasive in sciences, mathematics, and technology. These ideas transcend disciplinary boundaries and include patterns, cycles, systems, models, and change and constancy.**

http://ritter.tea.state.tx.us/rules/tac/chapter112/ch112a.html

Production and Distribution of Writing:

**CCSS.ELA-LITERACY.CCRA.W.4**
Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

**CCSS.ELA-LITERACY.CCRA.W.5**
Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

**CCSS.ELA-LITERACY.CCRA.W.6**
Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

The Fly

Tarsi, my taste buds
Help me taste your lasagna
Thanks, it’s delicious!
1. Creativity and innovation
Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.
   a. Apply existing knowledge to generate new ideas, products, or processes
   b. Create original works as a means of personal or group expression
   c. Use models and simulations to explore complex systems and issues
   d. Identify trends and forecast possibilities

2. Communication and collaboration
Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
   a. Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media
   b. Communicate information and ideas effectively to multiple audiences using a variety of media and formats
   c. Develop cultural understanding and global awareness by engaging with learners of other cultures
   d. Contribute to project teams to produce original works or solve problems

3. Research and information fluency
Students apply digital tools to gather, evaluate, and use information.
   a. Plan strategies to guide inquiry
   b. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media
   c. Evaluate and select information sources and digital tools based on the appropriateness to specific tasks
   d. Process data and report results

4. Critical thinking, problem solving, and decision making
Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
   a. Identify and define authentic problems and significant questions for investigation
   b. Plan and manage activities to develop a solution or complete a project
   c. Collect and analyze data to identify solutions and/or make informed decisions
   d. Use multiple processes and diverse perspectives to explore alternative solutions

http://www.iste.org/standards/iste-standards/standards-for-students
Assessment was based upon:

- Artist Statement (haiku poem)*
- Response to one Essential Question
RESOURCES

Artists:
• Mark Dion, Art21 http://www.pbs.org/art21/watch-now/segment-mark-dion-in-ecology
• Maria Sybilla Merian, NMWA https://nmwa.org/sites/default/files/shared/sfy_merian.pdf
• Albrecht Dürer & Leonardo da Vinci https://www.asba-art.org/article/history-botanical-art-part-3-renaissance

Other:
• Clay: http://portlandartmuseum.us/mwebcgi/mweb.exe?request=record;id=1518;type=901
• Common Core ELA Standards http://www.corestandards.org/ELA-Literacy/CCRA/W/#CCSS.ELA-Literacy.CCRA.W.4
• ISTE Standards for Students http://www.iste.org/standards/iste-standards/standards-for-students
• National Core Arts Standards http://www.nationalartsstandards.org
• Texas Essential Knowledge and Skills, 4th Grade (Art, ELA, Math, Science) http://tea.texas.gov/uploadedFiles/Curriculum/Texas_Essential_Knowledge_and_Skills/docs/Grade4_TEKS_0814.pdf
• Voicethread http://voicethread.com
WHAT’S NEXT?

How can you take a leading role in shaping effective STEAM practices?
GET INVOLVED!

• Submit a lesson, unit, or project.
• Encourage colleagues to do the same.
• Sign up for the Innovation Collaborative’s updates and quarterly newsletter.

WHO CAN SUBMIT?

• This round of research is focused on all disciplines in formal, K-12 classrooms.

NOTE: We are currently in planning phase for a study that will involve out-of-school-learning, such as programs in museums, libraries, and similar environments.
HOW DO I SUBMIT?
Visit www.innovationcollaborative.org/k-12-effective-practices and click the button for the online survey: TAKE THE EFFECTIVE PRACTICES SURVEY!

You will want to have ready:
* Length of lesson, unit, or other project
* Subjects covered
* How disciplines are integrated
* Big ideas
* Standards used

* Materials
* Instruction/Procedures
* Assessment
* Lesson successes

HOW ARE EXCEPTIONALLY EFFECTIVE TEACHERS ACKNOWLEDGED?
• The teachers whose submissions most effectively promote the creative and innovation thinking skills used as rubric criteria will be invited to be Innovation Fellows.
• The Fellows will participate with the Innovation Collaborative in planning the next phases of research and disseminating findings.
• Fellows will present together at NAEA, National Science Teachers Association (NSTA), National Association for Gifted Children (NAGC), and related conferences.
• Fellows will receive a stipend.
How do I submit?
Follow this link to the easy-to-use online submission form.
Answers are designed to be brief. You will want to have ready:

1. Whether it is a 1-2 day lesson, a multi-day unit, or other project
2. Subjects covered
3. How disciplines are integrated
4. Big ideas
5. Standards used
6. Materials
7. Instruction/procedures
8. Assessment information
9. What made the lesson successful

Is there more information on the submission process?

View our video that walks you through the process of submitting your lesson, unit, or project. It’s quick and easy to submit.

Where do I go with questions?
Email: info@innovationcollaborative.org

TAKE THE EFFECTIVE PRACTICES SURVEY!
QUESTIONS? IDEAS? SUBMISSIONS?

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