

# WebQuest Student Page

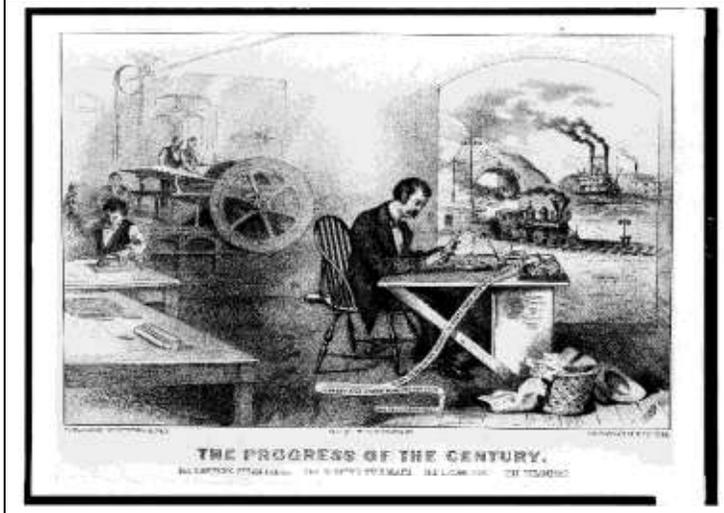
## Turning S.T.E.M. into S.T.E.A.M.

### An Interdisciplinary WebQuest

Grades 9 - 12

Stevie Kline & Joyce Mason

November 2012



**“Creativity is contagious, pass it on.” Albert Einstein**

*The progress of the century - the lightning steam press, the electric telegraph, the locomotive, [and] the steamboat.* Creator(s): [Currier & Ives.](http://www.loc.gov/pictures/item/90716345/)  
<http://www.loc.gov/pictures/item/90716345/>

## How is art essential to creativity and innovation?

### Introduction

Joichi Ito said, “Most creative work is a process of people passing ideas and inspirations from the past into the future and adding their own creativity along the way.” Many educators and business professionals feel America’s strength has always been her citizens' innovative and creative ability, and are becoming increasingly concerned that creativity is not being fostered in America’s public schools today. In this WebQuest you will explore the works of three very different innovators, Leonardo da Vinci, Albert Einstein, and Frank Lloyd Wright and attempt to discover the traits they had in common and how nature, beauty, and art influenced them. As students, what do you think your creative contributions will be? What do schools need to provide to assure students achieve their creative potential?

## How is art essential to creativity and innovation?

### Task

At last night's School Board meeting it was announced that due to budget shortfalls, the Board would begin reviewing ways to trim the school budget short of cutting funding for science, technology, and math. Board members identified possible areas to eliminate. The Board president suggested that by cutting the entire arts program, the budget could be balanced.

Consider this Brian Aldiss quote, "Whatever creativity is, it is in part, a solution to a problem." Your team will use its creativity to investigate the importance of art as part of the school curriculum. You will create an original visual presentation to persuade the School Board and school community to keep the arts in the school's curriculum by demonstrating how art is an essential component for increasing student achievement, creativity, and innovation. The final presentation to the School Board will be created using PowerPoint.

## How is art essential to creativity and innovation?

### Process

1. You will be assigned to a team consisting of four students.
2. Each team includes the following roles:
  - A. Progress monitors- check that each member of the team is gathering information and filling out the cluster map (graphic organizer).
  - B. PowerPoint tutors- assist members in creating the slides including the aesthetics.
  - C. Script writers- review the notes and prepare the final script for the presentation
  - D. Presenters- practice and deliver the final presentation

You may volunteer for one of the roles, or your teacher may assign you.

3. Your TEAM will explore ONE of three iconic innovators: Leonardo da Vinci, Albert Einstein, or Frank Lloyd Wright using resources from the Library of Congress and suggested supplemental sites.
4. Individual Assignment: Each team member will use the list of links to explore your group's assigned innovator. You are to find and record on the graphic organizer examples of art or art's influence on each of these men and/or their creations. You can find the cluster diagram (graphic organizer) at <http://my.hrw.com/nsmedia/intgos/html/igo.htm>
5. Click on the "Cluster Diagram" hyperlink to download a PDF of it. Once you've downloaded the organizer, type in your research findings and comments, and print it out.

Reminder: Graphic organizers are an illustration of your thoughts on paper. They can help you brainstorm, organize, and visualize your ideas. Place your innovator's name in the center of the organizer.

### Leonardo da Vinci

"Iron rusts from disuse, stagnant water loses its purity, and in cold weather becomes frozen; even so does inaction sap the rigors of the mind." Leonardo da Vinci



Title: Leonardo da Vinci.  
Wikimedia Commons (Public Domain)  
[http://www.encyclopedia.com/topic/Leonardo\\_da\\_Vinci.aspx](http://www.encyclopedia.com/topic/Leonardo_da_Vinci.aspx)

- A. Leonardo's Workshop: <http://www.loc.gov/loc/kidslc/LGpdfs/leo-teacher.pdf>
- B. Picture of an invention: <http://www.loc.gov/pictures/item/2006683373/>
- C. Reproduction from a page of Leonardo's notebook:  
<http://www.loc.gov/pictures/item/2006681086/>
- D. Inventor's Workshop: <http://www.mos.org/sln/Leonardo/inventorsworkshop.html>
- E. Leonardo's Inventions: <http://www.da-vinci-inventions.com/davinci-inventions.aspx>
- F. Leonardo da Vinci, scientist, inventor, artist from the Museum of Science:  
<http://www.mos.org/leonardo/>
- G. Chronological list of Leonardo's paintings:  
[http://arthistory.about.com/od/leonardo/ig/leonardo\\_paintings/](http://arthistory.about.com/od/leonardo/ig/leonardo_paintings/)

### Albert Einstein

The most beautiful experience we can have is the mysterious—the fundamental emotion which stands at the cradle of true art and true science.

Albert Einstein 'The World As I See It', Forum and Century Oct 1930), 84, 193-194. Albert Einstein and Carl Seelig. Ideas and Opinions, based on Mein Weltbild (1954), 11.



Title: [Albert Einstein, half-length portrait, seated, facing right] / Doris Ulmann.

Creator(s): [Ulmann, Doris, d. 1934](#), photographer

Date Created/Published: [1931]

<http://www.loc.gov/pictures/item/96522310/>

- A. Image "America Gains a Famous Citizen"  
<http://www.loc.gov/pictures/item/2004672481/>
- B. Proof of E=mc<sup>2</sup> Video: <http://www.youtube.com/watch?v=hW7DW9NIO9M>
- C. Read the story (transcript) behind Einstein's big idea:  
<http://www.pbs.org/wgbh/nova/physics/einstein-big-idea.html>
- D. Read Einstein's revolution:  
<http://www.amnh.org/exhibitions/past-exhibitions/Einstein>
- E. "This Einstein exhibit contains many pictures, cartoons, voice clips, and essays on Einstein's work on special relativity, Brownian motion, and more."

<http://www.aip.org/history/einstein/index.html>

F. Mathematics and graphic arts have important relationships; recent technologies have made possible the development of various forms of digital art that allow artists and mathematicians to cooperate in a highly synergistic fashion.

<http://virtualmathmuseum.org/mathart/MathematicalArt.html>

G. Discover mathematics in art:

[http://blantonmuseum.org/interact/math\\_and\\_art\\_connections/](http://blantonmuseum.org/interact/math_and_art_connections/)

## Frank Lloyd Wright

"An idea is salvation by imagination."

In The Speaker's Electronic Reference Collection, AApeX Software, 1994



Architect Frank Lloyd Wright

Credit: Ravenna, AI, photographer, "Frank Lloyd Wright, head-and-shoulders portrait, facing left." 1954. Prints and Photographs Division, Library of Congress.

[http://www.americaslibrary.gov/aa/wright/aa\\_wright\\_subj\\_e.html](http://www.americaslibrary.gov/aa/wright/aa_wright_subj_e.html)

A. Additional biographic information:

[http://www.americaslibrary.gov/aa/wright/aa\\_wright\\_subj.html](http://www.americaslibrary.gov/aa/wright/aa_wright_subj.html)

B. Designs for America Exhibit: <http://www.loc.gov/exhibits/flw/flw.html>

C. Frank Lloyd Wright's Buildings: [http://www.loc.gov/rr/print/list/103\\_flw.html](http://www.loc.gov/rr/print/list/103_flw.html)

D. The Genius of Frank Lloyd Wright:

<http://www.loc.gov/exhibits/treasures/tri004.html>

E. Windows of Frank Lloyd Wright:

[http://franklloydwright.tercenim.com/stained\\_glass.htm#Links](http://franklloydwright.tercenim.com/stained_glass.htm#Links)

(Scroll down the pages to view windows.)

F. Virtual Frank Lloyd Wright: <http://www.delmars.com/wright/index.html>

G. View the interior of the Deal estate:

<http://www.youtube.com/watch?v=wCviO2oNa0Y>

6. Group Assignment: After completing your exploration, you will discuss your discoveries with the rest of your team and together create a "team best" graphic organizer using a

spider map (graphic organizer). This spider map will be used as a resource for the final task. You will find the spider map at <http://my.hrw.com/nsmedia/intgos/html/igo.htm>. Download and fill it out. Your team may need to enlarge the spider map or use more than one.

7. **Partner Assignment:** Pair up with a member of your team to take on the role of your group's assigned innovator. Together, you and your partner will complete two of the suggested activities: design a building; create a tessellation; make a FLW window; create a painting; or illustrate a mathematical problem. You and your partner will decide which two activities to complete.
8. Create a PowerPoint slide to display your creations. Include the URL hyperlink and a picture or screenshot of your completed activities. Save it to your team shared folder.

### Leonardo da Vinci



- The National Gallery of Art offers several online interactive art projects. <http://www.nga.gov/kids/zone/zone.htm>
- Paint or draw like a famous artist.
  - Create your own Picasso <http://www.picassohead.com/create.html>
  - Keith Haring's interactive coloring book <http://www.haringkids.com/coloringbook/index.html>
  - Paint with drips and dots <http://www.jacksonpollock.org/>

### Frank Lloyd Wright



- Design a house with Frank Lloyd Wright using Architect Studio 3D [http://architectstudio3d.org/AS3d/design\\_studiolite.html](http://architectstudio3d.org/AS3d/design_studiolite.html) Read the instructions before beginning.
- Analyze the windows designs from Wright's Ennis House <http://franklloydwright.tercenim.com/Ennis.htm> Design your own window following the instructions on this site. You may adapt the project to fit your idea.

### Albert Einstein or Frank Lloyd Wright



- Design a tessellation <http://illuminations.nctm.org/ActivityDetail.aspx?ID=202>
- Design a tessellation online <http://gwydir.demon.co.uk/jo/tess/sqtile.htm>
- Interactive Tessellate <http://www.shodor.org/interactivate/activities/Tessellate/>

9. **Individual Assignment:** Reflect on your creative activity experience and write a 500 word report about it. Make sure you discuss how you approached this activity and what science, technology, and math you used. Expand on how art was also an integral part of the activity. You will use this report as resource to develop talking points for your final task.

10. Group Assignment: Now each team will meet to discuss and compare your teammates' individual slides and use them to make three team slides. These will be combined with the other teams' slides to create the final task presentation.

**Note:** There will be three slides for Leonardo da Vinci, three slides for Albert Einstein, and three slides for Frank Lloyd Wright. The entire group will collaborate to prepare the introductory, transition, conclusion, closing and reference slides. The PowerPoint tutors and scriptwriters will work closely together on the last task. Presenters will practice delivering the final PowerPoint, and the progress monitors will clock timings to make sure that all runs smoothly.

11. Presentation to School Board Members.

### How is art essential to creativity and innovation?

#### Evaluation

The group product will be evaluated using the Analyze/Persuade-Analytical Scoring Guide from DigiTales <http://tinyurl.com/stem2steam>. This rubric will be used to score content and presentation for both the individual contributions, and the final team presenting. In addition, there are individual checklists for research completion and a peer evaluation.

Peer Review Form: [www.intel.com/cd/corporate/education/apac/eng/387305.htm](http://www.intel.com/cd/corporate/education/apac/eng/387305.htm)

### How is art essential to creativity and innovation?

#### Conclusion

Now it is time for your team members to meet with the other two teams to discuss as a class what you have learned from each of the three iconic innovators. What attributes do these three men have in common? How did their work influence society? How does art contribute to innovation? Is creativity something that can be nourished? Would you add an A (for art) to S.T.E.M. education to make it S.T.E.A.M.? How would you explain this new concept? Are there any other innovators who might be an "A" example?

### How is art essential to creativity and innovation?

| [Link to Teacher Page](#) |

#### Credits and References

Designed by Stevie Kline and Joyce Mason, 2012, [klines@iu1.k12.pa.us](mailto:klines@iu1.k12.pa.us) and [masonj@cmsd.k12.pa.us](mailto:masonj@cmsd.k12.pa.us) as part of the *WebQuesting at the Library of Congress* professional development course offered through [Teaching with Primary Sources at Waynesburg University](#). This WebQuest was influenced by our presentation "S.T.E.A.M. Along with Leonardo, Albert, and Frank: Cross-curricular Project Creation" shared at various educational conferences in 2012.



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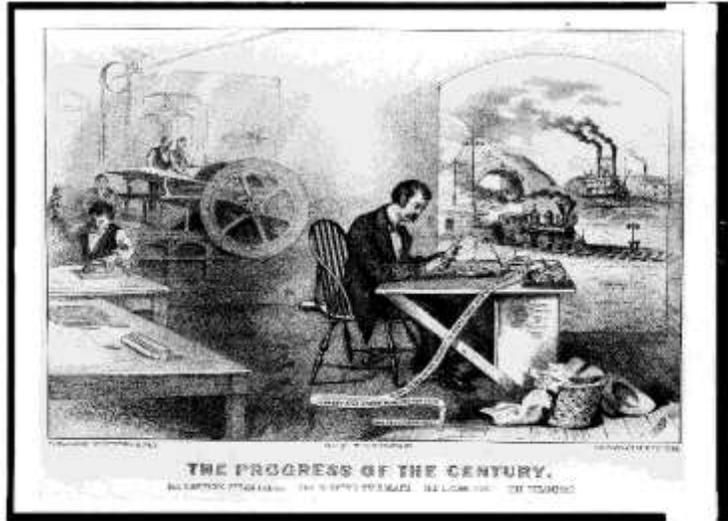
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*The progress of the century - the lightning steam press, the electric telegraph, the locomotive, [and] the steamboat. Creator(s): [Currier & Ives.](http://www.loc.gov/pictures/item/90716345/), <http://www.loc.gov/pictures/item/90716345/>*

## How is art essential to creativity and innovation?

| [Link to Student Page](#) |

### Introduction for Teachers

Designed by Stevie Kline and Joyce Mason, [klines@iu1.k12.pa.us](mailto:klines@iu1.k12.pa.us),  
[masonj@cmsd.k12.pa.us](mailto:masonj@cmsd.k12.pa.us).

This WebQuest is designed to be interdisciplinary. It could be used as a unit of study for English, Information Literacy (taught in a school library), Multimedia, Art, Psychology, Computer Design, and Social Studies.

## How is art essential to creativity and innovation?

### About the Learners

This WebQuest is designed for secondary students, grades 9-12, and by its nature is interdisciplinary. The team roles can be assigned by the teacher to allow for a divergent group of learners.

The WebQuest integrates technology tools and uses primary sources from the Library of Congress to teach persuasive writing, public speaking skills, presentation-creation skills, critical thinking, and problem-solving.

The students should have a basic knowledge of PowerPoint, webpage navigation, and web evaluation skills.

The students will be working individually and in pairs to research their group's assigned innovator (da Vinci, Einstein, Wright) through a series of critical thinking activities.

Students will then collaborate to construct a presentation designed to persuade the School Board that art is essential for the support of creativity and innovation.

### **How is art essential to creativity and innovation?**

**Academic Standards** – Listed below are standards for grades 9-10 and grades 11-12 in English Language Arts and Social Studies that are addressed in this project.

#### **PA Common Core English Language Arts**

**The student will explore and analyze an assigned innovator using the resource links provided and record responses on the graphic organizer.**

#### **1.2 Reading Informational Text**

Students read, understand, and respond to informational text – with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.

#### **Grades 9 -10**

CC.1.2.9-10.B

Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences and conclusions based on an author's explicit assumptions and beliefs about a subject.

#### **Grades 11-12**

CC.1.2.11-12.B

Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences and conclusions based on and related to an author's implicit and explicit assumptions and beliefs.

CC.1.2.11-12.G

Integrate and evaluate multiple sources of information presented in different media or formats (e.g. visually, quantitatively) as well as in words in order to address a question or solve a problem.

**The student will write a 500 word essay discussing how he approached the building/design activity and explain what science, technology, and math were used.**

#### **1.4 Writing**

Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content

#### **Grades 9-10**

CC.1.4.9-10.A

Write informative/ explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately.

CC.1.4.9-10.C

Develop and analyze the topic with relevant, well-chosen, and sufficient facts,

extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic; include graphics and multimedia when useful to aiding comprehension.

CC.1.4.9-10.J

Create organization that establishes clear relationships among claim(s), counterclaims, reasons, and evidence; Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims; provide a concluding statement or section that follows from and supports the argument presented.

CC.1.4.9-10.U

Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

## **Grades 11-12**

CC.1.4.11-12.A

Write informative/ explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately.

CC.1.4.11-12.C

Develop and analyze the topic thoroughly by selecting the most significant and relevant facts extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic; include graphics and multimedia when useful to aiding comprehension.

CC.1.4.11-12.J

Create organization that logically sequences claim(s), counterclaims, reasons, and evidence; Use words, phrases, and clauses as well as varied syntax to link the major sections of the text create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims; provide a concluding statement or section that follows from and supports the argument presented.

CC.1.4.11-12.U

Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments and information.

**The student will present a PowerPoint about the need for/ impact of art education to the School Board.**

## **1.5 Speaking and Listening**

Students present appropriately in formal speaking situations, listen critically, and respond intelligently as individuals or in group discussions.

## **Grades 9-10**

CC.1.5.9-10.A

Initiate and participate effectively in a range of collaborative discussions on grades level topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

CC.1.5.9-10.C

Integrate multiple sources of information presented in diverse media or formats (e.g. visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

CC.1.5.9-10.D

Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning; ensure that the presentation is appropriate to purpose, audience, and task.

CC.1.5.9-10.F

Make strategic use of digital media in presentations to add interest and enhance understanding of findings, reasoning, and evidence.

CC.1.5.9-10.G

Demonstrate command of the conventions of standard English when speaking based on grade 9- 10 level and content.

### **Grades 11-12**

CC.1.5.11-12.A

Initiate and participate effectively in a range of collaborative discussions on grades level topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

CC.1.5.11-12.C

Integrate multiple sources of information presented in diverse formats and media (e.g. visually, quantitative, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

CC.1.5.11-12.D

Present information, findings, and supporting evidence, conveying a clear and distinct perspective; organization, development, substance, and style are appropriate to purpose, audience, and task.

CC.1.5.11-12.F

Make strategic use of digital media in presentations to add interest and enhance understanding of findings, reasoning, and evidence.

CC.1.5.11-12.G

Demonstrate command of the conventions of standard English when speaking based on grade 11- 12 level and content.

**The student will cite specific information and respond to informational text and websites.**

**The student will present a PowerPoint about the need for/ impact of art education to the school board.**

### **8.5 Reading Informational Text**

Students read, understand, and respond to informational text – with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.

### **Grades 9-10**

CC.8.5.9-10.A.

Cite specific textual evidence to support analysis of primary and secondary sources, attending to such features as the date and origin of the information,

CC.8.5.9-10.G.

Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text.

CC.8.5.9-10.I.

Compare and contrast treatments of the same topic in several primary and secondary sources.

## **Grades 11-12**

CC.8.5.11-12.A.

Cite specific textual evidence to support analysis of primary and secondary sources, connecting insights gained from specific details to an understanding of the text as a whole.

CC.8.5.11-12.G.

Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, as well as in words) in order to address a question or solve a problem.

CC.8.5.11-12.I.

Integrate information from diverse sources, both primary and secondary, into a coherent understanding of an idea or event, noting discrepancies among sources.

**The student will explore and analyze an assigned innovator using the resource links provided and record responses on the graphic organizer.**

**The student will write a 500 word essay discussing how he approached the building/design activity and explain what science, technology, and math were used.**

**The student will present a PowerPoint about the need for/ impact of art education to the school board.**

## **Writing in History and Social Studies**

### **8.6 Writing**

Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate

## **Grades 9-10**

CC.8.6.9-10.E.

Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

CC.8.6.9-10.G.

Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for

citation.

## **Grades 11 -12**

CC.8.6.11-12.E.

Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

CC.8.6.11-12.G.

Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

## **NETS for Students**

1 through 6

<http://www.iste.org/docs/pdfs/nets-s-standards.pdf?sfvrsn=2>

## **Vocabulary Words**

- |                     |                |
|---------------------|----------------|
| - S.T.E.M.          | - relativity   |
| - aesthetics        | - spider map   |
| - cluster map       | - sustainable  |
| - graphic organizer | - tessellation |
| - innovator         |                |

## **How is art essential to creativity and innovation?**

### **Process for Teachers**

This lesson is designed to be completed in two weeks.

1. One class period to introduce the problem, solution through project evidence, WebQuest format, and team roles.
2. Three class periods to announce teams, complete research on the three innovators, and complete the cluster map.
3. One class period for team members to discuss their findings and complete the team spider map.
4. Two class periods for pairs to complete the innovator-inspired activities.
5. One class period for team members to prepare slide about their activity; if time permits, students can begin work on the 500 word essay. This can be assigned as homework.
6. Collaboration days – 2 class periods - students prepare sets of slides and then work as a class to finalize slides and script for presentation.
7. One class period for presentation practice.

Depending on the information literacy skills of the student, the teacher may deem it necessary to review PowerPoint design, web page navigation, and web evaluation. This would add two class periods.

The written reflection can be revised to meet the needs of students requiring adaptation.

Teacher skills required: PowerPoint creation, familiarity with the Library of Congress web pages and resources, and understanding of S.T.E.A.M. and S.T.E.M.

### How is art essential to creativity and innovation?

#### Resources for Teachers

- Access to computers
- Internet
- PowerPoint
- Flash
- Print cluster and spider map for students that may need pencil to paper.

#### Cluster Diagram

According to Enchanted Learning: "The cluster diagram helps students to systematize the generation of ideas based upon a central topic. Using this type of diagram, the student can more easily brainstorm a theme, associate about an idea, or explore a new subject. For example, a cluster diagram can be used to create a graphic display to brainstorm about a topic like pollution. The first level of ideas could be specific types of pollution (like air pollution, water pollution, polluted soil, etc.), and the second-level could be details on each of those subtopics (for air pollution, you could include causes of air pollution, effects of air pollution, how to stop it, etc.). You could go on to include further details on these third-level topics, and more levels, until you are out of ideas."

<http://www.enchantedlearning.com/graphicorganizers/cloud/>

**Teacher Notes** on how to use the Spider diagram as an organizer with a class can be found at [http://my.hrw.com/nsmedia/intgos/html/PDFs/Spider\\_Map\\_lesson.pdf](http://my.hrw.com/nsmedia/intgos/html/PDFs/Spider_Map_lesson.pdf).

**Joichi Ito** is a leading thinker and writer on innovation, global technology policy, and the role of the Internet in transforming society in substantial and positive ways. Biography <http://www.media.mit.edu/people/joi>.

**Brian Aldiss** is a multiple award winning Grand Master of science fiction; he is also a poet, playwright, and general fiction writer. He is the author of over 80 books in total.

#### **Links outside of the Library of Congress to be used for student exploration:**

Inventor's Workshop <http://www.mos.org/sln/Leonardo/inventorsworkshop.html>

Leonardo's Inventions <http://www.da-vinci-inventions.com/davinci-inventions.aspx>

Leonardo da Vinci, scientist, inventor, artist from the Museum of Science  
<http://www.mos.org/leonardo/>

Chronological list of Leonardo's paintings  
[http://arthistory.about.com/od/leonardo/ig/leonardo\\_paintings/](http://arthistory.about.com/od/leonardo/ig/leonardo_paintings/)

Proof of  $E=mc^2$  video from Minute Physics  
<http://www.youtube.com/watch?v=hW7DW9NIO9M>

Read the story (transcript) behind Einstein's big idea.

<http://www.pbs.org/wgbh/nova/physics/einstein-big-idea.html>

Read Einstein's revolution from the American Museum of Natural History

<http://www.amnh.org/exhibitions/past-exhibitions/Einstein>

"This Einstein exhibit contains many pictures, cartoons, voice clips, and essays on Einstein's work on special relativity, Brownian motion, and more." It is from the American Institute of Physics. <http://www.aip.org/history/einstein/index.html>

Mathematics and graphic arts have important relationships; recent technologies have made possible the development of various forms of digital art that allow artists and mathematicians to cooperate in a highly synergistic fashion.

<http://virtualmathmuseum.org/mathart/MathematicalArt.html>

--Discover mathematics in art

[http://blantonmuseum.org/interact/math\\_and\\_art\\_connections/](http://blantonmuseum.org/interact/math_and_art_connections/)

--Windows of Frank Lloyd Wright

[http://franklloydwright.tercenim.com/stained\\_glass.htm#Links](http://franklloydwright.tercenim.com/stained_glass.htm#Links) (Scroll down the pages to view windows.)

--Virtual Frank Lloyd Wright <http://www.delmars.com/wright/index.html>

--View the interior of the Deal estate (YouTube video)

<http://www.youtube.com/watch?v=wCviO2oNa0Y>

## **Activities for students**

### **Frank Lloyd Wright**

--Design a house with Frank Lloyd Wright using Architect Studio 3 D

[http://architectstudio3d.org/AS3d/design\\_studiolite.html](http://architectstudio3d.org/AS3d/design_studiolite.html) Read the instructions before beginning.

--Analyze the windows designs from Wright's Ennis House

<http://franklloydwright.tercenim.com/Ennis.htm> Design your own window following the instructions on this site.

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--Design a tessellation. <http://illuminations.nctm.org/ActivityDetail.aspx?ID=202>

--Design a tessellation online < <http://gwydir.demon.co.uk/jo/tess/sqtile.htm> >

--Interactive Tessellate <http://www.shodor.org/interactivate/activities/Tessellate/>

### **Leonardo da Vinci**

--The National Gallery of Art offers several online interactive art projects.

<http://www.nga.gov/kids/zone/zone.htm>

--Paint like a famous artist.

<http://blog.discoveryeducation.com/kbosch/2009/04/06/eight-great-interactive-sites-that-let-you-paint-like-a-famous-artist/>

## **Additional links for background reading**

### **Readings on S.T.E.A.M.:**

"Engaging Students in the STEM Classroom Through "Making"

<http://www.edutopia.org/blog/stem-engagement-maker-movement-anmarie-thomas>

"Gathering STEAM - Integration from STEM to the Arts" from innovate Our World

<http://www.innovateourworld.org/conference.htm>

"S.T.E.M. to S.T.E.A.M.: Art in K-12 is Key to Building a Strong Economy"

<http://www.edutopia.org/blog/stem-to-steam-strengthens-economy-john-maeda>

"STEM to STEAM -- Recognizing the Value of Creative Skills in the Competitiveness Debate"

[http://www.huffingtonpost.com/john-tarnoff/stem-to-steam-recognizing\\_b\\_756519.html](http://www.huffingtonpost.com/john-tarnoff/stem-to-steam-recognizing_b_756519.html)

"Yong Zhao: PBL Develops Students' Creative Confidence"

<http://www.edutopia.org/blog/yong-zhao-pbl-creative-confidence-suzie-boss>

### How is art essential to creativity and innovation?

#### Evaluation for Teachers

The scaffolding of this WebQuest allows the instructor to complete formative and summative assessments. The rubric from Bernajean Porter is comprehensive with "elements for both technical and good story structures that need to come together to create a powerful, moving piece of communication (<http://www.digitales.us/evaluating-projects>).

#### Evaluation documents:

**Rubric:** Analyze/Persuade Analytical Student Scoring Guide from DigiTales

<http://tinyurl.com/stem2steam>

**Individual checklists:** Research completion and a peer evaluation

[www.intel.com/cd/corporate/education/apac/eng/387305.htm](http://www.intel.com/cd/corporate/education/apac/eng/387305.htm)

**Cluster maps** <http://my.hrw.com/nsmedia/intgos/html/igo.htm>

**Spider maps** <http://my.hrw.com/nsmedia/intgos/html/igo.htm>

### How is art essential to creativity and innovation?

#### Conclusion for Teachers

After completing the WebQuest, students will be able to explain why it is necessary to add art (A) to S.T.E.M. to create S.T.E.A.M. by identifying the influence art has in nourishing creativity and innovation. Lead them in a discussion about what schools need to do to assure that students will achieve their creative potential.

This lesson can be extended through a study of inventors, inventions, and literature from the "Steampunk" genre. It could also become a format for a debate or a video about

innovation.

A suggestion for an alternative assignment to the written essay is for the students to create a ThingLink <http://www.thinglink.com/action/store/education>. ThingLinks are interactive images that help students develop 21st century skills and enrich their enthusiasm for learning. ThingLinks enable students to curate content inside an image to demonstrate an understanding of a topic around historical events by embedding media (video, sound, photos, written words, etc.) found online. ThingLink for education is free.

**How is art essential to creativity and innovation?**

**| [Link to Student Page](#) |**

### **Credits and References**

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