

Britannica

WHITE PAPER SERIES

FIVE WAYS TO SUPPORT FLIPPED CLASSROOMS

with Digital Resources



knowledgeable

OVERVIEW

The flipped classroom is a popular topic for discussion and debate among educators at conferences, in articles and social media posts, as well as in online blogs. Google it and you'll find more than 5.5 million results. Flipping the classroom—assigning the instructional portion of a lesson as homework and using in-class time for collaborative assignments or projects—has the potential to transform the teaching and learning experience in exciting ways when aided by digital resources. Students can watch videos of a lecture at home, for example, and then come to school the next day prepared to talk about the material and apply what they've learned in a project or group activity. In a flipped classroom, the teacher's role changes from the “sage on the stage” to that of a facilitator, the aptly-named “guide on the side.”

Depending upon the technology platform and content used by a school, the digitally-supported out-of-class work also may be accessed remotely using a mobile device, such as a tablet or smartphone. This is an added convenience for students without computers at home and contributes to the achievement of equity and access for all learners.

FLIPPING THE CLASSROOM CAN BENEFIT STUDENTS OF ALL AGES AND LEARNING NEEDS BY:

- ▶ Increasing opportunities for teacher-student interaction;
- ▶ Promoting differentiation and accommodating students' various learning styles and needs;
- ▶ Boosting students' comfort level with learning new information through pacing they can control, e.g., by providing opportunities to replay videos or audio;
- ▶ Providing interactive content that keeps students engaged in learning about a particular topic or subject area;
- ▶ Making a positive impact on test scores and student attitudes¹;
- ▶ Creating a peer-to-peer learning environment that promotes a focus on college and career readiness;
- ▶ Strengthening parent and family involvement in students' work.



A flipped classroom approach reinforces a student-centered atmosphere of providing one-on-one instruction and personalized follow-up by teachers for those students needing additional help, monitoring small group work through assignments, or challenging advanced students with new material.

TEACHERS ALSO BENEFIT BY FLIPPING THEIR CLASSROOMS. THEY CAN EXPERIENCE:

- ✓ Increased job satisfaction²;
- ✓ Maximized quality time spent with students;
- ✓ Reduced student behavior problems in the classroom due to boredom or lack of engagement;
- ✓ Minimized disruption due to absent students, who can access the materials online and stay current with assignments.

This white paper provides five lesson ideas for using digital resources to support a flipped classroom approach. In these sample lessons, resources from *Britannica Digital Learning* are used to make teaching and learning more effective and productive in a “flipped” setting³. If your school does not currently have access to Britannica resources, please contact us today!

Phone: 800.621.3900

E-mail: contact@eb.com

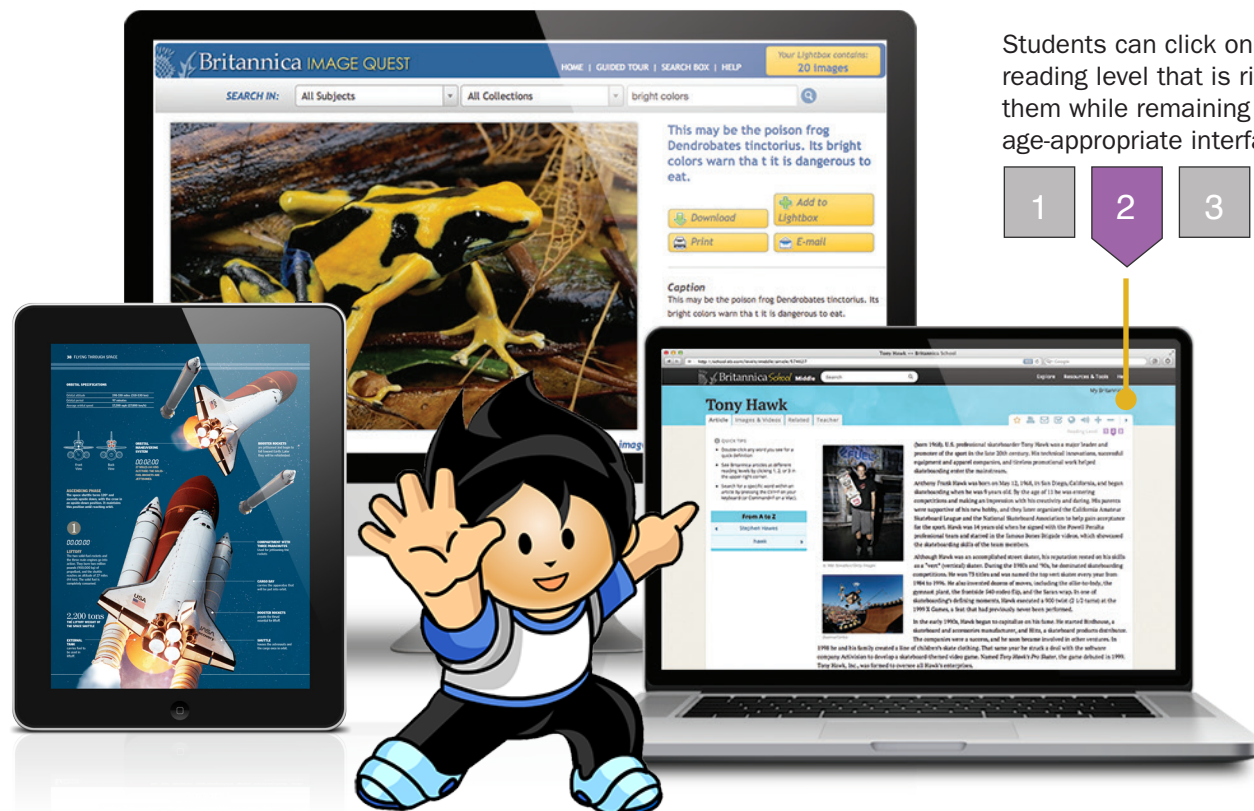
Web: info.eb.com

¹ In a 2012 TeacherView survey, 67% of respondents reported an increase in standardized test scores, with particular benefits for students in advanced placement classes and students with special needs, and 80% indicated an improvement in students' attitudes. Clintondale High School in Michigan saw the failure rate of its 9th grade math students drop from 44 to 13 percent after adopting flipped classrooms (Finkel, 2012).

FIVE WAYS TO SUPPORT FLIPPED CLASSROOMS WITH DIGITAL RESOURCES

FLIPPING THE CLASSROOM:

WHAT TYPES OF DIGITAL RESOURCES WORK BEST?



Students can click on the reading level that is right for them while remaining in an age-appropriate interface.

Digital resources that best support a flipped classroom approach exhibit several characteristics, including:

UNIVERSAL ACCESS from any device (e.g., computer, laptop, smartphone, tablet) that provides the same user experience features regardless of the device used;

SAFE, UP-TO-DATE, AND ACCURATE content on a platform that prevents accidental exposure to inappropriate digital material or Web sites;

CONTENT THAT INCLUDES A VARIETY OF MEDIA TYPES including articles, images, audio, and videos;

PRODUCTIVITY FEATURES including the ability to efficiently browse, search, print, tag, e-mail, and save content;

FUNCTIONALITY FOR ELLS AND OTHER LEARNERS WITH SPECIAL NEEDS including the ability to make the content easier or more challenging by changing the reading level, changing the size of the font, or hearing the text read aloud;

REPORTING OF USAGE STATISTICS to monitor the extent to which students are doing the assigned work in and out of the classroom.

² According to a TeacherView survey in 2012, flipping the classroom improved job satisfaction for 88% of the teachers. 99 percent said they would flip their classrooms again next year. (Flipped Learning Network, 2012)

³ Other resources to which your school has access may work similarly by making adaptations or modifications to these lessons.

FIVE WAYS TO SUPPORT FLIPPED CLASSROOMS WITH DIGITAL RESOURCES

1

ELEPHANTS LESSON

GRADE LEVEL 2-4
SCIENCE, LANGUAGE
ARTS, ART

OBJECTIVE



Students Will:

Take notes to compare and contrast features of African and Asian elephants using Britannica text and video to create a Venn Diagram.

Report on their acquired knowledge to engage in a discussion with the class.

Apply knowledge of physical features and attributes of elephants by creating a papier-mâché elephant.

Length: 3.5 days

COMMON CORE STANDARDS ADDRESSED IN THIS LESSON (examples):

CCSS.ELA-LITERACY.RI.3.9 Compare and contrast the most important points and key details presented in two texts on the same topic.

CCSS.ELA-LITERACY.W.3.4 With guidance and support from adults, produce writing in which the development and organization are appropriate to task and purpose.

CCSS.ELA-LITERACY.W.3.7 Conduct short research projects that build knowledge about a topic.

CCSS.ELA-LITERACY.W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

CCSS.ELA-LITERACY.SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.

PROCEDURES:

AT SCHOOL

Day 1

Teacher will first review with students how to create a Venn diagram and then introduce them to *Britannica School* with a demonstration of how to find an article/conduct a search about elephants.

AT HOME

Students will watch the following videos and read one encyclopedia article and one Web site article:

1. Three videos about elephants
<<http://school.eb.com/levels/elementary/search/videos?query=elephants&includeLevelOne=1&page=1>>
2. Elementary Article:
<<http://school.eb.com/levels/elementary/article/353093>>
3. WWF Web site found in Elementary search of elephant: <<http://worldwildlife.org/species/elephant>>

Students will find and take notes about 3-5 new facts from each resource. This will be their "ticket" into class the next day.

AT SCHOOL

Day 2

Using the knowledge gained from the videos and article, students will create a Venn Diagram comparing/contrasting African elephants with Asian elephants.

Teacher will prompt students to use notes, refer back to text and videos, and assist on the side.

Students will create a papier-mâché elephant or a poster depicting their choice of an African or Asian elephant. (NOTE: this part will take 1-2 days to create the form and cover it in papier-mâché, and 1 day to paint it.)

AT SCHOOL

Day 3

Students will present their gained knowledge using their Venn diagrams and papier-mâché project. Students will discuss new information they found from other students' projects.

ASSESSMENT



Teacher-created rubric and completed Venn diagrams.

DIFFERENTIATION AND MODIFICATIONS:

- When needed, pair students together when creating Venn diagrams.
- Provide support of reading strategies (KWL, SQ3R) to assist students with informational text reading.

- Use built-in tools within *Britannica School* articles (Read-Aloud, quick-click dictionary, enlarged font).
- For enrichment, have students read the middle-school level article to gain knowledge for Venn diagram.

FIVE WAYS TO SUPPORT FLIPPED CLASSROOMS WITH DIGITAL RESOURCES



ANCIENT EGYPT LESSON

GRADE LEVEL 6-8
SOCIAL STUDIES

COMMON CORE STANDARDS ADDRESSED IN THIS LESSON (examples):

CCSS.ELA-LITERACY.RI.8.1 Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.

CCSS.ELA-LITERACY.W.8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

CCSS.ELA-LITERACY.RI.7.7 Compare and contrast a text to an audio, video, or multimedia version of the text, analyzing each medium's portrayal of the subject (e.g., how the delivery of a speech affects the impact of the words).

OBJECTIVE



Students Will:

Answer self-generated questions in a short research project by watching videos and reading multiple text sources to gain knowledge on Ancient Egypt.

Length: 2.5 days

PROCEDURES:

AT SCHOOL

Day 1

Share Lesson Plan link from *Britannica School*:
<http://eb.com/794>

AT HOME

Watch: <http://school.eb.com/levels/middle/article/274132/media?assemblyId=137098>

Read: <http://school.eb.com/levels/middle/article/274132>

Take notes using the K-W-L (Knew-Wanted to know-Learned) strategy.

AT SCHOOL

Day 2

Students will form small groups and discuss their notes from the videos and text.

Students will compare what they Knew-Wanted to know-Learned from the video and text (referencing their K-W-L notes).

Teacher will guide conversations in each group on the side.

AT HOME

Watch: <http://school.eb.com/levels/middle/article/274132/media?assemblyId=119922>

Read: Students may choose to read an article from the 'related' tab in Britannica's Ancient Egypt article: <http://school.eb.com/levels/middle/article/274132/related>

AT SCHOOL

Day 3

Students will independently analyze their notes from both videos and text with assistance from the teacher as needed. Students will answer their self-generated questions from their K-W-L notes in a short research paper with assistance from the teacher as needed.

ASSESSMENT



Use formative assessment throughout the lesson to determine students that need assistance in the K-W-L strategy and with writing the research paper. Final assessment will be research paper with attached K-W-L notes.

DIFFERENTIATION AND MODIFICATIONS:

- As needed, students can read the Level 1, 2, or 3 article on Ancient Egypt.
- Use built-in tools within *Britannica School* articles (Read-Aloud, quick-click dictionary, enlarged font).
- Students may use other reading strategies (SQ3R, Concept Mapping, other graphic organizers).

FIVE WAYS TO SUPPORT FLIPPED CLASSROOMS WITH DIGITAL RESOURCES



MONUMENTS AND MEMORIALS LESSON

GRADE LEVEL 9-10
SOCIAL STUDIES, ENGLISH,
LANGUAGE ARTS

OBJECTIVE



Students Will:

Conduct a short research project, analyzing and synthesizing multiple sources of information in a variety of formats.

Work collaboratively to produce a written proposal for a public memorial, including justification of topic, reasons and evidence for support, and a description using appropriate, descriptive vocabulary.

Length: 3 days

COMMON CORE STANDARDS ADDRESSED IN THIS LESSON (examples):

CCSS.ELA-LITERACY.W.9-10.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

CCSS.ELA-LITERACY.W.9-10.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation

CCSS.ELA-LITERACY.RI.9-10.7 Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account.

CCSS.ELA-LITERACY.SL.9-10.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

CCSS.ELA-LITERACY.SL.9-10.1A Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

PROCEDURES:

AT SCHOOL

Day 1

MATERIALS: Chart paper, markers

1. Introduction of Activity (Teacher models using whole group instruction): Circle and Frame Map (two concentric circles framed by either a square or the outer edges of the chart paper)
 - a. Draw a circle in the middle of the chart paper.
 - b. Write the word "MEMORIAL" in the innermost circle.
 - c. Draw a second circle around the first circle, leaving enough room for writing words, phrases, and sentences.
 - d. Using the outer edges of the chart paper, draw a "frame" around both circles.
 - e. Brainstorm: Ask students for examples of memorials. Write examples within the outer circle. Examples: a war memorial, gravestone, a poem about a hero, commemorative coin, etc.
 - f. Brainstorm: Ask students to look at examples and make connections and distinctions between the examples. Write these in the space between the outer circle and the frame. Examples: remembering a loved one, honoring a hero's sacrifice, reminder of the cost of war, etc.
2. Give instructions for home activities.

AT HOME

1. *Britannica School*: Search MONUMENT and MEMORIAL in High School home page.
 - a. In "Results," find "Content Type," and "Dictionary." Record the full dictionary definitions of MONUMENT and MEMORIAL.
 - b. In "Results," find "Content Type," and "Articles." Using search results from either MONUMENT or MEMORIAL, choose two articles to read. Take notes on key ideas to share with your group members.
 - c. In "Results," find "Content Type," and "Videos." Using search results from either MONUMENT or MEMORIAL, choose 2 - 3 videos to watch. Take notes on key ideas to share with your group members.

FIVE WAYS TO SUPPORT FLIPPED CLASSROOMS WITH DIGITAL RESOURCES

MONUMENTS AND MEMORIALS LESSON (contd.)

AT HOME (contd.)

Day 1

2. *Britannica E-books*: Choose one of the following e-books to read at ebooks.eb.com. Although these are lower-level e-books, the purpose for this reading is to identify memorials and monuments, examine images, conclude what various elements make up a monument or memorial, and learn how these elements span the ages. Using children's picture books can be a strategy for higher level students to interact with images and text and use critical-thinking skills to construct a higher level of meaning.
3. Notes: Identify elements that make up a memorial or monument. Evaluate the choice of e-book images, using examples and descriptions. Summarize the e-book using appropriate, content-specific terminology.
 - a. Ancient Egypt, chapter 2, The Dynasties of Egypt
 - b. Vietnam War Memorial
 - c. The Statue of Liberty
 - d. Mount Rushmore
4. *Image Quest*: Find images of five different types of memorials or monuments. Note the title of the image, describe the image, and explain what it is memorializing (or why it is being maintained by the government). <quest.eb.com>
5. Answer the following questions using complete sentences, using evidence from reviewed resources (i.e. dictionary definition, articles, images, videos, or e-book):
 - a. What conclusions can you draw about why people create memorials?
 - b. What is the function of a memorial?
 - c. Based on what you know and the reviewed resources, how would you explain a person's emotional response to a memorial (historical or present)?

AT SCHOOL

Day 2

1. In Small Groups: Students will briefly share notes and summaries of the articles, images, videos, and e-books reviewed at home.
2. Each group will use individual answers from the three home-work questions, incorporate the main points, and produce a group response to each question.

3. Each group will choose a person (famous, historical, community member, public servant, etc.) or event (historical or recent), to publicly memorialize (i.e. monument, sculpture, park, etc.).
4. Each group will produce a proposal for their public memorial, answering the following:
 - a. Why did you choose _____ to memorialize? (Justify choice using reasons and evidence.)
 - b. What is the design and function of this memorial? (Describe the design, including location, function, symbolism, or other features unique to your memorial.)
 - c. Based on the topic, design, and location of your proposed memorial, predict the emotional response of the public (i.e. pride, reverence, honor, joy, etc.).

AT HOME

Britannica School: Search MAYA LIN, American sculptor and architect, designer of the Vietnam Veterans Memorial. In "Related" tab, choose "Web's Best Sites" and go to "Public Broadcasting Service: Biography of Maya Lin." Read short biography and watch the short video segment: Maya Lin in "Identity." What design elements in the park included symbolism or representations of nature? What surprised or inspired you about Maya Lin's design process?

Britannica School: Research the person or event chosen for the proposed memorial.

Image Quest: Research monuments, memorials, or symbols, including details that could be incorporated into your group memorial proposal.

AT SCHOOL

Day 3

Small groups will work together to write, revise, and complete the written memorial proposal, incorporating the information from the answers to the three questions. Option: Include a sketch of the proposal.

ASSESSMENT

Formative: Daily Peer Evaluation Rubric: Each student uses a rubric to assess the participation of group members individually (Teacher-created or search "peer evaluation rubric").

Summative: Essay Rubric for final memorial proposal.

DIFFERENTIATION AND MODIFICATIONS:

- As needed, students can read the Level 1, 2, or 3 article.
- Use built-in tools within *Britannica School* articles (Read-Aloud, quick-click dictionary, enlarged font).



CONSTRUCTING MEANING THROUGH CONNECTIONS, THEME, & PURPOSE

GRADE LEVEL 11-12
SOCIAL STUDIES, ENGLISH,
LANGUAGE ARTS

OBJECTIVE



Students Will:

Integrate and evaluate information on Abraham Lincoln using a variety of formats (articles, images, videos, Web sites) and construct meaning through connections, theme, and purpose of text.

Length: 3 days

COMMON CORE STANDARDS ADDRESSED IN THIS LESSON

(examples):

CCSS.ELA-LITERACY.RI.11-12.1 Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.

CCSS.ELA-LITERACY.RI.11-12.2 Determine two or more central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to provide a complex analysis; provide an objective summary of the text.

CCSS.ELA-LITERACY.RI.11-12.6 Determine an author's point of view or purpose in a text in which the rhetoric is particularly effective, analyzing how style and content contribute to the power, persuasiveness or beauty of the text.

CCSS.ELA-LITERACY.RI.11-12.7 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.

CCSS.ELA-LITERACY.RI.11-12.9 Analyze seventeenth-, eighteenth-, and nineteenth-century foundational U.S. documents of historical and literary significance (including The Declaration of Independence, the Preamble to the Constitution, the Bill of Rights, and Lincoln's Second Inaugural Address) for their themes, purposes, and rhetorical features.

PROCEDURES:

AT SCHOOL

Day 1

(This flipped classroom lesson begins at the end of a class period. Set aside 10 minutes to give directions.)

Introduction of Activity: Teacher gives directions for accessing *Britannica School* content, including multiple sources of information. Model access if necessary.

AT HOME

1. *Britannica School*: Search ABRAHAM LINCOLN in High School home page.
 - a. In "Results" for Abraham Lincoln search, find "Content Type" and "Magazines." Read the article "Abraham Lincoln".
 - b. In "Results," find "Content Type," and "Magazines." Read "Lincoln Plays to Win."
 1. Specific directions for "Lincoln Plays to Win"

Strategy: "Sentence – Phrase – Word." This strategy will bring out common themes, style, and rhetorical features in the text. It is often works best to not share the purpose of the strategy initially, so students don't try to predict the "correct" choice (since there is none).
 2. When reading, choose one sentence that is meaningful to you in some way (style, emotional, personal experience, etc.).
 3. Choose one phrase in the same way.
 4. Choose one word in the same way. Be prepared to share this with the group.
 5. In "Results," find "Content Type" and "Videos." Choose 3 – 5 videos to watch.
 6. In "Results," find "Content Type" and "Web's Best Sites." Review "Lincoln: Man, Martyr, Myth" Web site.
2. Notes: When reading, watching videos, and reviewing Web sites, answer the following questions, using reason and evidence from the text or video to support written responses.
 - a. What is the author, director, or creator's purpose for this article, video, or Web site?
 - b. Is the author's point of view evident?



Note on Lesson: The strategies outlined in this lesson can be translated into many topics. This lesson was based on the Common Core Standards for English Language Arts and the learning goals therein. The topic of Abraham Lincoln was used in this lesson, but the format and process can be used with many topics (modern or historical, people or events, etc.).

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AT HOME (contd.)

Day 1

- c. Determine two or more central ideas of the text, video, or Web site. Are these central ideas stated explicitly or inferred?
- d. At which points is the author especially effective in style and how does that affect the purpose of the text (i.e. persuasive quality, power, or beauty of the text or video).
- e. Provide a short summary of each resource.

AT SCHOOL

Day 2

Students work in groups of 4 to 5.

1. “Sentence – Phrase – Word” share from “Lincoln Plays to Win” article. (Teacher Note: This strategy can be used effectively with any article or primary source document, e.g. the Gettysburg Address.)
 - a. Going around the circle, each student reads the chosen sentence out loud, without commentary or reaction from the other group members. If another student in the group has chosen the same sentence, he/she will also read the sentence without commentary or reaction from group members (i.e. the student may not say, “I picked the same as Mary”).
 - b. Each student continues this activity by reading the chosen phrase, then the chosen word, each time without commentary or reaction from the group.
 - c. When complete, discuss: Are there common sentences, phrases, and words chosen by the group?
 - d. What does this say about the power of theme, purpose, and rhetorical features?
 - e. Small groups choose one representative to share their findings with the whole class. Are there common themes within the class as a whole?

AT HOME

1. *Britannica School*: Search ABRAHAM LINCOLN in High School home page.
 - a. In “Results,” find “Content Type” and “Primary Sources and E-Books.” Read one of the following: “Lincoln’s First Inaugural Address,” “State of the Union Addresses” (choose one), or “Lincoln’s Gettysburg Address.”
 - b. In “Results” find “Content Type” and “Images.” Review images, including “Abraham Lincoln Timeline,” “Lincoln,

Abraham: Dedication Ceremony at Gettysburg Battlefield,” “Library of Congress, Washington, D.C. Lincoln, Abraham, inauguration,” and two more, student choice.

2. Notes: When reading the primary sources (Lincoln’s speeches in writing), answer the following questions, using reasons and evidence from the text to support written responses:
 - a. Analyzing the speech, what is the historical and literary significance of the speech?
 - b. Did Lincoln use any specific rhetorical or literary devices to emphasize meaning or evoke emotion?
 - c. Provide a short summary of each resource (text and images).

AT SCHOOL

Day 3

Small Group Discussion

1. Groups share their notes, reflections, and summaries on the previous night’s reading.
2. Discussion Questions:
 - a. Were there common themes among students regarding the historical and literary significance of the speech?
 - b. Were there any common rhetorical or literary devices mentioned by group members?
3. Whole group discussion – Teacher Facilitator: “MAKING IT PERSONAL: Text to World, Text to Text, Text to Self”

Teacher models strategy, using a “think aloud.” Teacher gives his/her answers to the questions (i.e. Text to World: “I think that there are current human trafficking issues that resemble some aspects of slavery. I wonder if there’s a world leader like Lincoln who is championing that cause?”).

 - a. Text to World: Is there anything happening in the world today that is similar to Lincoln’s time, experiences, or challenges?
 - b. Text to Text: Do you know of any text, movie, poem, or song that has similar themes or literary devices, either historical or recent?
 - c. Text to Self: Was there anything in Lincoln’s writing or articles on Lincoln to which you can personally relate? Was there anything that you read that changed your opinion of Lincoln, either positive or negative?
4. Essay/Individual Student Response: Write a short essay, reflecting on and responding to the three aspects of “Making it Personal: Text to World, Text to Text, and Text to Self.”

ASSESSMENT

Formative: Daily Peer Evaluation Rubric: Each student uses a rubric to assess the participation of group members individually (Teacher-created or search “peer evaluation rubric”).

Summative: “Making it Personal” essay. Score using teacher-created rubric or search “essay rubric.”

DIFFERENTIATION AND MODIFICATIONS:

- As needed, students can read the Level 1, 2, or 3 article.
- Use built-in tools within *Britannica School* articles (Read-Aloud, quick-click dictionary, enlarged font).

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RATIO, SCALE, AND MODELS

GRADE LEVEL 7
MATH

COMMON CORE STANDARDS ADDRESSED IN THIS LESSON

(examples):

CCSS.MATH.CONTENT.7.RP.A.3 Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.

CCSS.MATH.CONTENT.7.G.A.1 Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

CCSS.MATH.PRACTICE.MP4

Model with mathematics.

CCSS.MATH.PRACTICE.MP5

Use appropriate tools strategically.

CCSS.MATH.PRACTICE.MP6

Attend to precision.

NEXT GENERATION SCIENCE STANDARDS

MS-LS-1 Phenomena that can be observed at one scale may not be observable at another scale.

MS-PS-1 Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

SCIENCE AND ENGINEERING PRACTICE 2: Developing and Using Models: Evaluate limitations of a model for a proposed object or tool.

COMMON CORE ENGLISH LANGUAGE ARTS STANDARDS

CCSS.ELA-LITERACY.RST.6-8.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

CCSS.ELA-LITERACY.W.7.2: Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

OBJECTIVE



Students Will:

Use models including double number lines and tables to show the relationship between actual dimensions and a scale drawing.

Accurately measure using a tape measure, ruler, or other appropriate measuring tool.

Create scale drawings (models) of a room using the actual measurements given a scale factor.

Describe the limitations and benefits of using models to describe space and distance (comparing map vs. globe, scale drawing to actual space)

Length: 4 days



PROCEDURES:

MATERIALS

Math in Context (MiC): Rates and Ratios Section D (Scale and Ratio); measuring tools, grid paper

<mathincontext.eb.com>

Pathways: Science: The Nature of Science, Models in Earth Science

<pathways.eb.com>

SmartMath: Lesson 7: Geometric Drawings, Lesson 7: Ratio II (or L6 Ratio I), Lesson 7: Proportion

<smartmath.eb.com>

AT SCHOOL

Day 1

1. Review 'models' with students.

Ask them about the kinds of models they have seen and used to describe space and distance (examples: maps, globes, scale drawings, illustrations (e.g., of the distance between planets). Once the list of models is generated, ask students to describe how models like those listed are actually created.

2. Introduce *MiC Rates and Ratios* Section D p. 30 - 32, discuss. Introduce the double number line model from the top of p. 32 and use one of the pieces of furniture from Activity 1 to model how to use the number line in this situation.

AT HOME

1. Students should complete *MiC* p. 32 Activity 1, as well as questions 4-8 on p. 32-43. Students should return to class prepared to share their drawings and calculations.

2. The teacher should assign *SmartMath* Lesson 7: Ratio II, Lesson 7: Proportions, and Lesson 7: Geometric Drawings. Students should practice in one or both topics for a total of at least 20 minutes, completing at least 1 challenge.

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AT SCHOOL

Day 2

1. In small groups students should share and review their answers to the *MiC* assignment. Once they have come to agreement on the answers to each item and resolved any confusion in their group (when possible), the group should answer the following questions:
 - a. What are the ratios being used in this lesson? How are they used to solve the problems?
 - b. What kinds of models can be created using ratios?
 - c. What would be an appropriate scale ratio for drawing a football field on a piece of paper?
2. Discuss small group review of questions. Were there any confusing items that couldn't be resolved by a group? Discuss the use of scale ratios and their uses. When are they used and how do you determine the correct scale ratio for a given model?
3. Assignment: each group will create a scale drawing of the classroom. Each group will work together to collect all necessary measurements, and then each member should create their own individual drawing.
 - a. Teacher should be prepared to provide tape measures, rulers, yard sticks, and other measuring tools, as well as grid paper to the class.
 - b. Measurements will be done in class; initial drawings will be done at home.

AT HOME

1. Students should use the measurements gathered in class and the grid paper provided to create a scale drawing of the classroom. They should determine the scale ratio and convert measurements using a ratio table and/or double number line to do their calculations.
2. Students should continue to practice in *SmartMath*. They should do at least 20 minutes of practice and complete at least 1 challenge.

AT SCHOOL

Day 3

1. Students should return to their groups and compare their scale drawings for the following items:
 - a. Scale ratio used (Are they all the same? Different? How did you determine the ratio to use?)
 - b. Completeness of drawing (Are all items accounted for, such as furniture, doors, windows etc.?)
 - c. Accuracy of scaling (Are any items out of scale? How?)
2. Discuss groups' review of their scale models, noting challenges

and interesting lessons learned. Ask about the usefulness of scale drawings and their relationship to other sorts of models like maps or globes. What is the difference between creating a scale drawing of a room and making a map or globe?

3. Introduce *Pathways: Science* and direct students to the lesson in The Nature of Science called Models in Earth Science. Do the initial question together (Is a map or a globe a better model to use to compare the shapes and sizes of continents?).

AT HOME

1. Complete the *Pathways: Science* lesson introduced in class. Students should come to class the next day aware of what their initial idea was, how their thinking changed during the lesson (including which resources were most helpful), and what the correct idea is and why.
2. Students should continue to practice in *SmartMath*. They should do at least 20 minutes of practice and complete at least 1 challenge.
3. Revise scale drawings. Any changes or adjustments that needed to be made to an individual scale drawing based on the small group and class reviews should be made.

AT SCHOOL

Day 4

1. Discuss *Pathways: Science* lesson results. Survey the class around their initial ideas and how they changed over the course of the lesson. Have students share which resources were most helpful to their thinking (and in what way they were helpful). Also discuss the correct response and how this lesson around maps and globes relates to the work the class has been doing around scale drawings.
2. In small groups students should review their scale drawings a second time (using the same criteria as on Day 3).

AT HOME

1. Students should write an essay that answers the following questions:
 - a. What is the purpose of a model? Why are models important to our understanding of the world around us?
 - b. How do you create a model and what is the relationship between the kind of model created and the space/distance being represented?
 - c. How are models used in day-to-day life? What are the benefits of using a model and what are the limitations?
 - d. Students should be sure to include examples of information/ ideas that was learned through their experiences in *MiC*, *Pathways: Science*, and *SmartMath* specifically.

ASSESSMENT

1. Students' written conclusion to the unit from Day 4: At Home. Score via teacher-generated rubric.
2. Students' scale drawings. Score via teacher-generated rubric.

3. Student performance data as recorded in *SmartMath* tracking their progress through the three assigned topics.
4. Student performance data as recorded in *Pathways: Science* for the assigned lesson.

FIVE WAYS TO SUPPORT FLIPPED CLASSROOMS WITH DIGITAL RESOURCES

INCREASING OUT-OF-CLASS ACCESSIBILITY TO FLIPPED LESSONS

For a flipped approach to work, students need access to a computer or mobile device with Internet access. If students don't have access to technology at home, teachers can:



Make it available at school. Students could use the library or computer lab before school, at lunch, or after school.



Burn a DVD for students to watch on their TV at home.



Put the files on a Web site that students can access from the public library.

FLIPPING OUT ABOUT FLIPPED CONTENT?

According to Robert Adhoot in a *School Library Journal* article from April 2013, “Leveraging already existing content makes total sense. It’s more efficient, it alleviates the technical stresses inherent with filming and publishing, and it saves time for teachers to do other crucial administrative tasks.”

- Subscribers to *Britannica School* can use ready-made videos in science, social studies, math, and language arts that are aligned to Common Core and state standards, plus activities, games, and worksheets that assess student comprehension.
- *Britannica School*’s Lesson Plan Builder makes it easy to create lessons, and sharing with students is simple with the “My Britannica” workspace.

- Math teachers who have access to *Britannica*’s *SmartMath* math practice resource can have students learn at home, and then use *SmartMath* as the assessment activity in the classroom. Students can work through some of the 40,000 math practice problems while the teacher moves around the room monitoring progress and answering questions.

As an alternative, use content developed by trusted peers. Join a network of educators who flip and talk to colleagues, including those new to the approach as well as experienced flippers. Finally, when you’re ready and have the equipment, the time, and the desire, create your own video or other content library to share the subjects that you are passionate about. Experienced flippers recommend limiting the videos to 10 minutes in length.

ADDITIONAL FLIPPED CLASSROOM TIPS



Start with one class to gain experience, and build from there. Share your successes, your failures, your ideas, and your materials with your colleagues. Solicit feedback from your students and parents to improve the process.



Experienced flippers recommend using a flipped classroom approach twice a week when you are getting started. Even experienced flippers don’t flip every day—usually 3 times a week, so that students and teachers both experience a variety of instruction and classroom activity.

MORE INFORMATION

Need more direction? The Britannica Professional Development team provides sessions about flipped classrooms. Contact us at training@eb.com for more information about dates and time.

Interested in another Britannica white paper? Download them at info.eb.com.

For more information about or to preview Britannica Digital Learning resources, please contact:



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