

Fractions to Decimals through False-Color Science

By Robyn Randall & Kendyl Stromberg
Collaborative Lesson Plan for Mandatory 4 Math Modeling

Introduction

This integrated math and science lesson is intended for 3-5th grade students, which uses 4th grade standards. It should take approximately one science period and one math period. Students will learn about false-color images and use that as the context for developing decimals concepts. The Google Slide Slideshow helps to fluidly guide the teacher and students through both science and math concepts in a variety of learning opportunities and activities. Videos, group discussion and practice, schema development, printable student pages, and digital challenges are all included.

Modeling Activity

Google Slideshow:

(This integrates all of the links listed in the materials and procedure below).

[Fractions to Decimals through False-Color Science Slide Presentation](#)

Materials:

- Projector & speakers (to feature phenomena video & reading excerpts)
- Teacher PDF: [My NASA Data Teacher PDF](#)
- Student Activity pages (pgs 1-2 for each student): [My NASA Data Student PDF](#)
- Colored pencils or crayons (for each student): White, Orange, Red, Yellow, Green, Blue, Black
- Student Challenges pages: [Student Printable of Challenges](#)
- Chromebooks (for each student)
- Workable (student or class) gmail to create digital model: [Data Display Template](#)

Procedure:

(Following the slideshow above will guide the teacher through these steps).

- 1) Begin the lesson with an anticipatory set of true/ false questions to activate background knowledge. Students may use the google form or the paper/ pencil version (as shown on Slides 2 - 3; DON'T display Slide 1 for students, as it gives away an answer to one of the initial questions). Google Form URL: [Anticipatory Set Google Form](#)
- 2) Engage students with a phenomena, (Slide 4): [False Color Phenomena Video](#)
- 3) Teach students how scientists use data, as numbers, and create false-color images from that. This link may be used by the teacher and excerpts read as a

class on a projector (or use the Instruction/ Discussion Slides): [Link for Further Reading](#)

- 4) Guide students in the false-color activity part of the lesson. Emphasize questions and higher order thinking.
 - a) The following PDF will be the teacher guide to this part of the lesson: [My NASA Data Teacher PDF](#)
 - b) The following PDF will be the student portion to this activity, only pages 1-2: [My NASA Data Student PDF](#)
 - i) Before students answer questions, engage in discussion. “Based on the chart, what could the numbers be representing?”
 - ii) “Use the chart to identify which numbers ranges are necessary?”
<in this case will be all of them. Some more than others.>
- 5) Then, develop student schema by a class or partner activity with the slide “Take a Moment to Notice.” Here, students take a step back to simply state what they see in the false-color image and form general thoughts or conclusions from their observations, which is a lead-in to the math instruction.
- 6) Lead students in instruction about changing numbers’ form from a fraction to a decimal with the following Youtube video: [Fraction to Decimal Youtube Video](#)
- 7) Facilitate several practice problems on the slide with the place value chart by projecting it on a white board and having students write in the place value chart for each practice problem.
- 8) Guide students through the instructions complete challenges # 1 - 3, which takes the fraction to decimal instruction and integrates it with the data from the false-color image activity. See the following link: [Student Printable of Challenges](#)
 - a) The slideshow has an example for Challenge #3.
 - b) Give students some time to ponder and problem-solve before showing them the example, they may come up with their own methods. The example is to scaffold student support.
- 9) Set students up to use the linked template for creating their own graph on Google slides. This is for challenge #4: [Data Display Template](#)
- 10) Allow students to share their “Data Displays” in small groups; students may make revisions to their graphs as needed.
- 11) As time permits, or possibly coordinate with the art teacher, introduce Challenge #5 as an extension activity.
- 12) Bring the lesson together in conclusion with the following video. [TV and Slow Motion YouTube Video](#) (started at 5:00)
- 13) Have students complete the Anticipatory Closure as a resolution to the diagnostic assessment.
- 14) Collect student surveys for feedback about the lesson itself and student interest.

Engaging Context

In this integrated lesson, students are engaged with colors. Their reality will be challenged by a concept called “false color,” where trees can be red and clouds can be blue. The scientific concept of false color will engage students in the math topic of changing numbers from fraction form to decimal form. A false-color, 10 unit by 10 unit, pixel image will be the context for students to change a fraction with 100 as the denominator into decimal form.

Measurable Objectives

- Students will recognize that false-color technology extends what humans can observe in science.
- Students will convert fractions into decimal form based on a pixel model to guide their data collection.
- Students will compare and contrast models to justify greater than, less than, or equal to.
- Students will synthesize data results to formulate graphs using Google Slides.

Standards

Common Core State Standards Math:

CCSS.MATH.CONTENT.4.NF.C.6 - Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.*

CCSS.MATH.CONTENT.4.NF.C.7 - Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols $>$, $=$, or $<$, and justify the conclusions, e.g., by using a visual model.

Standards for Mathematical Practice:

CCSS.MATH.PRACTICE.MP2 Reason abstractly and quantitatively.

CCSS.MATH.PRACTICE.MP3 Construct viable arguments and critique the reasoning of others.

CCSS.MATH.PRACTICE.MP4 Model with mathematics.

CCSS.MATH.PRACTICE.MP6 Attend to precision.

CCSS.MATH.PRACTICE.MP7 Look for and make use of structure.

Next Generation Science Standards:

4-PS4-3.

- Generate and compare multiple solutions that use patterns to transfer information.

*PS4.C: Information Technologies and Instrumentation

- Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa.

Patterns

- Similarities and differences in patterns can be used to sort and classify designed products.

Tennessee Fine Arts Standards:

3 3.VA.Cr1.A Elaborate on an imaginative idea.

4 4.VA.Cr1.A Brainstorm original approaches to an art or design problem.

5 5.VA.Cr1.A Combine ideas to generate an innovative plan for art-making.

New Mexico Core Arts Standards:

Conceiving and developing new artistic ideas and work.

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.

Standards for Technological Literacy:

Standard 1: In order to comprehend the scope of technology, students in Grades 3-5 should learn that:

C. Things that are found in nature differ from things that are human-made in how they are produced and used.

D. Tools, materials, and skills are used to make things and carry out tasks.

Standard 2: In order to recognize the core concepts of technology, students in Grades 3-5 should learn that:

I. Tools are used to design, make, use, and assess technology.

K. Tools and machines extend human capabilities, such as holding, lifting, carrying, fastening, separating, and computing.

Standard 3: In order to appreciate the relationship among technologies, as well as with other fields of study, students in Grades 3-5 should learn that:

C. Various relationships exist between technology and other fields of study.

Common Core State Standards: ELA Literacy:

- RI. 3.4, RI.4.4, RI 5.4,: Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a (grade 3, grade 4, grade 5) topic or subject area.

Evidence

Students will receive a diagnostic assessment at the very beginning with an anticipatory set. There are two versions available, a Google Forms version and a paper/pencil version, in order to accommodate what technology resources are available. The anticipatory set is a short five question set to activate students' background knowledge. The same questions will be asked at the end, allowing us to collect evidence of growth. After that, a student survey will be given to collect qualitative evidence.

In science, evidence collection through discussion is one of our methods of informal assessment. We were deliberate to include slide images that would encourage rigorous discussion in order to monitor and gauge students' understanding. Additionally, questions from the [My NASA Data](#) Student Activity pages will allow us to monitor critical thinking during the "Activity Time". This will be used as a method of collecting evidence of understanding through a formative assessment. Students will demonstrate knowledge and application of false-color images by engaging in phenomenon, participating in discourse, creating a false-color image, and answering questions that range in a depth of knowledge.

In math, a class practice activity will begin informal evidence collection to assess students' understanding of converting fractions to decimals. As we continue to monitor and collect evidence, students will use the Student Challenge pages that we created ([Student Printable of Challenges](#)). In an effort to extend the learning and offer differentiated activities, these challenges do not need to be completed in one math period. However, completing Challenges #1 through #4 will measure that students met the objectives of this lesson:

- *Students will convert fractions into decimal form based on a pixel model to guide their data collection.*
- *Students will compare and contrast models to justify greater than, less than, or equal to.*
- *Students will synthesize data results to formulate graphs using Google Slides.*

These challenge activities may be used as a formative assessment to guide what lessons should be taught afterwards. Students' competency to convert fractions to decimals will be assessed later, as a part of a unit's summative assessment.

Collaboration

We collaborated throughout the entire process, both contributing many ideas. We initially emailed to see what our first steps would be. Then, we met on ZOOM to discuss topics and ideas. From there, we collaborated on a Google Document to further brainstorm ideas, hone in on one *MyNASAdata* lesson, and unfold the details of our lesson proposal. We continued to work on Google together to create the slideshow and this document. We texted and zoomed throughout the collaboration process. Robyn Randall emphasized the science portion, contributing the standards, science instruction, phenomena videos, anticipatory set, and conclusion. Kendyl Stromberg emphasized the math portion, contributing the math instruction, practice, data display template, student challenges and related printable.

References:

- Common Core State Standards Initiative (CCSSI). (2010). Common Core State Standards for Mathematics. Washington, DC: National Governors Association Center for Best Practices and the Council of Chief State School Officers. http://www.corestandards.org/wp-content/uploads/Math_Standards.pdf
- Creating. (n.d.). Retrieved June 23, 2020, from <https://www.nationalartsstandards.org>
- Humboldt State University. (2014) *Natural and False Color Composites*. http://gsp.humboldt.edu/OLM/Courses/GSP_216_Online/lesson3-1/composites.html
- Fine Arts: Dance, Music, Theatre, Visual Art. (n.d.). Retrieved June 23, 2020, from <https://www.tn.gov/education/instruction/academic-standards/arts-education.html>
- Komodo Maths. (2015, November 4). *An Introduction to Decimals* [Video]. Youtube. <https://www.youtube.com/watch?v=t9vqm2eM5mk>
- My NASA data. (n.d.) *Creating Images from Numbers*. <https://mynasadata.larc.nasa.gov/mini-lesson/creating-images-numbers>
- NGSS Lead States. (2013). Next Generation Science Standards: For States, By States. Washington, DC: The National Academies Press.
- ONTOFORCE. (2020). *Systemic Integration & Knowledge Graphs*. <https://www.ontoforce.com/discover-linked-data-platform/technology/semantic-integration-knowledge-graphs/>

Standards for Technological Literacy: Content for the Study of Technology. (2000).
Retrieved June 23, 2020, from <https://www.iteea.org/42511.aspx>

The Slow Mo Guys. (2018, January 18). *How a TV Works in Slow Motion - the Slow Mo Guys* [Video]. Youtube.
https://www.youtube.com/watch?v=3BJU2drrtCM&feature=emb_logo

V1 Media. (2014, April 11). *How to Interpret a False-Color Satellite Image*.
EIJournal.com
[https://eijournal.com/print/articles/how-to-interpret-a-false-color-satellite-image?
doing_wp_cron=1591982635.5707969665527343750000](https://eijournal.com/print/articles/how-to-interpret-a-false-color-satellite-image?doing_wp_cron=1591982635.5707969665527343750000)

Weber et al. (2014). 6 Principles for Quantitative Reasoning & Modeling. *Mathematics Teacher*. Vol 108(1) pp. 24-30.

WebStockReview (n.d.). *Clipart Student Walking*. Retrieved 2020, June 16, from
<https://webstockreview.net/explore/clipart-walking-student/>

Winter, Jeff. (2010). IC 1340 - False Color Palettes [Photograph] *Gold Run Partners, Inc.* http://www.goldastro.com/astroimages/IC1340_Palettes.php