**Standards in Global Education**

By Erika Calvillo

I teach 7th and 8th grade math, therefore, I selected one standard for each grade.

**Mathematics CCSS -8th Grade:**

**Geometry**

Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

**8.G.C.9:** Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

**Integrating Global Education:**

Recently I attended a mathematics professional development provided by our network within our district. We were introduced to a strategy called Three Acts of a Mathematical Story in which students are given certain clues about a problem at three different times, beginning, middle, and end. Prior to Act One, the teacher will demonstrate the video and ask students: What do you notice? What do you wonder? In Act One the teacher clearly introduces the central conflict of the story/task through visuals, usually a video and says as few words as possible, should impose as few demands on the student as possible (language or math), and should ask for little, but offer a lot. Teacher can ask: What do you think the situation is about? What are some mathematical questions you think could be asked? During the Second Act students will overcome obstacles, look for resources, and develop new tools. The teacher needs to think about the resources that the students will need before they can solve the task, consider the tools that students already have, and what tools can the teacher help students develop. Teacher can ask: What information do you need to get an answer? During Act Three students solve the task and a sequel or extension can be set up. Teacher can ask: How close was your guess to the actual answer? How close was your math?

I was thinking of using the two Three Acts videos, Water Filter and Shower vs. Bath, on two different days to get students thinking about the water filter they may use at home in their refrigerator and the amount of water used during a shower vs. a bath. On the third day I would provide students with background knowledge by reading two articles, Global Water, Sanitation, and Hygiene (WASH) Health Burden and Diarrhea: Common Illness, Global Killer. I would also demonstrate Lauren Fry’s video of when she was in the Peace Corps in Cameroon demonstrating the effects of drinking unfiltered water and how that community manages to purify their water. Thinking about the three videos the students have watched, I would ask students to imagine what their lives would be like without consistent access to clean water at school and at home by writing their thoughts. I will then demonstrate to students the following images: brushing teeth at a wash station in Tanzania, gathering water at the town pump in Benin, washing dishes at school in Lesotho, carrying water from the river in Mali, and taking a bucket bath in Ghana (suggested by Lauren Fry). Students will write a reflection using the following questions: How might you use your time differently than you do now? What might your health concerns be? Students will then discuss or write about the connection between clean water and quality of life.

**Global Competences:  
Investigate the World:** Through this lesson, students will learn about things they do on a daily basis through math, geography, and routines in African countries. Through the three lessons, students will be communicate, ask questions, and develop questions of their own. On day three, students will analyze, integrate, and synthesize to construct coherent responses based on images, videos, and mathematical evidence.

**Weigh Perspectives:** During day one and two, students will be recognizing and expressing their own perspective and identifying influences on that perspective. Such as, where do they acquire their drinking water from (refrigerator, faucet, water bottle) and how they cleanse themselves, shower or bath, and whether or not they have any say so at home. On day three, students will be able to examine others’ perspectives and identify what influenced them. Students will be examining daily activities that take place in various African countries so that they can get a better understanding of others’ perspectives and culture based on geography and available resources. Through the videos, images, and mathematical evidence, students will compare/contrast their perspective with others and integrate their own and others’ viewpoints to construct a new one by writing about any changes they can make in their daily life.

**Assessment:**

According to the Asia Society, part of the goal of mathematics global education, students “use mathematics to support conclusions, arguments, and decisions that lead them to act as reflective, constructive, and concerned citizens of the world.” As an educator I took the following question (from Asia Society) into consideration when planning the lesson, “How do students need to think about and behave toward mathematics in their daily lives and throughout the curriculum?” In order to assess the math CCSS, I will look at student work and collaboration in their answers after watching the Three Acts videos. In order to assess global competence I will look at students writing after they investigate concepts in their daily life, read articles, watch videos and images of others’ perspectives. For Investigating the World, I will be listening to students’ discussion and reading their writing to see if students are building and integrating mathematical models to describe globally significant issues, in this case water. For Recognizing Perspectives I will also listen for student responses and read their writing checking to make sure that students are able to recognize, articulate, and address different perspectives and revise their conclusions and/or opinions. I will also check to make sure students have strengthen their conclusions through mathematical analyses.

**Resources:**

Three Acts

Water Filter <https://whenmathhappens.com/2014/07/29/water-filter/>

Shower vs. Bath <http://mrmeyer.com/threeacts/showervbath/>

Global Water, Sanitation, and Hygiene (WASH) Health Burden

<https://www.cdc.gov/healthywater/pdf/global/programs/cdc-global-wash-burden.pdf>

Diarrhea: Common Illness, Global Killer

<https://www.cdc.gov/healthywater/pdf/global/programs/globaldiarrhea508c.pdf>

Lauren Fry Peace Corps Volunteer serving in Cameroon Video

<https://www.peacecorps.gov/educators/resources/water-availability-and-usage/#video-modal-0>

Asia Society Graduation Performance System

<http://asiasociety.org/files/uploads/127files/Asia_Society_Graduation_Performance_System.pdf>

**Mathematics CCSS -7th Grade**

**Expressions and Equations**

Solve real-world and mathematical problems using numerical and algebraic expressions and equations.

**7.EE.B.4:** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

**Integrating Global Education:**

Using the Transportation Design Challenge lesson plan students will be able to reason their own logical methods for solving a problem using math and computational skills. In order to provide students with background knowledge and improve their basic understanding of fossil fuels and their impacts on the environment, students will watch three short videos and write a reflection after each video stating what they have learned and any questions that came to mind. For the Heat is On video, students will complete a FishBone graphic organizer listing one effect and several causes. Students will read the Solutionville Inquirer article and as a group, students will decide if they think that any of the arguments present in the three different hypotheses are valid. Students will then complete three challenges in which students will be able to describe how technology can reduce human impacts on Earth’s systems and human consumption of nonrenewable natural resources and weigh the benefits and drawbacks of various transportation energy sources in terms of cost, carbon emissions, energy production, as well as social and environmental impacts. Students will create a model for the citizens of Solutionville so that the community is healthy and safe place by providing efficient and convenient public transportation.

This lesson plan integrates global education because students will be learning about fossil fuels and their impacts on the environment. We all share a planet and need to be concerned about our carbon footprint. My students do not rely on public transportation to get to school now, but as they move on to high school, public transportation because their main mode of travel. This lesson touches upon the concept of climate change, since we share an earth, students need to understand the local impacts on the environment and how over time their effects can be felt throughout the world. Students also need to understand the basic concepts, trends and issues in regards to climate change. Students will then explore the public transportation system of Chicago to determine if it is energy or time efficient, impacts on the environment or community, and use knowledge learned to write a letter to mayor and head of Chicago’s public transportation department with recommendations for improvements.

**Global Competences:  
Investigate the World:**

In this lesson, students will be able to identify an issues, generate questions, and explain its significance within their community and the world. Students will also be able to analyze, integrate, and synthesize evidence to construct coherent responses. Using several resources and current data, students will develop argument based on compelling evidence and draw defensible conclusions. Using their evidence students will write letter to mayor and head of Chicago’s public transportation department with recommendations for improvements.

**Weigh Perspectives:**

In this lesson, students will have the ability to express their own perspective by drawing the bus route based on guidelines. Students will get to listen to others’ perspectives within the classroom by collaborating with peers and their ideas. Students will be able to articulate how different access to knowledge, technology, and resources affects quality of life and perspectives. Each student will have their own perspective that others may not share, therefore, students need to use mathematical evidence and other resources to make more convincing arguments for their thinking.

**Communicate Ideas:**

Throughout the lesson, students will need to communicate effectively with each other while reflecting on how effective communication affects understanding and collaboration in an interdependent world. Students will need to communicate ideas within collaborative teams all working toward a common goal energy efficiency, in their city and effects in the world. Students will also communicate formally in a letter to the mayor and head of Chicago’s public transportation system.

**Assessment:**

In order to assess math CCSS, I will look at student map of Solutionville and student approach to the solutions and their actual solutions to the questions. Also, students should be able to describe the mathematics learned to understand that the world consists of situations that can be represented, described, or quantified, entailing a solid understanding of algebra and the mathematics of generalizations. In order to assess global competences to Investigate the World I will read student letters so that they integrate comprehensive mathematical models in a global issue, describe how the mathematical relationships in a model reflect a situation, and their ability to employ mathematical tools and representations to analyze a global issue. To assess Recognize Perspectives students’ mathematical work and letter should include validation to their conclusions based on critiques of their peers to strengthen their arguments, opinions, or conclusions. To assess the area of Communicate Ideas, students should include explanations and justifications of their mathematical reasoning using precise mathematical language in an organized and sequential way. Also, students should include in their math work and letter should include clear written mathematical discourse analyzing the context of the problem.

**Resources:**

Building Better Buses: Transportation Design Challenges

<https://www.calacademy.org/educators/lesson-plans/building-better-buses-transportation-design-challenges>

Buses and Biofuels: Sustainable Transportation Video

<https://www.calacademy.org/educators/buses-and-biofuels-sustainable-transportation>

What’s the Deal with Fossil Fuels? Video

<https://www.calacademy.org/educators/whats-the-deal-with-fossil-fuels>

The Heat is On: Cause and Effect and Climate   
<https://www.calacademy.org/educators/lesson-plans/the-heat-is-on-cause-and-effect-and-climate>

Solutionville Inquirer

<https://www.calacademy.org/sites/default/files/assets/docs/pdf/flipsideenergy_heatison_solutionvilleinquirerarticle.pdf>

E85

<https://e85prices.com/>

Regular Gasoline

<http://gasprices.aaa.com/>

DESMOS

<https://www.desmos.com/>

U.S. Department of Transportation

<https://www.transportation.gov/mission/sustainability/sustainability-and-transportation-system>

Asia Society Graduation Performance System

<http://asiasociety.org/files/uploads/127files/Asia_Society_Graduation_Performance_System.pdf>