Curriculum Project

Introduction

Our curriculum project is a study on the solar system for a second grade class in a public elementary school.

Context

We believe this curriculum enables us to incorporate several components of Bloom’s taxonomy that promotes students’ higher-level thinking. Within this curriculum, students will have to understand, remember, create, and apply concepts learned throughout the five day implementation of this material. The curriculum will be spread out over five days in one week to enable a greater flow of material from day to day, allowing students to retain more information. We chose to apply this material to a second grade classroom because it is a topic that is attainable for students of that age to comprehend yet intricate and lies within a subject area that has oftentimes been left out in our experiences with Hartford Public Schools. Also, we believed that it would be useful to create a project designed in the sciences after learning about stereotype threat that targets women in the field of science particularly in STEM courses. Our lesson surrounding outer space covers the topics of science, english, and math, and incorporates the development of presentation skills as well as research skills. Because this solar system curriculum acts as a multidisciplinary lesson plan, we feel that second graders would be challenged by the material yet still intrigued. With the majority of their science related
curriculum in the second grade focusing on the earth's natural materials and the life cycle, we thought that this one week five day curriculum introduces new material easily within reach of their curriculum framework. Overall this curriculum satisfies many different Connecticut State Science and Math standards.

**Objectives**

- Students will understand the orientation of planets in the solar system.\(^1\)
- Students will become more spatially aware when examining the relative position of planets in the solar system in relation to the Sun.\(^2\)
- Students will utilize cooperative learning strategies to develop interpersonal and intrapersonal skills.\(^3\)
- Students will develop research skills by finding relevant information in both text and online sources.\(^4\)
- Students will gain presentation and communication skills by presenting their planet diorama in front of the class.\(^5\)

**Activities**

**Monday:**

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1. The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. (2-ESS1-1)

2. Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, ..., and represent whole-number sums and differences within 100 on a number line diagram. (2.MD.B.6)

3. Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-ESS1-1)

4. Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question. (2-ESS2-3)

5. Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions. (2-ESS2-2)
The first day will be an introduction to the solar system. Students will share in small groups (based on where they sit) then with the class as a whole, what they know about the solar system. This activity should take no more than five minutes. Next, they will discuss what more they want to learn about the solar system with the teacher as they begin to fill in a KWL chart. This chart will be drawn on the whiteboard with columns titled, “what I know,” “what I want to know,” and “what I learned.” After, students will take turns reading sentences from the book: “The Planets in Our Solar System” as a class.¹ They will then be given coloring worksheets and asked to complete them separately at their desks. Each page of the packet asks students to identify which planet is which based off a brief description and drawing of the planet and its environment. This day will primarily be dedicated to “Knowledge”, the first tier on Bloom’s Taxonomy, allowing students to get acquainted with the basis of what the week’s curriculum will include.

**Tuesday:**

On the second day, students will watch an eight minute video about the solar system.² This way students will have the opportunity to view a visual representation of the planets and then be able to create a physical representation of them. Next, students will be grouped based on mixed ability by the teacher. Our rationale behind mixed ability grouping is that students need to learn in order to think; therefore, being able to integrate and apply knowledge with a variety of students and ability levels will serve all students well for the rest of their educational careers. In addition, it is an ideal method to include a wide range of performance levels (which we have observed in our placements at Moylan) when working on a project. Lastly, mixed ability

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² [https://www.youtube.com/watch?v=6tjGSgsbvJ0](https://www.youtube.com/watch?v=6tjGSgsbvJ0)
grouping transforms diversity into a resource rather than a problem. Mixed groups act as a wonderful way for students to get to know peers of different ethnic backgrounds as well as other mainstreamed special education students and English Language Learners. In these groups, students will take turns (two people at a time) on the computers in the computer lab researching planets in the solar system on the website provided by their teacher. After half an hour, students will be called back to their desks for a mini literacy project. Each student will be asked to write down their favorite fact from each planet and paste it accordingly under the respective planet on the bulletin board in the classroom. This way students will be held accountable for researching the topic as well as furthering their ability to differentiate the planets.

**Wednesday:**

On Wednesday, students will begin class by joining their previous day’s assigned groups. The science project that will be completed on Friday will be introduced today. Students will be reminded to keep all of their worksheets to help them with their final presentation which will be focusing on one planet the group is assigned to. Once the project is explained, the teacher will assign two planets for every group which they will focus on in the following activity. Next a handout displaying the planet’s distance from the sun, minimum and maximum temperature will be provided. Each group of students will given nine index cards asking for the planet’s, a) Distance from the sun, b) Minimum temperature, and c) Maximum temperature. Once students have filled in the three facts per planet they will be be asked to place the completed index cards in one member of the group’s desk as they will be using the information later for the upcoming activity. Meanwhile, on the whiteboard the teacher will draw the sun on

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8 [http://www.kidsastronomy.com/the_planets.htm](http://www.kidsastronomy.com/the_planets.htm)
the far left of the board followed by a straight line extended to the right half of the board. The line will be divided by one hundred mile increments. After twenty minutes has gone by, students will be asked to come up as a group and write where their assigned planets would fall on the line according to its distance from the sun. For assistance, Earth will be on the line at ninety three million miles from the Sun, allowing students to have a better idea of where their planet falls on the line. Deciding whether or not their planet is farther or closer to the Sun than Earth, will help students to conceptualize distance and increase their math skills. This exercise will give them a better understanding of spatial awareness which will also help them with their capstone project.

On the whiteboard the teacher will draw the sun on the far left of the board followed by a straight line extended to the right half of the board. The line will be divided by increments of 100 miles. After twenty minutes, students will be asked to come up as a group and write where their assigned planet would fall on the line according to its distance from the sun. The teacher will have already placed Earth on the line at 93 million miles away from the Sun, allowing students to have a better idea of where their planet falls on the line. Deciding whether or not their planet is farther or closer to the Sun than Earth will help students to conceptualize distance and increase their math skills as listed in the Common Core Math Standards. This exercise will give them a better understanding of spatial awareness which will also help them with their capstone project.

**Thursday:**

Today students will depart on a field trip to the Connecticut Science Center where they will visit an exhibit dedicated to our solar system. In the “Exploring Space Exhibit,” students will visit at

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9 Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, ..., and represent whole-number sums and differences within 100 on a number line diagram. 
(2.MD.B.6)
least three out of the 4 stations, where they will accompanied by a chaperone and will complete a worksheet and participate in a variety of activities including making a moon crater, laying back in a space pod and touring the outer reaches of space, seeing a NASA space suit, and getting up close to a real moon rock. The worksheet allows students an opportunity to pause and reflect on what they just did and what exactly they learned satisfying the objective of having students record their scientific observations. When students return from field trip, they will discuss as a class what they learned and how they can use that information when creating their projects. This information will be added to the KWL chart that is still on the board from Monday.

**Friday:**

On Friday, students will be asked to get back into their groups so they can have class time to complete their projects. This final project will fulfill the objective that students will gain presentation and communication skills by presenting their planet project in front of the class.

For the project, each group will be given ten styrofoam balls, nine straws cut at different lengths, ten toothpicks, and ten pieces of tape. Based on their worksheets regarding each planet’s distance from the Sun, students will work together to create a diorama of planets. Those who feel compelled to express their knowledge gained from this curriculum in a different form can choose to perform a skit incorporating previously learned facts regarding the planets and or show each planet’s relative position. As a third option, students can create a drawing representing each planet’s distance from the sun and display it in front of the class just as the skit would be

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10 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-ESS1-1)

11 Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions. (2-ESS2-2)
performed in front of the class. With this students will accurately space out the planets according to their distance from the Sun (Pluto, being the furthest planet will be given the longest straw). Next, each student from the group will write down a fact about their planet and present those facts alongside their project in front of the class. Each presentation should last no more than five minutes to allow time for the teacher evaluation at the end of class. Students will then complete the KWL chart by sharing with the class what they learned about the solar system over the past week.

**Evaluation**

Jeopardy will act as the evaluation component of Bloom’s Taxonomy. Using Robert Slavin’s Teams-Games-Tournaments form of cooperative learning, students will work within their groups reviewing their material from earlier in the week. Then students will be individually called on to answer various questions worth different points regarding the solar system. If a person were to answer a question incorrectly the group that raises their hand first will have a chance to talk the question over and give a different answer. This will demonstrate the student’s ability to retain information and work collaboratively. The winning team will receive a reward chosen by the teacher to act as a form of positive reinforcement. In our classroom placements, Caroline and I have both personally experienced that positive reinforcement is an extremely efficient way of motivating students to get their work done. Since students will be competing as a group if a question was to be answered incorrectly, the design of the game limits individual competition. Secondly, Robert Slavin’s TGT method is all goal focused oriented. Students will

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see the benefits of rooting for each other to succeed rather than fail and will set the tone for interactions both inside and outside the classroom. Also, cooperative learning can increase student achievement, improve intergroup relations and increase self-esteem. As we have learned about and seen first hand, cooperative goals give students a new motive to do work and can expand the zone of proximal development. It’s also a fun and interactive way to test one’s retaintment of knowledge. Most importantly, having TGT as our evaluation creates equal opportunities for success which is crucial for many public school students in Hartford. In addition to recognizing which team/ individuals within the team were the most prepared for the game, the teacher will also be taking note of how well each group works collaboratively. Also one the game is over, the teacher will collect student’s worksheets and grade them accordingly with a check plus, check, and check minus based on how thorough the students completed them.

**Appendix**

- Connecticut Science Center: Exploring Space Exhibit
- Planet coloring pages: [http://www.education.com/slideshow/planet-coloring-pages/]()
- Jeopardy worksheet: [http://www.kidsastronomy.com/the_planets.htm]
- Video for kids: [https://www.youtube.com/watch?v=6tjGSqsbyJ0](https://www.youtube.com/watch?v=6tjGSqsbyJ0)
- Project materials (styrofoam ball, straw packets, toothpicks, piece of tape, piece of paper, sharpie)
- Jeopardy slideshow
- Candy for reward
- Index cards
- “The Planets in Our Solar System” book by Franklyn M. Branley
- Museum worksheet: [https://docs.google.com/document/d/1F_KUIkemW1-eLtweUwxlgqEwrz2a8yipdUyUQ44An9HQ/edit](https://docs.google.com/document/d/1F_KUIkemW1-eLtweUwxlgqEwrz2a8yipdUyUQ44An9HQ/edit)
- Computers in lab/ whiteboard/ smartboard
- School bus for museum transportation +6 chaperones
- Bloom’s Taxonomy
■ Robert Slavin’s TGT cooperative learning strategy
■ Project materials (styrofoam ball, roll of string, toothpick, piece of tape, piece of paper, sharpie)
Works Cited


**Wednesday’s planet fact worksheets: A)** Handout

**B)** Model of index card

### A)

**Mercury**

**Mercury means:**

Mercury was the Roman version of the god Hermes. He was the messenger for the other gods, and for this reason Mercury is often depicted in pictures with winged sandals. In addition to delivering messages, he was also the protector of travelers and merchants.

**How much would you weigh on Mercury?**

If you moved to Mercury you would not weigh as much as you do on Earth. Not because you would lose weight on the space ship, but because Mercury is smaller, and so has less gravity. If you weigh 70 pounds (32 kg) on Earth, you would weigh only about 27 pounds (12 kg) on Mercury.

**The Planet:**

Mercury is a world of extremes. Because it is so close to the Sun a visitor could easily cook to death. However, because mercury spins so slowly it gets very cold in the night time, which means a visitor could also freeze to death.

We are just starting to understand this world. It looks a lot like our moon, because it has craters and basins. Scientists used to think it acted like the Moon, but we are now learning that Mercury is in fact very different. In March of 2011, NASA’s Messenger probe entered Mercury’s orbit. It will soon give scientists a lot of new information about Mercury.

**Moons:**

Mercury has no moons.

**Mercury is so close to the Sun and so small that it has only a very small atmosphere. It has been blown away by the Sun’s solar winds. That means that there is almost no air on Mercury.**

### B)

**Names: ____________________________________________________________**

**MERCURY**

1. How far is Mercury from the Sun?

2. What is Mercury’s minimum temperature?

3. What is Mercury’s maximum temperature?