**Planning and Presenting a Mathematics Lesson Based on CCSS**

**Middle School Math**

**7th Grade**

**Section I: Planning**

**Overview: This section focuses on the elements to consider when planning for a CCSS lesson, such as content standards, mathematical practice standards, clear learning targets, task objectives, new learning for students, anticipated learning challenges, scaffolding, opportunities for differentiation, ways to prompt student thinking through assessing and advancing questions, instructional strategies to be used in the lesson, and materials and resources.**

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| **Lesson Topic: Students will examine directly proportional relationships via a lens of artistic creativity.** | **Time Frame/Lesson Length:**  **One (90 minute) class period** |

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| **Math Content Standards** | **Mathematical Practice Standards** | **Assessments**  **🗸 Formative** |
| 7.RP.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction 1/2/1/4 miles per hour, equivalently 2 miles per hour.  7.RP.2 Recognize and represent proportional relationships between quantities.  7.RP.2a Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.  7.RP.2b Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.  7.G.1 Draw construct, and describe geometrical figures and describe the relationships between them | * Make sense of problems and persevere in solving them. * Reason abstractly and quantitatively. * Construct viable arguments and critique the reasoning of others. * Model with mathematics * Use appropriate tools strategically. * Attend to precision * Look for and make use of structure. | * Compare & Contrast: Students will compare measurements of pieces created by both William Edmonson and Lonnie Holley in order to determine proportionality. * The students will present their solutions to each other. The students will analyze and critique the solutions and provide constructive feedback * Students will be expected to explain which scale drawings are accurate/proportional based the equations that they derive. * The students will be precise about labeling their tables and providing detail in relation to the construction of their equation. * The students will look for the patterns in the problem in order to create the structure of the equation. * Exit slip will include review of new vocabulary as well as an opportunity to solve to problems in order to prove that students have mastered the day’s topic of direct proportionality.   Summative assessments regarding this skill would come later in the form of a written assessment. |

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| **Planning Element** | **Description** |
| **Clear Learning Targets** | * I can compute unit rates associated with ratios. * I can recognize and represent proportional relationships between quantities. * I can identify a table as being proportional or not proportional. * I can use the proper formulas to identify proportional relationships. * I can use slope formula. |
| **Task Objectives (steps to reach mastery of clear learning targets)** | * Determine whether two quantities are proportional by examining the relationship given in a table, graph, equation diagram, or as a verbal description. * Identify the constant proportionality when presented with a proportional relationship in the form of a table, equation, or diagram. * Write an equation that represents a proportional relationship. * Use words to explain the relevance of a specific point on the graph of a proportional relationship, * Including, but not limited to (0,0) and (1,r). |
| **New Learning** | * Determining proportionality * Creating Equations * Slope formula |
| **Anticipated Learning Challenges** | * Some students may initially struggle with understanding the formula for slope (m= y2- y1/ x2-x1) .They may try to put the x variable on top. * Some students may struggle with understanding the attributes of a directly proportional relationship. In previous years students were taught that same direction automatically means direct. Students must now learn to apply the formula: Y= mx * Some students will not arrive at the correct conclusion because they will not ensure that the equation works for all the points. |
| **Scaffolding opportunities (to address learning challenges)** | * The teacher will emphasize that students must read graphs as y per x, in addition to labeling the first two order pairs of all tables. * The teacher will provide students with a variety of opportunities to encourage the learning of the equation for direct proportionality. These opportunities will include practice problems (converting tables to equation), direct application (applying skills to real world examples), and fun acronyms to assist students with the learning (example: the equation for direct is y= mx so an example memory device is “demarco young equals mr extraordinary-- to remember the order of the letters in the equation). * The teacher will have students check to make sure that their equations work with all of the tables and revise as needed. |
| **Opportunities to Differentiate Learning (explain how you address particular student needs by differentiating process, content, or product)** | The teacher will group students based on mastery of perquisite skills with groups ranging from 3-4 students. Students will be placed according to ability levels. The groups will remain the same for the duration of the lesson.  Students who struggle with note-taking and keeping up with the pace of the lesson will be provided with graphic organizers. |
| **Questioning: Planning to Illuminate Student Thinking** | *Assessing questions:*   * What can you tell me about the table? What do you see? * Based on the measurements of William Edmonson’s piece, what can you tell me about the table? * How do you know that your equation fits the pattern?   *Advancing questions:*   * How can ratios and proportional relationships be used to determine unknown quantities (scaling up or down). What makes you think that? * How can we determine the accuracy of a given scale? Why do you say that? |
| **Instructional Strategies** | * Accountable Talk * Summarizing and Note taking * Cooperative Learning * Generating and Testing Hypothesis   Activities include:   * Artist Assignment Task * Whole group discussion * Small Group Work |
| **Materials and Resources** | * LCD Projector * Ruler * Artist Assignment Task * Poster board * Clay, blocks, string, colored pencils, and cardstock will be provided to students as option; however, students will not be limited to such materials. * Exit Slip * Freedom Notes |

**Section II: Presentation**

**Overview: This section focuses on the steps involved in presenting the lesson. The lesson presentation is divided into segments, such as “Framing the Lesson,” “Exploring the Task,” “Sharing, Discussing, and Analyzing Solution Paths” and “Closing the Lesson,” and “Extending the Learning.” For each of these lesson elements, there is an explanation of the procedure, teacher actions, and student outcomes.**

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| **🕭 Framing the Lesson (10-12 minutes)** | | |
| **Detailed Procedure**   * Students will engage in introductory activity. * Students will measure each of the images provided within small groups. * Students will engage in class discussion. * Students will complete Freedom Notes graphic organizer. | **Teacher Actions**   * Teacher will distribute Freedom Notes graphic organizer and will introduce the lesson by reading Blurb A and B (included in appendix), while displaying William Edmondson’s photo (optional) and image of his art on the overhead screen. * Teacher will guide students in a discussion about Edmondson’s *Crucifixion* (image A in the appendix). What does this piece say? What exactly do we see? What does it tell us about Edmondson? What connections can we make to this piece? * Teacher will provide students with a small image of *Crucifixion* as well as one approximately, three sizes bigger. * Teacher will have students organize measurements in the table and discuss what they see (hopefully the see a pattern). * Teacher will facilitate discussion:   Questions could include: What do you see when you compare each feature? How do the sizes compare? What patterns do you recognize?   * Teacher will monitor and observe student measurements and creation of tables on Freedom Notes. | **Student Outcomes**   * Students will become familiar with Edmondson’s art, as well as with the idea of patterns across measurements of like items. * Students will work in groups to determine accuracy of measurements * Students will begin to demonstrate understanding of lesson goals. * Students will be formatively assessed. |
| **👓 Exploring the Task (10-12 minutes)** | | |
| **Detailed Procedure**   * Students will observe and compare Edmondson’s *Crucifixion* with a similarly themed piece by a trained artist (images A and B in appendix). * Students compare/contrast the pieces with four minutes of private think time. * Students have five minutes to share their ideas with a partner. * Students are introduced to the work of another self-taught artist, Lonnie Holley. | **Teacher Actions**   * Teacher will display images A and B (appendix) and instruct students to compare and contrast the two pieces individually. * The teacher circulates the room and provides feedback as necessary. * The teacher provides students with guiding questions to assess and advance their thinking. * Teacher facilitates partner time and determines which groups will share out. * The teacher will read Teacher Blurb C (included in appendix). | **Student Outcomes**   * Students will compare and contrast two images. * Students will work with partner collaboratively and respectfully to discuss similarities and differences.      * Students will understand the attributes of a self-taught artist, versus a trained artist. * Students will become familiar with Holley’s art. |
| **☺ Sharing, Discussing, and Analyzing Solution Paths** **(60 minutes)** | | |
| **Detailed Procedure**   * Students will examine a piece created by Holley as they engage in new learning. * Students will engage in private think time (2 minutes). * Students will engage in whole group discussion (5 minutes).   **Practice:**   * 5 minutes of determining direct proportionality * 10 minutes with partner * 10 minutes to explore new concept individually * Students will engage in culmination activity for the lesson (25 minutes):   **Prompt:** *Our challenge today is to create an image that you believe represents the class of 2015. What stands out about you? What is monumental to your time period? You can pick an event to focus on or specific person, but it must have some link to you.*  *You must begin by creating your image in the three by three squares on your paper then you will construct a larger model using any of the tools in the back of the classroom. Your model and the image created in three by three square are expected to be directly proportional and this must be proven in your work. Remember the art should speak for itself without explanation.* | **Teacher Actions**   * Teacher will read Teacher Blurb D (appendix). * Teacher will facilitate modeling activity as students take notes. * Teacher will focus on key concepts like slope and direct proportionality * Teacher will ask questions, allow for private think time and will facilitate discussion. * Teacher will extend learning through advancing questions. Teacher will give students several practice problems to apply new skill * Teacher will introduce the culminating assignment by reading Teacher Blurb E (appendix) and further explaining the assignment. Students may work with partners. * Circulate the classroom in order to fill in any gaps in understanding | **Student Outcomes**   * Students will engage in new learning regarding slope and direct proportionality while taking notes. * Students will work with shoulder partner to apply new concept (slope formula) * Students will work with partners to apply new concept and to demonstrate mastery of learning goals. |
| **🞐 Closing the Lesson** **(5 minutes)** | | |
| **Detailed Procedure**   * Students will engage in a reflection of the lesson by completing an exit slip | **Teacher Actions**   * Teacher will direct students to reflect on the objectives/ advancing questions and the different patterns seen in today’s lesson. * The teacher will circulate the classroom to check for students exhibiting signs of a lack of understanding. | **Student Outcomes**   * Students will reflect on their own learning * Students will demonstrate progression toward mastery of learning goals and will be formatively assessed. |
| **🕮 Extending the Learning**   * Future lesson suggestions would include the creation of a scaled replica of Edmondson Park (using graph paper) based on a scale provided by teacher. Example 1sq unit= 3 feet * The virtual tour referenced in Blurb C can be facilitated through images found at: <http://www.nashville.gov/Arts-Commission/Public-Art/Find-An-Artwork/Projects-in-Progress/Edmondson-Park.aspx> * Additional Learning Extensions: After the class creates a scaled replica of Edmondson Park, the Class of 2015 scaled image could be included as part of the model. | | |

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| **Appendices (attach resources used, such as handouts, etc…):**   * **Suggested Teacher Blurbs** * **Artist Images** * **Freedom Notes** * **Directly Proportional Relationship Guided Notes Sheet (student and teacher edition)** * **Exit Slip** * [**http://www.nashville.gov/Arts-Commission/Public-Art/Find-An-Artwork/Projects-in-Progress/Edmondson-Park.aspx**](http://www.nashville.gov/Arts-Commission/Public-Art/Find-An-Artwork/Projects-in-Progress/Edmondson-Park.aspx) |