**Planning and Presenting a Science, Social Studies, or Technical Subject/Fine Arts Lesson Based on TN Academic Standards**

**Physics**

**Grades 11-12**

**Section I: Planning**

**Overview: This section focuses on the elements to consider when planning for a content-specific lesson with TN Academic literacy standards embedded, such as Content Standards, State Performance Indicators, and CCSS Literacy for the Technical Subjects. Other elements to plan include 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: Optical Illusions** | **Time Frame/Lesson Length: 2 class periods** |

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| **Content Standard** | **State Performance Indicators** | **CCS Literacy Standards** | **Assessments (Please describe the specifics of the assessment)**  **🗸 Formative**  **⮚ Summative** |
| * CLE   3231.4.3 Explore the optics of lenses   * CLE   3231.4.4 Analyze the optics of mirrors | * SPI.3231.4.5   Identify the properties of light related to reflection, refraction, diffraction, and interference of light waves   * SPI.3231.4.6   Using light ray diagrams, identify the path of light using a convex lens, a concave lens, a plane mirror, a concave mirror and a convex mirror. | * CCSS.ELA-LITERACY.RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. * CCSS.ELA-LITERACY.RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics. | * Formative * Comprehension questions during the guided reading section      * Monitoring during lab stations * Summative * 5 question assessment * Final Product |

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| **Planning Element** | **Description** |
| **Clear Learning Targets** | * Students will be able to distinguish the different properties of light * Students will be able to complete optical labs with appropriate steps * Students will be able to use different diagrams (such as the *Witness Walls*) to demonstrate the path of lights with different mirrors * Students will be able to identify the different meanings of domain specific language in text |
| **Task Objectives (steps to reach mastery of clear learning targets)** | * Students will be able to look at the *Witness Walls* piece and describe the different optical illusions taking place, created by the convex and concave images. |
| **New Learning** | * The different properties of light * The different types of mirrors * The different types of lenses * The significance of the *Witness Walls* piece |
| **Anticipated Learning Challenges** | * Students will have a difficult time getting rid of misconceptions. Any time there is a concept in science that students interact with on a daily basis, there are always many misconceptions that have already formed. |
| **Scaffolding opportunities (to address learning challenges)** | * Students that are having a difficult time understanding the concepts will be put in a small remediation group with a peer leader. |
| **Opportunities to Differentiate Learning (explain how you address particular student needs by differentiating process, content, or product)** | * The websites in the interactive reading sections can be adjusted to different websites on students reading levels or the questions from the reading can be adjusted. * The product can be adjusted to meet the students’ needs. The product can be less open-ended and provide guided questions for students who need the scaffolding. |
| **Questioning: Planning to Illuminate Student Thinking** | *Assessing questions:*   * What are the similarities and differences between concave and convex lenses? * What is the difference between a lens and a mirror? * What ability of glass allows us to magnify, or make things larger? * How do light waves act when they hit a smooth or shiny surface?   *Advancing questions:*   * What effect does changing the distance between the lens and the object viewed have on the orientation and size of the image produced using a convex and a concave lens? * What are some real world examples of the following: concave mirror, convex mirror and concave lens? * Why do convex and concave mirrors make some images more powerful? |
| **Instructional Strategies** | * Accountable Talk- During all stations, but particular during the mini-labs. * Text-Based Questions- Station #2- The questions come directly from the information that has been read. * Problem- Based Learning- in the Putting it all Together activity. The students receive a problem that they must solve. |
| **Materials and Resources** | Spoon, water, mirrors, glass test tube, stopper, ruler, index card, Witness Wall picture, Explore Learning account, computer access, flashlight, modeling clay, protractor, construction paper, flashlight |

**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,” “The Texts and Task,” “Sharing, Discussing, and Analyzing” 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** (15 min) | | |
| **Detailed Procedure**   * Intro Activity- Spoons and Images – See Handout * The students will use spoons to look at different images of the Civil Rights Movement and of Walter Hood’s *Witness Walls*. During the activity, students will gain the basics on how curved surfaces reflect light. Students will begin to discuss the Nashville Civil Rights Movement as they look at the pictures. | **Teacher Actions**   * Teacher must have spoons and different graphic images of the Civil Rights Movement in Nashville for each group (see appendices). Before the class begins the intro activity, the teacher should have a short discussion about the Nashville Civil Rights Movement Pictures. This discussion should activate students’ prior knowledge on the subject. During the activity, the teacher should walk around and monitor students’ answers to the intro activity. Teacher should listen for misconceptions that need to be addressed before students move on to the stations. | **Student Outcomes**   * The basic expectation is for students to see that different types of mirrors reflect different images. The students should also have some real world examples where different mirrors are used. The students should take away some background knowledge of the Nashville Civil Rights Movement. |
| **👓 Exploring the Texts and Task** (2 hours and 15 minutes (over two days) | | |
| **Detailed Procedure**   * The lesson will consist of three stations that will take approximately 45 minutes each. * The stations are designed to give students an in-depth overview of mirrors, lenses, and how they work. * Station 1- Explore Learning- It gives the students real images to look at as they study mirrors. * Station 2- This station gives students basic knowledge and vocabulary. They will read information from the computer (similar to a webquest) and answer questions. The students will also make a foldable as visual representation between the key terms. * Station 3- Mini-Labs. The mini-labs are designed for students to discover misconceptions on their own. | **Teacher Actions**   * Station #1- The teacher will make sure that the classroom has computers with internet. The teacher should have set up a free account with Explore Learning, so that students could have the password to get on the virtual lab. Teacher should make sure that all students are following the directions on the virtual lab * Station #2- Teacher should make sure that students are understanding the material. Teacher should check and make sure that students have correct information on their handout and in their foldable. * Station #3- Teacher should listen to the accountable talk among the groups to ensure that misconceptions are being addressed. Teacher should ask probing questions to make the students go deeper with the simple materials. | **Student Outcomes**   * Station #1- Students should have a deeper understanding of concave and convex mirrors. * Station #2- Students should be able to explain the difference between key terms- Refraction and reflection, concave and convex, and the different types of mirrors. This station provides the basic background knowledge for all of the information in the unit. * Station #3- Students should get hands-on experience with the different lenses and mirrors. This station should address misconception that the students have by allowing them to observe the phenomena. |
| **☺ Sharing, Discussing, and Analyzing** (45 minutes) | | |
| **Detailed Procedure**  The students will complete a Putting it All Together activity that will sum up the different types of mirrors and lenses. The students will pick what type of lenses that they think are the best for the Witness Wall. | **Teacher Actions**   * Teacher should group the students by ability level during this portion of the lesson. By grouping by ability teacher can differentiate the products and scaffold the problem if necessary. | **Student Outcomes**   * Students should gain a deep understanding of the *Witness Walls* and the science behind the design. Students should be able to relate the design to what makes *Witness Walls* such a dynamic exhibit. |
| **🞐 Closing the Lesson** (15 minutes) | | |
| **Detailed Procedure**   * The students will complete a five question assessment. | **Teacher Actions**   * Teacher will distribute the assessment. Even though the assessment is summative in nature, the results will guide the teacher’s next steps in teaching. | **Student Outcomes**   * At least 80% of students should exhibit mastery of the information. |
| **🕮 Extending the Learning**   * To extend the learning, students could make their own witness wall for the school. It would be built on the same principles from the artist. The witness wall would have to include at least one concave, convex, and plane mirror. | | |

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| **Appendices (attach resources used, such as handouts, etc…):**   * Intro Activity- Spoons and Images * Optics Stations Directions/Handouts * Station 1- Explore Learning Activity * Station 2- Interactive Reading and Foldable * Station 3- Concave and Convex Lenses/Mirror Mini- Labs * Putting It All Together Activity- Through the Lens |