**Engineering Design Process Packet Answer Key**

**ASK: Asking Questions to Understand**

As artists and engineers, we ask important questions about our project to understand the problem.

Asking questions in the format *“who, what, when, where, why, and how”* helps us to develop efficient solutions.

Read the questions below and write a complete sentence to answer each one.

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| **IMPORTANT QUESTIONS** |
| **WHO** IS IN NEED?  Professor (name) is in need.  **WHAT** IS THE PROBLEM?  On a treasure hunt, the professor got lost while exploring with our art class. All of us were able to find  the treasure, but the professor needs clues to find the treasure. The professor does not speak the same  language as we do, but we must make directions to help.  **WHEN** DO WE NEED TO FIND A SOLUTION?  We need to find a solution in 4 art class periods.  **WHERE** DOES THIS PROBLEM TAKE PLACE**?**  The problem occurs in our school!  **WHY** DO WE NEED TO HELP?  We need to help the professor to reveal lost treasure. The treasure includes artifacts from  history that can be used for research and cultural learning.  **HOW** CAN WE SOLVE THE PROBLEM?  We can solve the problem by using pictures as clues. We can make a map! |

**RESEARCH: Looking at Hieroglyphs**

Hieroglyphs are a writing system used in Ancient Egypt. The word Hieroglyphs breaks down to

“Holy Writing”; *hiero* means “holy,” and *glyphs* means “marks” or “writings.” Hieroglyphs are made up of

pictures of animals, objects, and symbols. Hieroglyphs were used to represent words, letters, or sounds.

Below are three hieroglyphs. Draw and write what you think the hieroglyph means, and why. The teacher will

reveal what the hieroglyph means.

**Key Terms**

*Research: Exploring and studying to learn facts and better understand a topic*

*Hieroglyph: Ancient Egyptian writing*

*Symbols: A mark, image, or object that represents something*

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| **Hieroglyph** | **What I think it means** | **What it means** |
|  | Answers will vary. | This hieroglyph is a foot or means “walk.” |
|  | Answers will vary. | This hieroglyph is a leaf, knife, or means “to cut.” |
|  | Answers will vary. | This hieroglyph means lion or “L,” because it is the first letter in the word. |

**IMAGINE 1: Brainstorming**

Put on your thinking caps! Think about how you will create your map prints using your own symbols. Think

about how you can represent pictures for important places in the school just as Ancient Egyptians would.

Would you recognize the symbols you created? Draw two symbols you can use to give directions around the

school. Give one reason why. Draw or write what materials you might use.

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| **My Ideas** |
| **SYMBOL**  **I used this symbol because:**  It is simple and it can be used for turning left and right.  **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **I can use:**  Sticks  **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **SYMBOL**  **I used this symbol because:**  “X marks the spot.” This means they have found the treasure!  **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **I can use:**  Sticks  **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |

**IMAGINE 2: Brainstorming**

Take time to draw more symbols and write what they mean to complete your map.

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| **My Symbols** |
| **SYMBOL**  **SYMBOL**  **MEANING: Art Room MEANING: Library**  **SYMBOL**  **SYMBOL**    **MEANING: Tree/Plant MEANING: Music Class** |

**PLAN: What’s Your Solution? (Individual)**

What is your solution? Draw a basic layout of your map and note any personal ideas you may have.

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| **My Solution** |
| **Circle=** Starting Point “You are here” **Arrows=** left, right direction  **X=** End, Treasure  **\*Important Checkpoints Paintbrush=** Art Class **Music Note=** Music Class **Book=** Library |

**PLAN: What’s Your Solution? (Group)**

Discuss the plan as a group and come together to decide on a final solution!

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| **Our Solution** |
| **Circle=** Starting Point “You are here” **Arrows=** left, right, straight direction  **\*Important Checkpoints Flower=** Mural Wall Painting **Paintbrush=** Art Class  **Music Note=** Music Class **Book=** Library  **X=** End, Treasure |

**TEST: Test Your Prototype!**

Test your map print. Record observations and notes.

**Key Terms**

*Prototype: An original model from which later stages are created*

*Observation: The process of watching or studying closely*

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| **My Observations** |
| * Sticks work well for making straight lines. * Dirt can be an option for making symbols because it is easy to manipulate. * Leaves work well for big shapes, not small shapes. * Flowers are successful for prints. * Detailed pictures are more challenging to create. * Simple designs turn out clear on construction paper. * Darker construction paper works best for more contrast. * The longer the print sits in the sun, the clearer the print. * Simplicity is key! |

**IMPROVE: How Can We Make Our Prints Better?**

As a group, think about the outcome of your map. Were the directions successful? How do you think your

group can improve your map prints? Discuss as a group and use complete sentences to answer the questions.

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| **Ways We Can Improve** |
| **How can your group improve your directions?**  My group can improve our directions by adding more clues! We can make our clues easier to read by  adjusting our paths. We can improve our symbols.  **How can your group improve your symbols to make them clearer?**  Our group can improve our symbols by making them relate more to the classrooms.  We can make our symbols simpler too, like creating arrows for turning points.  **How can your group improve your cyanotype map prints to make them more effective?**  My group can improve our cyanotype map prints to make them more effective by leaving them in the sun  longer to make an accurate/clearer print. We can change some of the objects in nature (e.g., use sticks for straight lines). We can try using darker construction paper to increase the contrast of our symbols. |