**Problem Finding**

**Preparation**

**Purpose**

This lesson helps students connect their individual interests with opportunities for solving problems.

Specifically, this lesson requires students to:

* Examine the interconnectivity of topics with their interest topic as a starting point
* Develop a general understanding of where their topic fits within a larger field of knowledge.
* Explore existing problems in an area of interest and identify numerous alternative problems that also need to be solved

**Essential Question/s**

How are domains of knowledge connected?

What is a problem?

How do you solve problems?

**Materials**

Computers

Access to the Internet

Paper

Pencil

Large format paper

Markers

*Expanding Knowledge* handout

**Notes for Planning**

In searching for a problem, students need to seek out a problem or question that does not have an existing solution or a solution where there is only one right answer or unique solution. Keep in mind that the purpose of pursuing a problem is to bring about change or contribute something new to a domain or field of study. While this curriculum is very process focused, knowledge is foundational to any field, domain, or area of endeavor, therefore students must gain knowledge. As the teacher, it may be challenging to keep up with the many different paths of knowledge students’ work to develop, but keep in mind that the student should be constructing their own knowledge through the process and they will need to be able to communicate it in a way that you understand. The caveat here: If they have advanced knowledge in a field and exceeds your capacity to understand (I have encountered this many times!) then it is important that you find a more knowledgeable “other” to support the student’s growth and assess the quality and efficacy the student’s understanding.

This lesson begins the process of students immersing themselves in a topic of interest. This immersion is one step in students developing the foundational knowledge necessary to meaningfully understand and begin to map the interconnectedness of knowledge while deepening their own understanding of their topic of interest.

Students’ level of knowledge about their identified topic of interest will vary significantly, but each student should be able to find a starting point for the process, even if it is only using the key word in their topic of interest. That said, it will be important for students to have ready access to the Internet throughout this exercise, but computers and the Internet should not be the primary focus – the Internet is merely a tool for students to access when needed.

**Implementation**

**Time Needed**

2 @ 45 minutes

**Notes for Instruction**

Part 1:

Using the *Expanding Knowledge* handout have students take their topic or the keyword from their topic and list 5 ideas or concepts that are more general but related to the topic or keyword. These should be listed above the main topic. Then, have students list 5 ideas or concepts that are more detailed or specific. These should actually be subsets or sub domains of the main topic. Five is a minimum, but students can list as many as they would like.

Part 2:

Once students have a list of at least 11 items relevant to their topic, they can begin to search their topic on the Internet. The goal of this search is for students to create a web or map of related topics, concepts, concerns or issues relevant to their topic. We recommend that students start with Wikipedia and utilize the “Contents” box for their search (i.e. the boxed areas that lists the topics and subjects associated with the query). Students should take notes about the related topics to be used to create a map.

Using the large format paper, have students draw the topics, ideas, and concepts they found. Students should also begin to identify the conflicts, challenges, problems, or needs within the field and include these as they develop a mind map to illustrate the connections between and among topics.

Once students complete the large format paper version, they should re-create the same mind map using Prezi (<https://prezi.com/>). Using Prezi allows students to develop technology skills, while supporting them as they formalize their own understanding of the related knowledge in their field or domain of interest. Conflicts, challenges, problems, or needs within the field should be highlighted. Help students understand that their map represents a portion of a “field of knowledge” and while they may have a lot of information within their map, the map itself does not represent a complete “field”. Hopefully they will begin to identify that there is always more to learn. You might simply close the lesson by asking: Did you find out everything there is to know about your topic? If they were successful in their search, they will begin to recognize that there remains a lot to learn.

Journal:

This lesson is reinforced with a journal entry. Have students consider at least one of the following questions.

Consider your topic search today:

* What problems exist that need to be solved? What ideas do you have that might be useful in solving those problems?
* Is there anything in your field of interest you would like to do? What would you like to do and why is it important?
* Is there anything in your field that you could do better? What could you do better and how would you make it better?
* What ideas do you have for your field? What ideas would you like to get going?
* What would you like to get others to do? What steps might you take to encourage others to act in a positive way?
* What change would you like to see in your field? What steps might you take to begin to make that change happen?

You have identified a topic that interests you more than all other topics at this time and that you can communicate to others. Make sure that the topic you have identified is one that you can stay interested in for a long time (at least 3 months!). Now that you have identified a topic, you are going to work to find where your topic fits in a field of knowledge.

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| **General / Broad** |
| List at least 5 ideas, concepts, or topics related to your topic of interest that are more general or broad than your topic. For example: If your topic is “Mars” more general topics might be planets, the solar system, exploration, space, NASA, astronomy, etc. |
| **Your Topic:** |
| List at least 5 ideas, concepts, or topics related to your topic of interest that are more general or broad than your topic. For example: If your topic is “Mars” more specific topics might be physical characteristics, regolith, orbit and rotation, moons, habitability, future exploration, surface rovers (Spirit, Opportunity, and Curiosity), etc. |
| **Specific / Detailed** |

Now that you have identified knowledge relevant to your topic of interest, it is time to identify the conflicts, challenges, problems, or needs that exist within your field of interest. List the conflicts, challenges, problems, or needs that definitely exist or that you think might exist. Are there any conflicts, challenges, problems, or needs that you have identified that no one else has identified? Put a star by these.

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| **Conflicts, Challenges, Problems, or Needs** |
| List at least 5 conflicts, challenges, problems, needs, or questions: |

What questions do you still have about your topic of interest? For each question word below, generate at least two questions about your topic that begins with each of the question words. Make sure that the question you pose cannot be answered with a simple Google search. If you need help generating questions, use your question cubes for help!

|  |  |
| --- | --- |
| **Who…** |  |
|  |
| **What…** |  |
|  |
| **When…** |  |
|  |
| **Where…** |  |
|  |
| **Why…** |  |
|  |
| **How…** |  |
|  |

You have expanded the breadth of your thinking about your topic. Now it is time to go online and see what else you can learn. This sheet is designed to help you collect information that may be useful to you in the future as you create your map of knowledge related to your topic.

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| Main Topic: |
| Sub-Topics: |
| Why did you choose this topic? |
| What did you learn by exploring this topic on the Internet? |
| What new sources did you discover related to your topic? |
| How do you know the new sources you found were reliable? If you are not sure, what steps can you take to determine the quality and reliability of the sources? |
| Where will you go to find the answers to the questions you still have? |
| Are you still interested enough in this topic to explore it for several months? If not, what other topic would you like to consider? |