1. “Explore” resources:

   a. Journal, Meriwether Lewis:  
      On April 20, 1803, Lewis wrote President Jefferson,  
      ‘My detention at Harper's Ferry was unavoidable for one month, a period much greater than  
      could reasonably have been calculated on; my greatest difficulty was the frame of the canoe,  
      which could not be completed without my personal attention to such portions of it as would  
      enable the workmen to understand the design perfectly. -My Rifles, Tomahawks & knives are  
      already in a state of forwardness that leaves me little doubt of their being in readiness in due  
      time.’”  
      https://www.nps.gov/articles/harpers-ferry.htm#:~:text=%E2%80%9CMy%20detention%20at%20Harper%27s%20Ferry,workmen%20to%20understand%20the%20design

   b. Engineering Design Problem: How can you get the "The Experiment" to float?  
      1. Students will build a frame for a boat– using wire to simulate the “metal frame”.  
      2. Students will attach cloth to the frame shaped like a boat.  
      3. Teachers will have various kinds of cloth, beeswax, vegetable shortening,  
         charcoal, and other substances for students to mix together and spread onto  
         cloth.  
      4. Students will test the water resistant quality of their newly created substance by  
         testing how long their cloth-covered frame floats in a tub of water.  
      5. Students will revisit their substance to make a better one– trying again to  
         improve the water resistant quality of their boat.

   f. The Captain’s Dog, by Roland Smith (pp. 149-159)  
      July 4, 1805  
      “Captain Lewis was sitting near the iron boat with the red book in his lap, his pen in his hand .  
      . . when Captain Clark found him.  
      “I wondered where you had gotten to. What are you doing down here by yourself? . . . How  
      long will you give the boat?”  
      "You don’t think it will work, either?” Captain Lewis was clearly surprised.  
      “It was a good idea, “Captain Clark said carefully. But no, I don’t think she’ll float.”  
      (excerpt: The Captain’s Dog”, pp. 152-153)

   g. Primary Source: Journals of Lewis and Clark (Entries for Clark, Ordway, Gass, Whitehouse)
Clark

July 9th Tuesday 1805

a clear warm morning wind from the S W. Lanced the Leather boat, and found that it leaked a little;
Corked Lanced & loaded the Canoes, burried our truk wheels, & made a Carsh for a Skin & a fiew papers
I intend to leave here on trial found the leather boat would not answer without the addition of Tar which
we had none of, having Substituted Cole & Tallow in its place to Stop the Seams &c. which would not
answer as it Seperated from the Skins when exposed to the water and left the Skins naked & Seams
exposed to the water

Ordway

July 9th Tuesday 1805

a beautiful pleasant morning. the Island near the Camp is covered with black
birds. [3] we put the Iron boat which we covered with green hides in to the water. Corked Some of the
canoes in order to git in readiness to depart from this place in the afternoon we loaded the 6 canoes but
did not load the Iron boat as it leaked considerable Soo[n] after we got the canoes loaded Thunder and
high wind came on So that we had to unload again. our officers concludes for to leave & burry the Iron
boat, as we cannot git tar or pitch to pay the over the out Side of the Skins. the coal Tallow & bease wax
would not stick to the hides as they were Shaved

Whitehouse

July 9th Tuesday 1805

a beautiful morning. the Island near our Camp is covered with black
birds. the musquetoes verry troublesome. we put the Iron boat in to the water the coal Tallow &
bease wax would not Stick to the hides, &c. the time being So far Spent they concluded to burry hir at
this place and go about 20 miles up the River and make 2 canoes which would answer much better. So
we Sunk [4] Sd. Iron boat in the River So that Shee may be taken apart the better
tomorrow.

Gass

Tuesday 9th. A fine morning, and heavy dew. In the forenoon we loaded our canoes, and put the
Experiment into the water. She rides very light but leaks some. In the afternoon a storm of wind, with
some rain came on from the north west, and we had again to unload some of our canoes, the waves ran so
high. After the storm we had a fine evening. The tallow and coal were found not to answer the purpose;
for as soon as dry, it cracked and scaled off, and the water came through the skins. Therefore for want of
tar or pitch we had, after all our labour, to haul our new boat on shore, and leave it at this place.
2. “Elaborate” Resources:
   a. Journal of Meriwether Lewis, July 9, 1805
      “. . . we discovered that a greater part of the composition had separated from the skins and left the seams of the boat exposed to the water and she leaked in such manner that she would not answer. I need not add that this circumstance mortified me not a little; and to prevent her leaking without pitch was impossible with us, and to obtain this article was equally impossible, therefore the evil was irreparable. I now found that the section formed of the buffaloe hides on which some hair had been left, answered much the best purpose; this leaked but little and the parts which were well covered with hair about \( \frac{1}{8} \)th of an inch in length retained the composition perfectly and remained sound and dry. From these circumstances I am preswaided, that had I formed her with buffaloe skins singed not quite as close as I had done those I employed, that she would have answered even with this composition.”
      https://lewisandclarkjournals.unl.edu/item/lc.jrn.1805-07-09
   b. Vocabulary: pitch (noun) a sticky resinous black or dark brown substance that is semiliquid when hot, hard when cold. It is obtained by distilling tar or petroleum and is used for waterproofing.
   c. How to make pine pitch glue
      Here’s how to use Pine resin in a homemade glue recipe.
      1. Collect the resin from a pine tree. Here’s a method to tap a pine tree to obtain the sap from a tree.
      2. Melt the resin. If it ignites, blow out the flame and move the container so the heat is lessened. Try to not overheat the resin as the compounds are destroyed the longer they are subjected to heat.
      3. Add 1 part hardwood charcoal powder. This helps temper the resin and reduces its stickiness.
      4. Add 1 part filler material. This can be ground plant material (crushed to a fine powder) or rabbit or deer scat/droppings (dried and ground up). In a pinch, you may also substitute sawdust, bone dust, or animal hair. The filler material helps strengthen the glue compound.
      5. If you wish to make the resultant glue more flexible, so it can be easily worked, add one part fat, tallow, or beeswax to the mixture.
      6. Mix thoroughly.
      7. Apply using a stick.
      8. After the glue hardens, it will resemble hardened glass (unless you choose to add beeswax or fat in which case it will be more elastic).
      Dried pine pitch glue can be reheated to convert it back to its liquid state. Dip a stick into the mixture and remove, allowing the glob of glue to harden on the stick. Re-dip the stick to add additional layers of glue (as it cools, you may wish to roll it between your hands to compress and shape it). The finished lolly of pine pitch glue can then be carried with you and reheated when needed.
      https://www.wildernessarena.com/skills/general-repair/how-to-make-pine-pitch-glue
3. Primary Sources:
   1. 1803 Map of North America—prior to the expedition
      https://www.loc.gov/item/99446111/
   2. 1810 Map created by William Clark
      https://www.wdl.org/en/item/3057/view/1/1/
   3. Journals of the Lewis and Clark Expedition
      https://lewisandclarkjournals.unl.edu/
      https://www.weather.gov/media/wrh/online_publications/TMs/TM-269-1.pdf

4. Suggested books:
   1. Picture books:
      a. Seaman’s Journal, Patti Reeder Eubank
      b. The Crossing, Donna Jo Napoli
      c. Sacagawea, Liselotte Erdrich
      d. The Journey of York, Hasan Davis
      e. Prairie Dog Song, Susan L. Roth and Cindy Trumbore
   2. Historical fiction: The Captain’s Dog, by Roland Smith
   3. Informational books:
      a. Mountains, Seymour Simon
      b. Who Needs a Prairie?, Karen Patkau

5. Parks Resources:
   1. Harpers Ferry National Park
      https://www.nps.gov/hafe/index.htm
   2. Lewis and Clark Historic Trail National Park
      https://www.nps.gov/lecl/index.htm
   3. Gateway Arch National Park
      https://www.nps.gov/jeff/index.htm
   4. Fort Mandan Interpretive Center
      https://www.parkrec.nd.gov/lewis-clark-interpretive-center
   5. Lewis and Clark Interpretive Center, Great Falls, Montana
      http://www.lewisandclarkfoundation.org/home.php
6. **Fort Clatsop National Park (also has a Traveling Trunk available for Educators)**
   [https://www.nps.gov/lewi/planyourvisit/fortclatsop.htm](https://www.nps.gov/lewi/planyourvisit/fortclatsop.htm)

6. **More Resources:**
   7. The Lewis and Clark Trail
   8. National Maritime Historical Society
   9. The Historical Marker Database
      [https://www.hmdb.org/m.asp?m=143669](https://www.hmdb.org/m.asp?m=143669)
   10. United States Geological Survey (USGS)
       a. Lewis and Clark map
           [Lewis and Clark Map USGS Comparison](https://www.lewisandclarkfoundation.org/_newsletters/lcf_nwsltr_V6N1_FinalProof.pdf)
       b. Newsletter describing the student ethnobiology project
           [http://www.lewisandclarkfoundation.org/_newsletters/lcf_nwsltr_V6N1_FinalProof.pdf](http://www.lewisandclarkfoundation.org/_newsletters/lcf_nwsltr_V6N1_FinalProof.pdf)
   11. Student Ethnobotany Project
   12. NASA
       [https://www.nasa.gov/multimedia/podcasting/nasa360/nasa360-0104.html](https://www.nasa.gov/multimedia/podcasting/nasa360/nasa360-0104.html)
   13. Discovering Lewis and Clark