

The Suchman Inquiry Model and the Disappearing Aral Sea

by Catherine Snyder

Several years ago, I attended a New York State Geography Alliance Institute conducted by John Crawford where I learned about the disappearing Aral Sea. It was a fascinating topic, but I was not sure how I could teach it to my Global History and Geography students in a way that would capture their attention and address the economic and social consequences of geographic change. I decided to use the Suchman model, an inquiry-based method written for science teachers. The Suchman model asks students, working in small groups, to find the answer to a larger question by formulating yes/no questions based on a series of teacher “inputs.” After all the inputs are delivered and analyzed, student teams develop answers to the larger question. The questions for this lesson were simply, “So what?” and “Why should I care?” The Suchman Inquiry Model contains the following steps: (1) Select a problem and conduct research. (2) Introduce the process and present the problem. (3) Gather data. (4) Develop a theory and verify. (5) State the rules and explain the theory. (6) Analyze the process. (7) Evaluate. I was assisted in this project by Kerry Filiberto, an intern from the MAT Program at Union University.

Background: The Aral Sea crisis started during the Soviet era. In order to increase agricultural production, rivers feeding the Aral Sea were diverted for irrigation. This overuse led to lowering of the water levels in the Aral Sea and an increase in the salinization of the water. This caused a steep reduction in the number of species of animals living in and around the sea and decimated the local fishing industry. As the water level receded, salt and other pollutants in the water became air born, causing an increase in tuberculosis, various cancers, and other diseases among local populations. People living in the immediate vicinity of the Aral Sea in Kazakhstan and Uzbekistan have suffered health problems and the loss of their livelihoods, drinkable water and the ability to grow food. However, the most serious problem involves Vozrozhdeniye, an island in the middle of the Aral Sea. The Soviets used the island to conduct research on biological and chemical weapons and as a storage facility for byproducts of nuclear testing. The



http://www.fpif.org/briefs/maps/map_aral.jpg map

remnants of that research are still there today. The receding water levels have resulted in a land bridge to the island which poses a major security and health risk. This is a multifaceted international crisis. The two countries bordering the sea do not have the means to clean up or contain the material left behind by the Soviets.

1. Select a problem and conduct research. I teach this lesson within Global History and Geography 10 curriculum during the World Today unit. This lesson, which takes one 80 minute block, incorporates issues related to the Cold War, the environment, economics, health, terrorism and developing nations and is well worth the instructional time. During the questioning rounds, students will ask unexpected questions which will require quick reference to the material researched. In order to conduct this lesson, you will need fairly substantial background information on the topic. Plan to spend some time reading in order to feel comfortable carrying out this lesson model. There are several websites which provide up-to-date information on the status of the Aral Sea as well as photographs, satellite images and maps. Among the United Nations websites I have used are: <http://www.unep.org/vitalwater/24.htm> (United Nations Environment Programme, “The Shrinking of the Aral Sea: Socio-Economic Impacts”);

<http://www.unep.org/vitalwater/25.htm> (United Nations Environment Programme, “Will the Aral Sea Disappear Forever?”); <http://www.environmenttimes.net/article.cfm?pageID=78> (The Environment Times, United Nations Environment Programme, “The disappearing Aral Sea”); <http://www.fao.org/NEWS/1997/970104-e.htm> (Food and Agriculture Organization of the United Nations, “Contaminated water devastates health across the Aral Sea region”); <http://www.un.org/Pubs/chronicle/1999/issue1/0199p38.htm> (United Nations Chronicle Online Edition, “Dry Tears of the Aral” by Beatrice Grabish).

2. Introduce the process and present the problem. Explain to the students that they will be investigating a world crisis and that at the end of the lesson, they must answer the following questions: “So what?” and “Why should I care?” They will conduct their research in teams of 4-5. There will be eight rounds of inputs for them to examine. All groups will receive the same input each round. After a few minutes to examine the input, groups must formulate yes-no questions to ask the teacher to gather further information. They need to pay attention to the other groups’ questions as that will help them to gather information and answer the lesson questions. Once the students understand the rules (one question per group per round, question must be a yes-no question, students must pay attention to other groups questions) you can proceed with the investigation.

Sample Inputs (Copies of each for every team. Photographs and maps are available on-line).

1. Color photograph of ship stranded in a sandy field with no water in sight with no other textual evidence.
2. An outline map of Kazakhstan and Uzbekistan showing the Aral Sea in between them.
3. A bag of rock salt.
4. Two color satellite images of the area: one from the 1990s and one from the 2000s.
5. A bag of sand.
6. A collection of photographs of the shipping towns and people who used to make their living from the Aral Sea.
7. An article discussing the history of the region as a Soviet agricultural region.
8. A map of the region with a nuclear or danger sign over the island in the Aral Sea.

3. Gather data. Proceed through the eight inputs, allowing students a few minutes each round to examine the input and formulate a question. After each group has asked one question on that round’s input, pass out the next input. Complete all eight rounds in this manner (Note: I use 8 rounds because I teach in an 80 minute block and found that I can complete 8 rounds. Each round takes about 5-6 minutes. The number of inputs you choose will depend on the length of your class, class size, and your ability to secure resources for the lesson). As each round takes place, students keep the material from the previous rounds. This allows them to juxtapose the new information with previously gained knowledge. A variety of inputs insures that learners with a wide range of strengths and abilities can participate. Students actively try to figure out the mystery; putting the pieces together as the class progresses through the inputs. By forcing the students

to ask questions that can only be answered with a “yes” or a “no”, they have to do disciplined thinking. It requires to put together yes-no questions in order to figure out the mystery. It is tempting to try to rephrase questions for students, but resist the temptation. The more you force them to frame clear and concise yes-no questions, the more authentic their learning. If you use this method for additional lessons, , students will become more proficient with each additional application. The first input I use with my students is a color photograph of a fishing boat marooned in the sand. Typically, students will ask questions like: “Was there a storm that put the



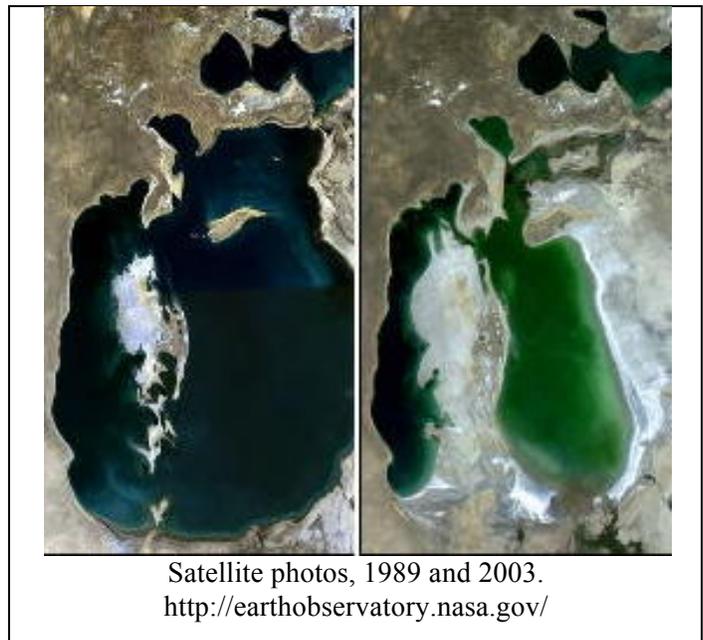
<http://www.irtc.org/ftp/pub/stills/2000-08-31/aral.jpg>

boat there?” or “Was the boat no longer useable and therefore discarded?” If students ask a question that is not answerable by a yes or a no, you have to ask them to rephrase. Other teams should build on the information acquired by students who asked questions before them.

4. Develop a theory and verify. As the rounds continue, students will begin to grasp the scope of the tragedy and formulate theories to answer the questions: So what? Why should I care? You can allow “yes” theories to be written on the board so that other groups can try to clarify them further. As the rounds continue, an accumulation of “yes” theories will help the students answer the primary questions. When all the rounds of inputs are complete, allow students a few minutes to formulate answers they would like to present to the class. Invite groups to report their findings. Critique each consecutive theory, reinforcing correct conclusions and correcting misconceptions. At this point, incorrect theories can be eliminated from the board as well. Typical theories by students are: “The sea lost its water because people over farmed the area.” “The fishing industry and fish died because there wasn’t enough water.” “The people are sick because the water is salty and they can’t drink it.” “We should care because we should help them.” As the inputs progress and students try to layer all the pieces together, theories become more detailed. A group might put forth a theory: “We should care because people no longer have jobs, they are getting sick and Russia is not interested in helping them any more.” Or, “We should care because the chemicals left on the island by the Soviets is dangerous to everyone.”

5. State the rules and explain the theory. At this point in the lesson, students should have a few working theories on the board with which they agree. Teams should discuss the accumulated facts and decide whether one theory offers a better explanation than the others or if they need to combine theories. After class discussion, I take time to explain the whole situation to clarify any misconceptions that might have arisen. The full information is revealed so all students can answer the larger questions.

6. Analyze the Process. I strongly recommend teachers evaluate the process with students, especially if they will use this method again. Students reflect on the progression of questioning, critique the questions asked and brainstorm ways they could have made their inquiry more efficient or effective. The goal is to decide the best way to approach a puzzling new piece of information in the future.



7. Evaluate. During this step, students are invited to find interesting dilemmas of their own to investigate. This can be a homework assignment or project.

Further Suggestions. I have experimented with this model and made different modifications. I was able to complete the lesson in 50 minutes by giving the students more than one input at a time. I have also created inputs that are reusable by mounting photographs and maps on laminated card stock. Salt and sand samples are kept in plastic containers. I change the news articles from year to year. I give each group only one copy of the input so they have to share the resource and talk to each other. I find that a reflective writing assignment on the topic of the Aral Sea is the best homework assignment for this lesson. It allows me to check for misconceptions and assess

the students' depth of understanding of the problem. I provide websites for students to consult because they frequently want to learn more about the problem. I have seen this method for lessons on the Salem witch trials and on the rift between North and South Korea and I am in the process of assembling material on the Taliban in Afghanistan and the destruction of the Bamiyan or "Big Buddha."