

Sustainability - Sustainable Resource Use

Upper Primary/Secondary

Key Inquiry Questions

1. How can sustainability relate to students' everyday life?
2. What happens when we are not cautious of our resource use?

Learning Outcomes

1. Students will be able to refresh their memory on the meaning and importance of sustainability after the lesson.
2. Students will engage in an interactive game, allowing them to understand the importance of sustainable resource use after the lesson.

Sustainability Curriculum Goals

Systems Thinking:

1. Our planet - the biosphere - is a complex system that supplies resources and creates conditions that sustain life on Earth.
2. All forms of life, including humans, are connected to each other through man-made and natural ecosystems on which their well-being depends on.
3. Sustainable living relies on the interdependence of viable, healthy social, economic, ecological, and political systems.
 - a. Without a healthy ecological system, human life cannot be supported by the biosphere.

Sustainable Futures:

1. A sustainable future across social, economic, and ecological systems is accomplished through informed action and decision making at the individual and community levels that place a value on fairness across both present and future generations.
2. Actions associated with a sustainable future reflect values of care, respect, responsibility, empathy, and compassion for all living and nonliving things.
3. To act sustainably, best practices should be evaluated based on the assessment of scientific knowledge, technological developments, and cultural context.
 - a. Best practices should not be human-centered. Sustainable practices should give equal consideration for social, economic, and environmental pillars.

Activities/Goals:

1. Students should be able to explain what sustainability is, the importance of ecosystem services and biodiversity.

Overview:

Before you begin this lesson, it is important to complete the “Introduction to Sustainability” lesson to ensure students have an understanding of the concept of sustainability. In this lesson, students will be learning about the importance of using natural resources sustainably. In the activity, students will be split into villages and undertake a series of fishing seasons as a means of catching enough fish to survive. After the students complete the fishing seasons, they will realize that there are not enough fish left (even after they are replenished) for everyone to survive. Students will then be given the opportunity to strategize and redo the fourth fishing season, which is the season where there was still enough fish for everyone. This will allow students to think about how they use their resources daily as to only use as much as they need. Specifically, when met with new technology or easier processes of acquiring a natural resource, students will learn that they should still only take as much as they need.

Materials

SolarSPELL Resource:

1. “Introduction to Sustainability” Worksheet (Worksheet from Introduction to Sustainability Lesson Plan)
2. “Fishing for Food” Worksheet (Included below)
3. For the teacher: “Fishing for Food Activity Script” (Included below)

Other:

1. One pair of sticks, chopsticks, or any utensil per for each person
2. A cup, bucket, or small cup-like vessel for students to collect their fish in.
3. Lake: Tape or construction paper
4. Fish: One type of small item that can be picked up with the chosen utensil (i.e. rocks, small crackers, dry beans, or crayons)

Suggested Procedure

It is recommended that you complete the “Introduction to Sustainability” lesson before starting this lesson.

Before Lesson:

- Ask students the following questions to help refresh their memory from the previous lesson. Allow students to first talk with their group, then call on students to answer the questions.
 - 1. What is sustainability?
 - Answer from Worksheet: Making the world a BETTER place for all people now, without DESTROYING the possibilities for the next generations.

- United Nations Definition: “meeting the needs of the present without compromising the ability of future generations to meet their own needs.”
- 2. What are the three pillars of sustainability?
 - Answer: Social, Economic, Environmental
- 3. How do you know if something is sustainable?
 - Answer: Something is sustainable if it can be done forever.

During Lesson:

- Split the class into three or four equal groups and hand each group member the worksheet titled “Fishing for Food”.
 - For example: If you have a class of 16 students, you could create 4 groups of 4.
 - Each group represents a different village community living around a lake. Each village gets all of its food from the fish in that lake.
 - **If printing is not an option, have students draw the chart in their notebooks and write down the questions.**
- After splitting the students up into their groups, use tape, paper, sticks or any material available to create a large circle in the center of the classroom [note: the game can also be played outside].
- Put a bunch of small rocks or any object with similar dimensions to small rocks in the center of the lake. Note: these items will serve as the fish.
 - There should be five times as many “fish” as there are students. So if there are 16 students, then there should be 80 “fish.”
- Explain to students the background information:
 - They depend on the lake for their food and survival as a village. Give each student a set of sticks, chopsticks, or chosen utensil to use as their fishing tool. Inform them that each of them represents a head of the household for their family, meaning they provide the main source of food for the whole family.
 - Each student is representative of one family and will be referred to as such below.
- Explain to the students that in order to survive as a village, each family must catch at least one fish.
- Tell students:
 - If they catch 1 or 2 fish their family survives. If they catch more than 2, they can sell the extras for a profit.
 - You are not allowed to step into the lake or talk at all during the game.
 - If you do not receive a fish, you will not be able to fish the next season as your family has not survived.
- Start the fishing season for 20-30 seconds.
 - All families should have at least one fish.
 - Ask any student that does not have at least one fish to raise their hand. If a student does not have a fish, do not allow them to fish and inform them that they have not survived. This student will no longer be able to fish.
 - Note: students can share fish among their village, but this should be kept a secret from them. Allow students to decide on their own if they want to share.

- Give each group one minute to fill in the data table.
- Next, replenish the fish in the lake by adding one “fish” into the lake for each one that is still there.
- Start another 20-30 second fishing season.
 - Ask any students that do not have at least one fish to raise their hand. If a student does not have a fish, do not allow them to fish and inform them that they have not survived. This student will no longer be able to fish.
- Give each student one minute to fill in the data table.
- Replenish the “fish” again by adding one or two “fish” into the lake for each piece that is still there.
- Give each student a cup and inform students that in the third fishing season, they are allowed to use their utensils to scoop fish into the cup. If I [the teacher] see anyone using their hands, your family will have all of their fish returned to the lake and will not survive. This student will no longer be able to fish.
- Start another 20-30 second fishing season.
 - Ask any students that do not have at least one fish to raise their hand. If a student does not have a fish, do not allow them to fish and inform them that they have not survived.
 - Most likely, this process is so efficient that the level of fish in the lake is depleted so much so that it can’t be fully replenished.
- Give each student one minute to fill in the data table.
- Replenish the fish again by adding one fish into the lake for each one that is still there.
- Open the fourth fishing season with the same rules as the third.
 - Ask any students that do not have at least one fish to raise their hand. If a student does not have a fish, do not allow them to fish and inform them that they have not survived. This student will no longer be able to fish.
 - Most likely, the fishery becomes devastated and when the fifth fishing season comes around there won’t be nearly enough fish for all members to survive.
- Give each student one minute to fill in the data table.
- If there are fish left to reproduce, replenish the fish and open the fifth fishing season. If not, have all students put in a zero for the fifth season.
- After the fifth season ends, give groups 8 minutes to answer questions 1 - 4 on their worksheet. Tell students they are allowed to talk with their group, but each person must have their own answers written in complete sentences.
- Inform students that they will be playing the game for a second time. While they still are not allowed to talk, they should have a better idea of how to survive throughout the five years. Remind students that the game may only be 5 years, but they should fish as if there is no time limit of the number of years. This is their life and without fish, they can’t survive in the future.

After Lesson/Discussion:

- After Game 2 is complete, answer the rest of the questions together as a class.
 - 1. Did you change your fishing strategy? If so, what did you change and why?

Fishing for Food

GAME 1	Number of fish in the lake (after reproduction)	Number of fish caught per person in your community	Number of fish caught per year (by the entire class)
Year 1			
Year 2			
Year 3			
Year 4			
Year 5			
Total			

Questions:

1. Did every student in your group try and take as many fish as they could?

2. Did any group or student take too many fish? If so, what happened as a result?

3. How did it make you feel if you did not survive because a different group/family took more than the necessary amount of fish needed for survival? If you were the group/student taking too many fish, how do you think that made the students that did not survive feel?

4. Did you or anyone from your group offer to share their extra fish with you in order to survive? If so, how did that make you feel? If not, why didn't you offer to share with those in need?



GAME 2	Number of fish in the lake (after reproduction)	Number of fish caught per person in your community	Number of fish caught per year (by the entire class)
Year 1			
Year 2			
Year 3			
Year 4			
Year 5			
Total			

Questions:

1. Did you change your fishing strategy? If so, what did you change and why?
2. Is it possible to maximize the total number of fish in the lake AND the total number of fish you caught for your family?
3. Do you see similar issues in your community?
4. How can you use the lesson you learned from this game to make sure the same thing does not happen in your community?



Fishing for Food Activity Script (for Teacher)

Members Needed:

- 1 Facilitator
- 16 students

Materials Needed:

- Round 1 and 2 of fishing: sticks, chopsticks, or any utensil that makes it hard to catch fish
- Rounds 3, 4, and 5 of fishing: add a cup, bucket, or small cup-like vessel for students to collect their fish in
- Lake: Tape or construction paper
- Fish: Small rocks or small rock-like item (i.e. crackers, beans, or crayons)
 - You will need at least 120 pieces for 15 people

Set-up:

- There should be a large circle in the center of the room to represent the lake. Place twice as many fish in the lake as there are students.
 - In this example, there will be 30 fish in the lake.

Facilitator: Good morning students. Today we will be playing a fishing game. Before starting the game, I am going to assign each of you a number. Remember this number as it will be the number of the group you are in.

[show facilitator giving each student a number 1 through 4 as there should be at least four students per group]

Facilitator: If you have the number 1 [point to a group of desks or space on the floor around the lake], sit at this spot. If you have the number 2 [point to a group of desks or space on the floor around the lake], sit at this spot. If you have the number 3 [point to a group of desks or space on the floor around the lake], sit at this spot. If you have the number 4 [point to a group of desks or space on the floor around the lake], sit at this spot.

Facilitator: Now that everyone is in their groups, I am going to explain the rules of the game. Each of your groups represents a community in a village. In your villages, everyone depends on fish from the lake for their main source of food. If you do not receive a fish, you do not survive.

[pan to students reactions].

Facilitator: Each of you represents the head of a hungry family. In order for your family to survive, you must catch enough fish for all of them to eat. The only source of food is this lake that can hold up to 80 fish.

[The facilitator will hand each fisher their fishing utensils: chopsticks, sticks, knives for example. Additionally, this ensures each group has a designated fisher] [students return to their families].

Facilitator: Once a year, you will have the opportunity to fish, and each time you fish you may take 0, 1, 2, 3, or 4 fish from the lake. It is your choice of how many fish you take. If you take:

- 1 fish, your family survives
- 2 fish, your family survives
- More than 2 fish, you can sell them for profit.

Facilitator: You will fish for 5 years. After each season, fill in the data table. The fish in the lake will reproduce once a year. Make sure to keep your fish in front of you. Again, if your family does not receive the necessary amount of fish, your family will not survive to the next season. You will not be allowed to step in the lake as you do not have a boat, and there will be no talking during the fishing seasons.

Facilitator: Are there any questions?

[waits for questions and answers them if they exist].

Facilitator: Alright. If there are no more questions, the first fishing season is about to begin. You will have 20 seconds to fish. When I say “fish”, the fishing season has officially opened.

Facilitator: Ready, set, fish!! [start time... use countdown clock in the corner].

Facilitator: [after the fishing season has ended]. Stop fishing!!! All fishers, please return to your community and fill out the data table [pan to groups filling out the data table].

[Walk around each group to make sure no group has more than 5 fish].

Facilitator: Raise your hand if you do not have a fish. [If any group does not have at least 1 fish, take their utensils away and inform them that they did not catch enough fish to survive, thus, they will have to sit out of the next fishing seasons].

[Replenish the lake in the fish by adding one “fish” to the lake for each piece that is still there.]

Facilitator: The fish in the lake have reproduced. You will have 20 seconds to fish. Remember there is no talking and you need at least 1 fish per household to survive. Ready, set, fish!! [start time].

Facilitator: [after the fishing season has ended]. Stop fishing!!! All fishers, please return to your community and fill out the data table [pan to groups filling out the data table].

[Walk around each group to make sure no group has more than 5 fish].

Facilitator: Raise your hand if you do not have a fish. [If any group does not have at least 1 fish, take their utensils away and inform them that they did not catch enough fish to survive, thus, they will have to sit out of the next fishing seasons].

[Replenish the lake in the fish by adding one “fish” to the lake for each piece that is still there.]

Facilitator: The fish in the lake have reproduced. [This time, give all heads of household a cup.]

Facilitator: You will now be able to scoop fish into your cup using your utensils. If I see you using your hands, you will no longer be allowed to fish and your family will not survive. You will have 20 seconds to fish. Remember there is no talking and you need at least 1 fish per household to survive. Ready, set, fish!! [start time].

Facilitator: [after the fishing season has ended]. Stop fishing!!! All fishers, please return to your community and fill out the data table [pan to groups filling out the data table].

[Walk around each group to make sure no group has more than 5 fish].

Facilitator: Raise your hand if you do not have a fish. [If any group does not have at least 1 fish, take their utensils away and inform them that they did not catch enough fish to survive, thus, they will have to sit out of the next fishing seasons].

[Replenish the lake in the fish by adding one “fish” to the lake for each piece that is still there.]
[Note: there will likely not be sufficient fish in the lake for all groups to survive the next season].

Facilitator: The fish in the lake have reproduced. You will have 20 seconds to fish. Remember there is no talking and you need at least 1 fish per household to survive. Ready, set, fish!! [start time].

Facilitator: [after the fishing season has ended]. Stop fishing!!! All fishers, please return to your community and fill out the data table [pan to groups filling out the data table].

[Walk around each group to make sure no group has more than 5 fish].

Facilitator: Raise your hand if you do not have a fish. [If any group does not have at least 1 fish, take their utensils away and inform them that they did not catch enough fish to survive, thus, they will have to sit out of the next fishing seasons].

[Note: Most likely, the fishery becomes devastated and when the fifth fishing season comes around there won't be nearly enough fish for all members to survive.]

[Replenish the lake in the fish, if possible, by adding one “fish” to the lake for each piece that is still there.]

Facilitator: This will be the final fishing season. [Note: if there are no fish left in the lake, then tell all groups they have not survived because there are no more fish and to fill in a zero on their table].

Facilitator: You will have 20 seconds to fish. Remember there is no talking and you need at least 1 fish per household to survive. Ready, set, fish!! [start time].

Facilitator: [after the fishing season has ended]. Stop fishing!!! All fishers, please return to your community and fill out the data table [pan to groups filling out the data table].

[Walk around each group to make sure no group has more than 5 fish].

Facilitator: Raise your hand if you do not have a fish. [If any group does not have at least 1 fish, take their utensils away and inform them that they did not catch enough fish to survive, thus, they will have to sit out of the next fishing seasons].

Facilitator: Answer questions #1 - #4 on their worksheet. You may talk to your community, but everyone should write their own answers. Please answer the questions in complete sentences.

[Give students 8 minutes to answer the questions.]

Facilitator: Alright. Now that you have played Game 1 and have some experience, we are going to play a second game.

[Go through the exact same process as Game 1.] [This time, all communities should survive after realizing that there are plenty of fish if they don't take them all out at once.]

[When Game 2 ends, have students answer the rest of the questions.]

[Discuss the answers as a class].