Outdoor Survival

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Program Purpose
The purpose of this program is to introduce students to basic outdoor survival concepts and participate in a small group shelter building exercise.

Length of Program: 1-2 ½ hours

Age: Grades 4th – 12th

Maximum Number of Participants: 20

Objectives:
After completion of all activities, students will be able to:
- Identify the seven basic needs for survival.
- Describe the symptoms and treatment for frostbite and hypothermia.
- Compare and contrast the value of different materials in a survival situation.
- Demonstrate creative and critical thinking in a group shelter building exercise.

Preparation:
Before the class arrives:
- Obtain the "Outdoor Survival" kit from the storage room.
- Stage a bucket of water near the fire building are if planning to do fire building

Basic Outline:
I. Introduction *(10 minutes)*
II. The Seven Basic Survival Needs *(20 minutes)*
III. Dangers of Cold *(10 minutes)*
IV. Dangers of Heat
V. Interactive Immersion (optional)
VI. Gilligan's Island *(30 minutes)*
VII. 10 Essentials for a survival kit
VIII. Shelter/Fire Building *(50 minutes)*
IX. Conclusion *(10 minutes)*

Materials:
D.O.T.S Kit (Lux meter, Kestrel, and Thermal Imager)
Rule of 3 Cards
5 plastic tarps (optional)
5 foam pads (optional)
5 – 4" lengths of twine (optional)
5 fire building pans
5 zip lock bags with matches and tinder
5 clipboards with paper and pen attached
Tent poles and twine
Dry erase board & markers (or chalkboard & chalk)
Coffee can survival kit w/ 10 essential items

Interactive Immersion - See Appendix A (optional)

Introduction:
As humans we have a tendency to put ourselves into potentially risky survival situations. Even though we're not all campers, it is still a good skill to learn to survive outdoors. So what is a survival situation? It is a time when you are forced to rely on your own resources to live. It is usually a sudden and unplanned situation where there is little or no outside help and it could happen anywhere. There are usually four reasons why we get into survival situations.
1. Lack of skills – lost and don't have orienteering skills
2. Weather – can't control
3. Accidents – illness or injury
4. Under prepared

The Seven Basic Survival Needs:
In any survival situation, the following seven basic needs must be met. Write numbers 1-7 on the board. Give the students a scenario of a survival situation (real life if possible). Ask the students for suggestions of what they might need to survive in the given scenario. As the students give suggestions, list them on the board in order. Then ask the students how long they think they could survive without each.

1. **PMA** (Positive Mental Attitude, or "don't lose your head"): The most important thing in any survival situation is to not panic. You can use your senses to inventory your resources and surroundings and come up with a plan to provide for your needs. Your brain is your best tool as it can process the information it receives and immediately plan and respond. However, if you panic, you will likely not respond appropriately. (4-LS1-2; MS-LS1-8) Panic can lead to making irrational, counterproductive decisions that actually make the situation worse, not better. This is the hardest yet most important of all survival skills. If you think you will live and try to survive, chances are that you will. If you are not relaxed, calm, and positive you will not be able to think clearly enough to be able to accomplish the other tasks at hand. Henry Ford once said, "If you think you can or can't, then you will." Using the STOP acronym helps you make a plan of attack. **S**it-down, **T**hink, **O**bserve, and **P**lan.
- **How long? 3 seconds.** For example, if your car breaks through the ice on a frozen lake and you panic, you may waste time pounding against the windows when you should be rolling them down.

People have saved themselves by popping the trunk, pulling down the back seats and swimming out.

2. **AIR** (oxygen): Although we may take air for granted, in a drowning, choking, or toxic fume situation it becomes critical to maintain an adequate supply of oxygen to the brain. The brain is not able to store oxygen, so it is critical to maintain a constant supply of oxygen to the brain.
- **How Long? 3 minutes.** After 3 minutes, brain cells begin to die and consciousness will soon be lost.

3. **SHELTER**: A shelter is used to conserve the heat your body already has. Clothing is considered shelter because it traps a layer of warm air and holds it next to your body. While fires or electric blankets may add thermal heat, shelters do NOT. Would you be warmer standing outside in winter in swimsuit next to a fire, or in a parka and snow pants with no fire? The best way to keep warm is to keep from losing heat. Exposure is the most common cause of death in the backcountry; hence, it is important that you learn the fundamentals of shelter building. If you don't have a good shelter to protect from the sun or to provide warmth, it could mean surviving or not. It also important to consider the impact of weathering when building a shelter. Wind or rain could have significant effects on your structure. Depending on your situation, you want to find a spot that will protect you from wind (usually southwest), from precipitation, or from the sun. Ask the students why each of these recommendations might affect the safety of their structure. What kind of indicators might they observe or "read" on a landscape to accurately predict the effects weathering and thus pick the best location possible? (Cracked soil, exposed tree roots, degraded terrain, etc.) (4-ESS2-1)
   To build your shelter you should keep these few things in mind to ensure success (MS-ETS1-1):
   a. Location: protection from weather, natural hazards, dry/well drained area, open southern exposure, entryway facing east, fire proximity and safety, plant and animal hazards, abundance of building materials, and comfort.
   b. Shelter size: small is beautiful whereas large is a waste of time and resources, plus more space to heat.

   c. Insulation: the more the merrier depending on the situation.

   There are many different types of shelters; the kind you build is up to you and your abilities. Here is one way that can work in all situations. Start by leaning a sapling into the crotch of the tree and then stack sticks at right angles to it for the frame, then pile debris (leaves, needles, grass, ferns) on it. Repeat the frame and debris piles until it is the thickness of your arm length. In the winter snow caves (quinzee) make great shelters. If you can find a large snow bank try to dig a cave with enough space for yourself. If a large snow bank isn't readily available you can make a large pile of snow, which is 6 feet tall and 6 feet in diameter. Then let it settle for at least an hour and a half before you start to dig a cave into it. Other things to consider include adding small holes for ventilation and finding the correct depth of snow wall (too thin or too thick may cause the cave to collapse). Remember that both of these take a lot of energy, so start early and work at a moderate pace as not to overexert yourself.
- **How long? 3 hours.** If you are wet and exposed to wind and/or cold temperatures, failure to seek shelter can lead to fatal hypothermia. Keeping you DRY and out of the WIND are the two most important assets of any shelter.

4. **WARMTH**: If you are in an extended survival situations that may last for days, shelter alone may not be enough to prevent frostbite and/or hypothermia. Warmth can be added through building a fire or drinking hot liquids. Physical activity of any kind will increase blood flow and raise body temperature. The body heat from a warm person can be used to transfer heat to a cold person. This is an exchange of energy. Ask the students if there are other ways heat energy can be exchanged? (Fire, sun, etc). For example, a fire can also transfer heat energy to keep individuals warm. (4-PS3-2). Fires can also purify water, cook food, and signal to others your presence. Here are a few hints to help with the fire building process:
- *The smaller, the more efficient* - A small fire is better than a big one. A big fire may make you feel better, but will waste your energy having to gather fuel and will waste natural resources (5-ESS3-1; MS-ESS3-3).
- Have a four-foot radius cleared of debris for your fire.
- Keep a careful watch over the fire. Be aware of wind shifts and other hazards.
- A fire needs three main things
   1. *Heat for ignition* - A fire starts with a spark. Tools for getting a spark could be a lighter, matches, or flint and steel. You can also make a bow drill, mouth drill, hand drill, or catch rays of sun in an eyeglass lens to start a fire.
   2. *Fuel* - Dry fuel is very important (see the different classes below).
   3. *Oxygen* - Make sure you don't smother the fire by putting too much wood on the fire at one time and thus preventing the flow of oxygen.

When you are gathering wood to make a fire, gather twice as much as you think necessary. There are four types to look for. **Tinder** is a material that will light with just a spark. Dry grasses, nest material of rodents,

cattail fluff, down from thistles, milkweed, and the fibers of dried plants all make good tinder. Tinder must be totally dry unless you are using birch bark. Birch bark has oils in it that will catch fire even when wet. **Kindling** is made of tiny slivers or twigs as thick as a pencil. If needed, you can shave slivers off larger pieces of wood to create kindling. Collect more than you think you will need, it burns up quickly. **Intermediate firewood** is thicker and longer than kindling. Pencil size to as big around as your wrist. This is what you will use the most of once your fire gets going. **Bulk firewood** is wood that is bigger than your wrist and too big to break. It is added only after your fire is going strong. Remember when you're done to have everything that you used burnt completely or put out completely. You should aim to Leave No Trace (MS-ESS3-3).

- **How long? 3 hours-3 days:** This is variable depending upon conditions.

5. **REST** (sleep): Any physical activity will burn calories and deplete the body of energy that could be used later. Resting will conserve calories so that they may be burned slowly for warmth over time. Before any activity, make sure to weigh the benefits and costs, especially if you have no food give yourself more energy.
   - **How long? 1-3 days**: This is variable depending upon conditions. Twenty-four hours without sleep or rest will lead to fuzzy thinking and bad decision making for most people.

6. **WATER:** It is possible to survive a full three days without water, but as the body dehydrates it begins to function less efficiently. Water loss can occur through breathing, sweating and evaporation. There is no place in the world you can be guaranteed pure water but there are ways that you can treat water so it is drinkable. If your water is not purified then you risk the chance of getting giardia, a micro-organism that causes dysentery and vomiting. Water can be purified by boiling, filtering, or chemically treating it. During the boiling process, thermal energy is added to allow water particles to speed up and change state from liquid to steam. This ensures the water is hot enough to kill the harmful microorganisms. Be sure to boil for at least 10 minutes (add 1 min for every 1000 feet in elevation gain). In contrast, filtering acts to physically remove harmful microorganisms, while chemically treating kills microorganisms with the addition of chemicals, such as Iodine (MS-PS1-4). Once you treat your water you want to keep in mind the concept of conservation. There are seven good ideas to keep in mind: don't eat anything unless you have liquids (digestion requires body fluids), travel during cool hours, walk at an easy pace without breaking a sweat, don't drink urine, store water in your stomach by drinking as much of your water as you can as often as possible, and don't try to conserve by not drinking it. It is also important to know is how to obtain the water and how much to consume. On average you need 2-3 liters of water a day but that can change depending on the circumstances. Different ways to collect water include trapping rain water, absorbing dew from plants with a cloth, and tapping a vine, plant, or tree. If there is a body of water near by that would be the best recommendation.
   - **How long? 3 days:** Remember to stay hydrated in all seasons. Drink even BEFORE you are thirsty! Thirst is a warning signal telling you that you are already dehydrated. People tend to get dehydrated more in the winter because they don't feel hot. If snow is the only source of water, melt it first so you do not cool your body temperature by eating snow.

7. **FOOD:** In most survival situations, food is not a top priority. Food is usually the first thing people think they need when in fact it is usually the last thing they need. We feel we need food because we are used to eating three meals a day every day, but we have enough energy reserves to go three weeks without food if water is available. If, however, other needs are sufficiently satisfied, food does play an important role in survival. When food is consumed, it is broken down in you body and rearranged via chemical reactions. New molecules are created which provide you with energy (MS-LS1-7). This energy helps your body stay warm by adding calories and raises body temperature by activating your metabolism. When gathering food, keep in mind that multiple trophic levels within a food web can be safely eaten by humans. While all of these levels ultimately originate from the sun's energy, there are still several things to consider before safely consuming (5-PS3-1):
   a. Gather with respect, whether plant or animal; take only what you need.
   b. Make sure the area where you are collecting is not polluted or contaminated.
   c. Positive identification is essential! There are many look-a-likes. Don't eat anything that you aren't sure of.
   d. Make sure you know what kind of food preparation is needed
   e. Know what parts of the plant are edible in what season.

   There are four types of plants that you can be fairly safe eating in all parts of the country. **Grasses**: The roots, shoots, leaves, and seeds are all edible. The young shoots can be eaten raw. They are rich in vitamins and minerals. When the grass becomes more mature, they are harder to digest, so chew them, swallow the juices, and spit out the fibrous parts. Grass seeds are rich in protein. These can be eaten raw, roasted, boiled into a mash or ground into flour. It is suggested that you roast

all grass seeds you are not sure of; some are toxic if eaten raw. Seeds that are black or purple may indicate the presence of a toxic fungus so just eat seeds that are green or brown. **Cattails**: In early spring the young shoots (up to two feet tall) can be peeled and eaten raw or boiled. In late spring the green flower heads can be husked and boiled. In the summer the pollen heads can be picked and eaten raw or ground into flour. The root can be eaten in late summer and winter, boiled or raw. **Pine Trees**: All types are edible. The needles can be chopped and steeped in hot water to make a tea that is rich in vitamin C. In spring the male pollen anthers can also be eaten. They are high in protein. The seeds are a tasty treat and very high in protein. **Acorns:** All acorns are edible, even when green. A handful will provide as much nutritional value as a pound of hamburger. White oak and pin oak acorns can be eaten raw, but the rest need to be leached of the bitter tannic acids, done by boiling them in several changes of water. **Insects**: Nearly all insects are edible; just make sure to cook them first to get rid of parasites. Insects contain protein and essential vitamins. They work well added to soups and stews even if you don't have many of them. Grasshoppers, crickets, katydids and cicadas can be gathered from the grasses they cling to. Gather ants by digging into their nest with a small bucket and collecting the ants along with their nesting material. Then roast them and the sugary abdomen. Look in the rivers and streams under rocks for stonefly and mayfly larvae. Caterpillars can also be eaten, but avoid the fuzzy ones, they tend to be poisonous. Grubs, maggots and earthworms are easy to gather and are a good source of protein. Put them in a stew or fry them.

- **How long? 3 weeks**: Without food, your body will burn fat reserves as fuel. After fat reserves are used up, the body will begin to metabolize protein, burning muscle as a food source.

Dangers of Cold:
There are two main winter dangers: hypothermia and frostbite. Hypothermia can be fatal; frostbite can lead to the amputation of body parts. It is critical to understand and be able to recognize and treat both these conditions.

Hypothermia is a drop in the body's core temperature (in the central part of the body). As the body loses heat, it begins to function less and less efficiently. In order to handle such circumstances, humans have developed certain adaptations that function to support survival (4-LS1-1). For example, blood vessels constrict, drawing blood away from the hands and feet toward the heart and lungs. This is a way the body has adapted to prioritize survival of essential organs, which we cannot live without. This is also an example of how we as humans are made up of interacting cellular subsystems. Our bodies have adapted to prioritize major organs, as other systems depend on them. (MS-LS1-3). If our heart system fails, all other organs will shut down without blood flow.
98.6 ° F : Average normal body temperature
96.0 ° F : Body shivers to generate heat. Chemical reactions slow.
94.0 ° F : Body may shiver uncontrollably. Mental and physical processes are very inefficient; good chance of making dangerous, irrational mistakes.
92.0 ° F : Beyond this body requires added heat to warm itself. Person is mentally and physically incompetent.
90.0 ° F - 85 ° F : All shivering stops. Muscles become rigid. Unconsciousness sets in.
78.0 ° F : Death occurs.

Signs of Hypothermia
Mild Hypothermia (above 90.0 ° F): Look for consistent shivering and blue lips, progressing to slurred speech, dazed expression, and stiff muscles.
Severe Hypothermia (below 90.0 ° F): Shivering has stopped. Person appears confused and unaware; muscles are rigid and unconsciousness sets in.

Treatment of Hypothermia
Reduce heat loss and add heat. Get the victim out of the weather and remove wet clothing. Replace it with dry clothing or a sleeping bag. You must get the victim warm. If possible, get to a warm place (inside heated shelter or car). Get several people to huddle around the victim to slowly add heat. If conscious, give victim warm liquids to drink. They should see a doctor as soon as possible.

Frostbite commonly happens to exposed body parts like the cheeks, nose, and ears, and to the extremities, such as hands and feet. To understand how frostbite occurs, think about what happens to a soda can in the freezer: It explodes! As the water inside turns to ice, it expands. The same thing can happen to your skin. Consider this: humans are made up of many types of cells and trillions of cells in total. These cells contain water. What could happen to cells in extremely cold temperatures? (They can freeze). And what might happen to cells as they freeze? (They can expand and burst, just like the soda can.) (MS-LS1-1) Frostbite is not usually fatal, but it can kill body parts, turning them black.

Signs of Frostbite
Pain or burning sensation in exposed area. White spots form surrounded by red skin. Numbness occurs in the affected area.

Treatment of Frostbite
Slowly and gently warm the affected parts by placing them on someone's stomach, placing a hand on the exposed part, or putting in lukewarm (not hot) water. If the body parts are numb, the victim should see a doctor.

To prevent cold dangers keep in mind the COLD theory.

C – clean wool clothing
O – over heating
L – layers
D – dry

Technology Inclusion: Have students with different levels of layering pose for a picture with the thermal imaging camera. The camera will create an image with the brightest colors showing where heat is escaping the body. After a few pictures have been taken, ask the students what they notice about which parts of their bodies are or are not holding in heat. If they were in a real survival situation, would they want to be wearing the same clothes that they are right now? If not, what would they do differently?

Dangers of Heat:
Just as cold can have adverse effects on your body, so can heat and dehydration. As humans, we have developed features that function to support survival in extreme heat. Sweat is an adaption that helps cool your body. As sweat leaves you pores, evaporation of the liquid occurs which cools your body (4-LS1-1). Without proper rehydration, sweating leads to dehydration. This can lead to heat exhaustion, which is a mild form of heat related illness. Heat stroke, on the other hand, is the severe result of overheating and could possibly lead to death.

Heat Exhaustion is severe exhaustion caused by extreme body heat. It can be caused by exposure to high temperatures and is likely paired with dehydration. Heat exhaustion often occurs when one over exerts oneself in warm weather. This increases your kinetic energy which is transferred throughout the body and over warms it. (MS-PS3-5). The excessive heat and dehydration cause the body to overheat, thus raising your body temperature to over 102˚.

Signs of Heat Exhaustion
Paleness, nausea, extreme fatigue, dizziness, lightheadedness, vomiting, fainting and cool, clammy skin.

Treatment of Heat Exhaustion
Get the victim to a cool, shady environments. Drink liquids. Place cool rags on various areas of the body. Replace electrolytes (can be done with sport drinks). If body temperatures don't drop consult a doctor immediately.

Heat Stroke is a medical emergency, and the most severe form of heat related illness. This is a condition in which the body is extremely over heated and reaches temperature of 104˚ or higher. Anyone exhibiting the signs and symptoms of heat stroke should be rushed to the nearest hospital or clinic. Heat stroke doesn't have to be caused by exercise or exertion and isn't always preceded by heat exhaustion. High temperatures, lack of body fluids, and overexposure to the elements can all bring about heat stroke.

Signs of Heat Stroke
The first sign to look for is red, flushed skin. People who are suffering heat stroke do not sweat, so it is critical that they receive emergency care. Other signs include body temperatures above 104˚ F, red, hot and dry skin, rapid, strong pulse, throbbing headache, dizziness, nausea, confusion, and unconsciousness.

Treatment of Heat Stroke
If you notice any of these conditions have someone call for medical assistance. Until medical assistance gets there get the victim to a shady area. Cool the victim rapidly using whatever methods you can. These include immersing the victim in a tub of cool water, placing in a cool shower, spraying with a garden hose or sponging down. If humidity is low, wrap the victim in a cool, wet sheet and fan them vigorously. Monitor body temperature and continue cooling efforts until the body temperature drops to 101˚ or 102˚ F. Do not give the victim any alcoholic beverages. If emergency medical personnel are delayed, call the hospital emergency room for further instructions. Lastly if the victims' muscles begin to twitch uncontrollably as a result of heat stroke, keep the victim from injuring themselves and make sure the airway remains open by turning them onto their side.

Gilligan's Island:
Split the students into groups of four and give each group a clipboard, paper and pencil. Give them the following scenario: They have crash-landed on an island that has a climate similar to Wisconsin's in the winter. The distance to the mainland is too great to swim and there is no boat. What five items would the group choose to have with them to increase their chances of survival? Tell the students to be specific. Give them about 15 minutes to work within their group. Encourage them to think about how different systems on earth may affect their decisions. For example, consider the atmosphere's effects via weather and climate on your physical surroundings. How will this change what you chose? (5-ESS2-1). Call the groups back together and one by one have each group write their items on the board, explaining why each was chosen. Be sure to ask how each of the items they have selected addresses one or more of the seven basic needs. Encourage the class to brainstorm possible connections if needed (RI.5.7). Encourage the students to question each other's choices. The purpose of this activity is to get them to think critically and creatively and to be able to justify their reasons for choosing certain items over others. Answers may vary greatly; here are a few things to consider:

- Is a tent better than a sleeping bag?
- Is a tent without a waterproof ground cloth effective?

- If matches are chosen, how will they get dry wood?
- Would a knife or axe be more useful?
- Would a signal mirror, CD, or flare gun be useful?
- If blankets or extra clothing is chosen, what material are they made from?

Having the right clothing for the weather conditions can be just as important as having the right equipment for your trip. Both natural and synthetic materials, which ultimately come from the earth's natural resources, play a role in proper dress. In some cases synthetic materials may be viewed as having enhanced characteristics of natural fibers. Here are some recommendations for appropriate dress (MS-PS1-3).

- Layer clothing to adjust to the level of activity and weather conditions – a light synthetic layer such a polypropylene to wick moisture away from the skin, followed by an insulating layer such a polar fleece jacket and finally a storm shell to keep out the wind and rain.
- Choose the proper fabrics – wool and synthetic fabrics such as polar fleece, nylon and polypropylene are superior to cotton in keeping you warm by minimizing thermal energy loss, even when wet. Cotton tends to absorb moisture, which prevents wicking and does not hold warm air well. (MS-PS3-3)
- Wear a hat for warmth and to keep the sun, rain and bugs off. An uncovered head will loose 50% of your body heat in 40°F weather.
- Mittens are warmer than gloves; your fingers heat each other.
- Loose clothing provides easier movement and greater warmth.
- Wear sturdy, comfortable, well broken-in boots for support and to avoid blisters.

Fire/Shelter Building:

Begin by recapping about what we learned about survival and why warmth would be a high priority. Ask students what ways we can find warmth. Break students up into groups, with one adult, to practice their survival skills. You may want to pull the adults aside to emphasize that they are there for supervision only, not to participate.

Fire Building:

Before allowing students to begin anything with fire building, emphasize these safety guidelines

1. All fires must be small and under control, this will be done by having fires by built on metal pie tins. If the fire does not fit on the tin, it is too large.
2. Pie tins will be kept on the stone of the fire ring are (we are in a pine forest)
3. After a fire is lit, no one may remove anything from the tin until it is doused
4. Students may gently add material to a fire after it is lit, as long as it does not get bigger than the tin
5. Do not move a tin until it is doused

Show the students a few examples both of natural tinder, kindling, and fuel as well as structures such as a log cabin or teepee. Explain that they will have a limited amount of time to try and build a small fire of their own. You may choose to provide them a few starting materials, but they will need to do the majority of the material gathering and building themselves. To light the fire, they may use flint and steel strikers, or a match.

As an added challenge, you may choose to have a bit of twine hung over a pie tin tied between tent poles. In this case, the goal of the students is to build a fire that will burn the twine

Be sure to give students clear guidelines on how much time they have to build their fire, and emphasize that they only use dead material without stealing from other groups. When the time is up, douse each tin and have students dump any unburnt material into the fire ring.

Technology inclusion: Use a thermometer and thermal imager to record the temperature of the fires before and after they are lit and again after being doused. A lux meter may also be used to gain an understanding of the brightness of each fire. Both temperature and brightness can be measures of how much heat a fire is kicking out.

Shelter Building:

Safety considerations for shelter building

1. Do not allow students to try and carry any material longer than they are tall, have them use a friend to help
2. Give students clearly defined boundaries concerning where they can and cannot go to find materials

Set up a survival situation (for example 35˚ F, raining, one hour before sunset and they are lost in the woods). They need to work together to build a fire, boil water and/or build a shelter (depending on time and seasons). If they can maintain PMA through out the activity, they will survive the situation. If the students are shelter building, remind the them to minimize their impact on the environment by finding downed materials and to consider the effects of gravity as a downward force when considering the safety of their shelter (i.e.-be sure all materials are secure and will not fall on a group member!). (5-ESS3-1; MS-ESS3-3; 5-PS2-1)

Give each group the materials necessary for their activity and appropriate further instructions. This may include a demonstration of a log cabin, lean-too, and teepee style fire structures and revisiting the principles of shelter site selection, safety, etc. You may also include a discussion

of ways to predict weather conditions in a survival situation and why it would be important to predict the weather (affects shelter and fire site selection). Changes in temperature, pressure, humidity, precipitation, and wind are good ways to predict weather. (MS-ESS2-5)

Fire

- Zip lock bag , fire pan
- Gathered kindling – *down and dead only!*

Shelter

- Emphasize that knocking down trees or logs is strictly forbidden.
- Tell the group that they will have about 40 minutes to build a shelter using just what they find at the site.
- Encourage them to consider the slope of their location, relationship to the wind or sunrays, etc.
- Everyone must be able to fit inside the shelter, and everyone must participate in making it.
- At the end, we will have a "Parade of Homes" where each group can show off their shelter and explain how and why it was constructed to the other groups.

Once they begin, circulate among the groups and ask them how they have read the landscape regarding their shelter site location and the shelter's entrance. Have they considered earlier discussions? Give suggestions when necessary but let them try ideas on their own and evaluate their success. Watch to make sure the adults don't take over the activities of the group. After the allotted time, gather everyone and start the "Parade of Homes" (SL.5.5; SL.8.5) to compare and contrast shelters, as well as identify the best characteristics in each. Ask questions like; why this location, reasons for design, are they worried about any elements, if they had more time what would they add (RST.6-8.7). After the Parade, discuss how the best characteristics of each could be combined to create a successful shelter. (MS-ETS1-3)

Technology inclusion

When the group is close to finishing their shelters walk around and encourage them to collect the following data…

Use a thermal imaging camera to see how well the shelter holds in heat with students inside it. More precise measurements may also be obtained with the thermometer.

A lux meter can also be used inside the shelter to have a measure for how much light is blocked out. The less sunlight is let in, the more solid the walls are. This is also a factor to consider for blocking wind

A kestrel weather unit can be used to obtain current weather conditions such as wind speed and temperature. Based on the time of day, students can predict whether or not the weather will get warmer or colder, and can consider what changes or improvements to make to their shelters.

Have them write down on an index card their findings and what they are going to say about their shelter. This will serve as your scientific story.

Conclusion:

After the success of boiling water, students must return the zip lock bags to the teacher with all items and disperse unused wood. Ask them what methods worked best in building a fire and what things did the fire need in order to start and keep burning? After the parade of homes, students must disassemble their shelters and bring materials back to the classroom. For both activities ask the students: Did they work as a team? Did they have a PMA? Remind them that it is not the tools they bring with them but the ability to use what they've got.

For review have the students list the Seven Basic Survival Needs, and the signs and treatment of hypothermia and frostbite or heat exhaustion and stroke. Emphasize that the most important factors in keeping warm are staying dry, keeping out of the wind, keeping exposed areas and extremities covered, and seeking shelter.

Appendix A

Optional Activity

Interactive Water Immersion:

(Fits well before Gilligan's Island)

Materials

- 2 large containers
- Ice cubes
- Several pennies
- 2 towels

- Fill one cooler half full with luke-warm water and the other cooler with ice water (use the bag of ice to help accomplish this)
- Place pennies in the bottom of each cooler
- Have three students at each cooler attempt to pick up the coins, then switch
- Have them try with their eyes closed – When able to see, students typically blame their inability to pick up coins on the ice obscuring their view.
- Make them use just their fingertips
- Don't let them use the side of the cooler to aid them
- Use towels to dry off
- Students should note that it is more difficult to pick up coins in the ice water rather than in the warm water. This is because ice water constricts blood vessels decreasing the flow of nutrients to the muscles, which causes sense of touch and dexterity to deteriorate. This is showing what happens when you don't have the proper hand covering.

Appendix B
Standards Alignment

Wisconsin's Model Academic Standards
Environmental:
A.4.4
B.4.1
B.4.2
B.4.8
B.8.17
D.4.1
Science:
D.4.3
F.4.1
H.8.3

Next Generation Science Standards
4-PS3-2
4-LS1-1
4-LS1-2
4-ESS2-1
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