

Topic 1: Scientific Method – 1b. Thinking/Processing Skills – Winter Survival Exercise

Resources: Handouts attached

Possibly survival shows on Discovery Channel

- “Survivorman” had this same scenario in a smaller plane in which the host had to survive for one week on his own (though he was more prepared and the temperature was not quite as cold).
- “Man vs. Wild” also has many survival scenarios with which the students may be familiar. Both shows are aired on the Discovery Channel and DVDs can be purchased on their website.

Building on: The requirements of life, systems of the body—particularly the circulatory system and endothermic organisms.

Links to Chemistry and Physics:

This activity provides an introduction to thinking and problem-solving skills, which will be important in many lab settings. May be used as an icebreaker to start a new school year semester, or unit.

Stories: Students are very engaged by this exercise. They are usually very interested in the follow-up discussion and hearing what the “expert” has to say about it. I like to use this as a second semester warm-up activity; it is usually cold outside, the students have just finished final exams from first semester, and often our classes include new students that switch in at the semester. This activity allows me to gauge very quickly how well the new students think and interact with the rest of the class.

Lab Instructions and Materials for the Teacher:

Some demos may be good in the follow-up discussion such as starting steel wool on fire using a 9-volt battery or burning alcohol soaked clothing; otherwise, the handout alone is sufficient.

Winter Survival Exercise or Can Science Save My Life?

The Situation:

- You have just crash-landed in the woods of northern Minnesota and southern Manitoba. It is 11:32 A.M. in mid-January.
- The small plane in which you were traveling has been completely destroyed except for the frame. The pilot and co-pilot have been killed, but no one else is seriously injured.
- The crash came suddenly before the pilot had time to radio for help or inform anyone of your position. Since your pilot was trying to avoid a storm, you know the plane was considerably off course. The pilot announced shortly before the crash that you were eighty miles northwest of a small town that is the nearest known habitation.
- You are in a wilderness area made up of thick woods broken by many lakes and rivers. The last weather report indicated that the temperature would reach minus twenty-five degrees in the daytime and minus forty at night.
- You are dressed in winter clothing appropriate for city wear—suits, pantsuits, street shoes, and overcoats.
- While escaping from the plane, your group salvaged the fifteen items listed below.
Your task is to rank these items according to their importance to your survival.
- You may assume that the amount of each item is the same as the number in your group and that the group has agreed to stick together.

Winter Survival Decision Form:

Rank the following items according to their importance to your survival, starting with “1” for the most important and proceeding to “15” for the least important!

- | | |
|---|---|
| _____ Compress kit (with 28 ft. of 2-inch gauze) | _____ Ball of steel wool |
| _____ Cigarette lighter without the fluid | _____ Loaded .45-caliber pistol |
| _____ Newspaper (one per person) | _____ Compass |
| _____ Two ski poles | _____ Knife |
| _____ Sectional air map made of plastic | _____ 30 feet of rope |
| _____ Family-sized chocolate bar (one per person) | _____ Flashlight with batteries |
| _____ Quart of 85-proof whiskey | _____ Extra shirt and pants for each survivor |
| _____ Can of shortening | |

Winter Survival Exercise

Background Information:

(Note: None of the information here should be given to participants until after they have completed the decision-making parts of the exercise.)

Mid-January is the coldest time of the year in Minnesota and Manitoba. The first problem the survivors face, therefore, is to preserve their body heat and to protect their body against its loss. One can solve this problem by building a fire, minimizing movement and exertion, and using as much insulation as possible.

The participants have crash-landed. Many individuals tend to overlook the enormous shock reaction this has upon the human body, and the death of the pilot and copilot increases the shock. Decision making under such conditions is extremely difficult. Such a situation requires a strong emphasis upon the use of reasoning not only to make decisions, but also to reduce the fear and panic every person would naturally feel. Along with fear, shock reaction is manifested in the feelings of helplessness, loneliness, and hopelessness. These feelings have brought about more fatalities than perhaps any other cause in survival situations. Through the use of reasoning, hope for survival and the will to live can be generated. Certainly the state of shock means that movement of individuals should be at a minimum and that an attempt to calm them should be made.

Before taking off, a pilot always has to file a flight plan. The flight plan contains the vital information regarding the flight, such as the course, speed, estimated time of arrival, type of aircraft, number of people on board, and so on. Search-and-rescue operations would begin shortly after the plane failed to arrive at its destination at its estimated time of arrival.

The eighty miles to the nearest known town is a very long walk even under ideal conditions, particularly if one is not used to walking such distances. Under the circumstances of being in shock, dressed in city clothes, having deep snow in the woods and a variety of water barriers to cross, to attempt to walk out would mean almost certain death from freezing and exhaustion. At the temperatures given, the loss of body heat through exertion is a very serious matter.

Once the survivors have found ways in which to keep warm, their most immediate problem is to provide signaling methods to attract the attention of search planes and search parties. Thus, all the items the group has must be assessed according to their value in signaling the group's whereabouts.

Winter Survival Exercise Scoring Key

The correct ranking of the survivors' items was made on the basis of information provided by Mark Wanig and supplemented from Rulstrum (1978). Wanig was an instructor for three years in survival training in the reconnaissance school in the 101st Division of the U.S. Army and later an instructor on wilderness survival for four years at the Twin City Institute for Talented Youth. He is now conducting wilderness survival programs for Minneapolis teachers.

1. *Cigarette lighter (without fluid)*. The gravest danger facing the group is exposure to the cold. The greatest need is for a source of warmth and the second greatest need is for signaling devices. This makes building a fire the first order of business. Without matches something is needed to produce sparks to start a fire. Even without fluid, the cigarette lighter can be used to produce sparks. The fire will not only provide warmth; it will also provide smoke for daytime signaling and firelight for nighttime signaling.
2. *Ball of steel wool*. To make a fire, a means of catching the sparks made by the cigarette lighter is needed. Steel wool is the best substance with which to catch a spark and support a flame, even if it is a little bit wet.
3. *Extra shirt and pants for each survivor*. Clothes are probably the most versatile items one can have in a situation like this. Besides adding warmth to the body, they can be used for shelter, signaling, bedding, bandages, string when unraveled, and tinder to make fires. Even maps can be drawn on them. The versatility of clothes and the need for fires, signaling devices, and warmth make this number three in importance.
4. *Family-sized Hershey bar (one per person)*. To gather wood for the fire and to set up signals, energy is needed. The Hershey bars would supply the energy to sustain the survivors for quite some time. Because they contain basically carbohydrates, they would supply energy without making digestive demands upon the body.
5. *Can of shortening*. This item has many uses the most important being that a mirror-like signaling device can be made from the lid. After shining the lid with the steel wool, the survivors can use it to produce an effective reflector of sunlight. A mirror is the most powerful tool they have for communicating their presence. In sunlight, a simple mirror can generate 5 to 7 million candlepower. The reflected sunbeam can be seen beyond the horizon. Its effectiveness is somewhat limited by the trees, but one member of the group could climb a tree and use the mirror to signal search planes. If the survivors have no other means of signaling, they would still have better than 80 percent chance of being rescued within the first twenty-four hours.

Other uses for the item are as follows: The shortening can be rubbed on the body to protect exposed areas, such as the face, lips, and hands, from the cold. In desperation it could be eaten in small amounts. When melted into oil, the shortening is helpful in starting fires. Melted shortening, when soaked into a piece of cloth, will produce an effective candlewick. The can is useful in melting snow to produce drinking water. Even

in the wintertime, water is important as the body loses water in many ways, such as through perspiration, respiration, shock reactions, and so on. This water must be replenished because dehydration affects the ability to make clean decisions. The can is also useful as a cup.

6. *Flashlight*. Inasmuch as the group has little hope of survival, if it decides to walk out, its major hope is to catch the attention of search planes. During the day the lid mirror, smoke, and flags made from clothing represent the best devices. During the night the flashlight is the best signaling device. It is the only effective night-signaling device besides the fire. In the cold, however, a flashlight loses the power in its battery very quickly. It must, therefore, be kept warm if it is to work, which means that it must be kept close to someone's body. The value of the flashlight lies in the fact that, if the fire burns low or inadvertently goes out, the flashlight could be immediately turned on the moment a plane is heard.
7. *Piece of rope*. The rope is another versatile piece of equipment. It could be used to pull dead limbs off trees for firewood. When cut in pieces, the rope will help in constructing shelters. It can be burned. When frayed, it can be used as tinder to start fires. When unraveled, it will make good insulation from the cold if it is stuffed inside clothing.
8. *Newspaper (one per person)*. The newspaper could be used for starting a fire much the same as the rope. It will also serve as an insulator; when rolled up and placed under the clothes around a person's legs or arms, it provides dead-air space for extra protection from the cold. The paper can be used for recreation by reading it, memorizing it, folding it, or tearing it. It could be rolled into a cone and yelled through as a signal device. It could also be spread around an area to help signal a rescue party.
9. *.45-caliber pistol*. This pistol provides a sound-signaling device. (The international distress signal is three shots fired in rapid succession.) There have been numerous cases of survivors going undetected because, by the time the rescue party arrived in the area, the survivors were too weak to make a loud enough noise to attract attention. The butt of the pistol could be used as a hammer. The powder from the shells will assist in fire building. By placing a small bit of cloth in a cartridge, emptied of its bullet, a fire can be started by firing the gun at dry wood on the ground. At night the muzzle blast of the gun is visible, which also makes it useful as a signaling device.

The pistol's advantages are counterbalanced by its dangerous disadvantages. Anger, frustration, impatience, irritability, and lapses of rationality may increase as the group waits to be rescued. The availability of a lethal weapon is a real danger to the group under these conditions. Although it could be used for hunting, it would take a highly skilled marksman to kill an animal and then the animal would have to be transported through the snow to the crash area, probably taking more energy than would be advisable.

10. *Knife*. A knife is a versatile tool, but it is not too important in the winter setting. It could be used for cutting the rope into desired lengths, making shavings from pieces of wood for tinder, and many other uses could be thought up.

11. *Compress kit (with gauze)*. The best use of this item is to wrap the gauze around exposed areas of the body for insulation. Feet and hands are probably the most vulnerable to frostbite, and the gauze can be used to keep them warm. The gauze can be used as a candlewick when dipped into melted shortening. It would also make effective tinder. The small supply of the gauze is the reason this item is ranked so low.
12. *Ski poles*. Although they are not very important, the poles are useful as a flagpole or staff for signaling. They can be used to stabilize a person walking through snow to collect wood, and to test the thickness of the ice on a lakeshore or stream. Probably their most useful function would be as supports for a shelter or by the fire as a heat reflector.
13. *Quart of 85-proof whiskey*. The only useful function of the whiskey is to aid in fire building or as a fuel. A torch could be made from a piece of clothing soaked in the whiskey and attached to an upright ski pole. The danger of the whiskey is that someone might try to drink it when it is cold. Whiskey takes on the temperature it is exposed to, and a drink of it at minus thirty degrees would freeze a person's esophagus and stomach and do considerable damage to the mouth. Drinking it warm will cause dehydration. The bottle, kept warm, would be useful for storing drinking water.
14. *Sectional air map made of plastic*. This item is dangerous because it will encourage individuals to attempt to walk to the nearest town—thereby condemning them to almost certain death.
15. *Compass*. Because the compass may also encourage some survivors to try to walk to the nearest town, it too is a dangerous item. The only redeeming feature of the compass is the possible use of its glass top as a reflector of sunlight to signal search planes, but it is the least effective of the potential signaling devices available. That it might tempt survivors to walk away from the crash site makes it the least desirable of the fifteen items.

Winter Survival Exercise: Key

The correct ranking of the survivors' fifteen items is as follows:

<p><u>11</u> Compress kit (with 28 ft. of 2-inch gauze)</p> <p><u>1</u> Cigarette lighter without the fluid</p> <p><u>8</u> Newspaper (one per person)</p> <p><u>12</u> Two ski poles</p> <p><u>14</u> Sectional air map made of plastic</p> <p><u>4</u> Family-sized chocolate bar (one per person)</p> <p><u>13</u> Quart of 85-proof whiskey</p> <p><u>5</u> Can of shortening</p>	<p><u>2</u> Ball of steel wool</p> <p><u>9</u> Loaded .45-caliber pistol</p> <p><u>15</u> Compass</p> <p><u>10</u> Knife</p> <p><u>7</u> 30 feet of rope</p> <p><u>6</u> Flashlight with batteries</p> <p><u>3</u> Extra shirt and pants for each survivor</p>
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See two attachments:

Helpful overhead to illustrate grading

Helpful overhead to illustrate grading, plus grading” scale for survivability! Use this only after students have added up their points.

Winter Survival Exercise: Key

Diff	Expert	Yours	
	11		Compress kit
	1		Cigarette lighter
	8		Newspaper
	12		Two ski poles
	14		Sectional air map
	4		Family-sized chocolate bar
	13		Quart of 85-proof whiskey
	5		Can of shortening
	2		Ball of steel wool
	9		Loaded .45-caliber pistol
	15		Compass
	10		Knife
	7		30 feet of rope
	6		Flashlight with batteries
	3		Extra shirt and pants
	Total of "Differences"		

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	6		Flashlight with batteries
	3		Extra shirt and pants
			Total of "Differences"

0–50: All survive.

51–60: Frostbite

61–70: Three live.

71 & up: Prepare for a new life.