**Turning Mistakes into Opportunities**

Elisapee and her younger brother, Joelie loved springtime in their community. The longer days and warm sunlight made for ideal ice fishing conditions. During the day many people would use ice augers to drill through the ice so they could fish for char. She and her brother would try to fish at their own holes close to each other so they could talk away as they jigged for fish. They would talk away for hours and usually there were plenty of fish caught to keep them happy.

One day they were getting frustrated fishing as they could see the fish swimming by their bait but there were no bites. Joelie started to get really frustrated and said, “You know, if we had a spear we’d have better luck in getting these fish that using a baited hook. I’ve had enough, I’m going home!”

Elisapee watched her brother throw down his jigging line and march across the lake to the town. She was content to keep trying to catch fish expecting that maybe Joelie would come back once he cooled down. It was no surprise that only about ten minutes later he came running back across the lake. But, he had something in his hand. As he got closer Elisapee could see that Joelie had their father’s metal spearing rod. This was just no spearing rod; it was one of their dad’s prize possessions. Elisapee wondered how Joelie convinced their dad he could use it.

“Hey”, Elisappee yelled, “How did you get dad to let you used that?”

Elisappee didn’t get a response and watched Joelie go to a distant hole and begin to fish. Elisapee went back to fishing and kept an eye on how her brother was doing. A while later Elisapee heard Joellie start to yell at the top of his lungs. He was upset and down on his hands and knees gazing into the hole. Elisapee ran over to the hole. Joelie was both crying and mad. There was no spearing rod to be found.

“ I dropped it in the water”, Joelie wailed. “I can see it on the bottom of the lake. It’s really shallow here, maybe only two meters deep. How am I going to get it? Dad told me to look after it.”

Elisapee said she didn’t know what they could do, but telling dad was a good start she told Joelie. Joelie reluctantly agreed and they slowly walked across the lake not looking forward to what their father might have to say about this!

Joelie tried to calmly tell his dad what had happened. Rather than getting mad, he told Joelie he can, instead, figure out how he could get the spear off the bottom of the lake.

Joelie didn’t have any ideas at all; nor did Elisapee. He was even more surprised when his father said that he could get it out by just using **a car battery, a long length of wire and a tire iron**. They could haul this gear on a sled down to the bay and get the spear themselves.

Elisapee and Joelie looked at each other and wondered how this would help them get the metal spearing rod off the bottom of the lake. The only advice dad gave was they would never be able to hook it off the bottom of the lake as the spear was a straight metal pole.

**Using a flashlight battery, a length of copper wire and a nail as a small scale version of the equipment required, figure out how the spear (an unfolded paper clip) can be retrieved from the bottom of the lake. Use a nearly full glass of water to represent the lake and put the clip at the bottom of the glass to represent the spear.**

1. Try to solve this problem. Once you get it, draw a picture of the device below.
2. After how it works has been explained to you, explain it to a friend and then write and draw the explanation below.
3. Once you have devised a means to which to retrieve the spear, consider ways in which you can improve the device to make it better for retrieving the clip. What ways might they be able to make the electromagnet batter?

a.

b.

c.

d.

Carry out a fair test to determine if:

Use the following planning grid to help you plan the investigation.

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What did you find out? Explain your results.

Summary Questions:

1. Draw pictures of your attempts below and the results from each attempt.
2. Draw a picture of what this device would look like if it actually was used by Joelie and Elisappee to get the spear off the bottom of the lake.
3. What other modifications might be made to improve the outcomes of the electromagnets strength?
4. What are two strengths and two limitations of electromagnets over common magnets?
5. Do think the children in this story did anything ‘wrong’? Explain your answer.