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| **Name** | Camping “Lightmare” |
| **Materials**  (for each group) | * 1 - D-cell battery * 1 - 1.5 v light bulb * 2 - insulated copper wires with stripped ends * tape (preferably electrical) |
| **Safety Considerations** | * students need to be careful not to touch the stripped ends of the wire when the circuit is about to be completed |
| **General Learning Outcomes** | **Science**  C2 – demonstrate appropriate scientific inquiry skills when seeking answers to questions  D4 – understand how stability, motion, forces, and energy transfers and transformations play a role in a wide range of natural and constructed contexts  **Mathematics**  Collect, display, and analyze data to solve problems.  **English Language Arts**  General Outcome 5 – Students will listen, speak, read, write, view, and represent to celebrate and to build community. |
| **Specific Learning Outcomes** | **Science**  6-3-06 – Develop a definition of an electrical circuit, based on classroom explorations.  6-3-10 – Explore to determine factors that affect bulb brightness in simple series and parallel circuits.  **Mathematics**  6.SP.2 – Select, justify, and use appropriate methods of collecting data, including questionnaires, experiments, databases, and electronic media.  **English Language Arts**  5.2 – Encourage, Support and Work with Others: select and assume roles to assist in the achievement of group goals; engage in ongoing feedback. |
| **Reasoning**  **Reasoning** (continued) | I chose this topic because I was interested in doing a hands-on experiment with students that is beneficial to daily living. That is, the students would be able to make a connection between a simple circuit and household items, such as light turning off and on. They would also be able to extend the simple circuit by adding objects like a switch.  I chose the narrative approach because when I looked at my lesson plan from last year, it was dry and lacked context. I could not believe that I wrote something like that. I even tried part of that lesson plan during my practicum and it somewhat worked, but there were a select few that were not engaged because they lacked attention that Osborne and Wittrock wrote about. They were bored because they did not have a clue on how to begin to get the light to turn on. They lacked the instruction that would guide or steer them in the right direction. I thought that giving them the freedom to figure it out on their own would spark inquiry. To some it did, but the rest did not care for it. Perhaps I could have posed focused questions that were carefully worded, as mentioned by Osborne and Wittrock, to facilitate the students’ thinking process and cause them to draw information from their long-term memory.  I find that students learn best when what they are learning is relevant to their lives. I believe that the narrative I wrote is relevant to grade 6 students because they can relate to it. Most grade 6 students have gone camping and loved it, so they can start to be engaged by reading the narrative. Once posed with a problem, they will more likely want to find a solution to that problem rather than finding a solution to a problem without context. |

**Camping “Lightmare”**

Rachel and Justin wanted to go tent camping with their parents just before school started. They were nagging their parents to go one last time to end their summer with a bang! Their parents agreed to go and off they went.

“I can’t wait to go swimming!” Rachel said excitedly.

“Swimming! I can’t wait to go tubing!” yelled Justin.

“We’re almost there. I don’t think you’ll have time to go swimming *or* tubing because we have to put the tent up and make supper. By then it’ll be *way* too dark to go out in the water,” said Mom.

“Aw man!” Justin complained.

“Look on the bright side, Justin. We get to tell scary stories at the campfire!” replied Rachel.

“Oh yeah! I know the scariest story that’ll make you pee in your pants! I can’t wait!”

While Justin and his dad were putting the tent together, Rachel was shining the flashlight in their direction. A mosquito suddenly bit Rachel’s leg. As she tried to slap it, she lost her balance and accidentally nudged her brother. He thought she did it on purpose so he shoved her.

“It was an accident,” said Rachel as she pushed back.

“Yeah right!” Justin replied.

He tried to push her again but she ran away from him. He chased after her and as she was almost in his grasp, he tripped over a rock and toppled over his sister. The flashlight was knocked out of her hand and smashed against a bigger rock, causing the batteries to fall out.

“Look what you did! Now the flashlight is broken!” Rachel accused.

“What do you mean it’s broken? You can just put the batteries back in,” said Justin.

“No you can’t! Look at the flashlight. It broke in half! How are we going to finish putting the tent up *and* tell scary stories at the campfire now?” cried Rachel.

They walked back to the campground and told their parents what had happened. To their surprise, they did not get in trouble. Instead, their mom told them that they can make a flashlight using the batteries and the light bulb from the flashlight, tape, and a couple of wires that their dad keeps in the van.

You have just created an electrical circuit. Draw a picture of it below.

You will be working in a group of 4. Each person will have one of the following roles:

1. Runner: gathers materials before and after the experiment

2. Recorder: records data and observations

3. Checker: makes sure that everyone understands the concepts and group’s conclusions

4. Leader: ensures that everyone does the work and no one is left out

Now that you all have a role, figure out a way to light the light bulb using the materials mentioned above.

Explain how it works.

Rachel and Justin were able to make the light bulb light, but they didn’t understand why that happened.

Their dad asked, “What does the battery do?”

“It supplies energy.”

“What do you think happens with that energy?”

“Um…it gets transferred to the light bulb?” Justin answered unsurely.

“How?” Dad asks.

“Through the wires,” Rachel replied.

“Exactly!”

But Justin was still confused. He understood that a wire must be connected from the battery to the bulb, but he didn’t understand why another wire needed to be connected from the bulb to the battery. Why didn’t it just work with just one wire connecting the battery to the bulb?

Rachel replies, “Remember what we learned in static electricity, Justin: opposite charges attract?”

Justin remembered and understood.

How does this apply to the electrical circuit you made (hint: what does *circuit* mean)? Explain your answer.

Rachel wondered if it was possible to make the light brighter. Think of different ways to make the light brighter. Carry out a fair-test to try it out.

You will need to do this experiment at least twice with different variables (what you will change).

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

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |
|  | **What will you change?** |  | **What will you keep the same?** |  | **What will you measure?** |  |
|  |  |  |  |  | **How will you measure?** |  |
|  |  |  |  |  | **How often will you measure?** |  |
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Record your results in the following table:

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| --- | --- | --- |
| Variable Changed | Observations | Drawing |
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What did you find out? Explain.

Summary Questions:

1. Draw pictures of your attempts in the table above.
2. What are the 3 requirements to make an electric circuit work (hint: what do the materials represent)?
3. Explain how a switch would work in an electric circuit (i.e. how does it turn the light off and on)?
4. In the fair-test you conducted, you may have added more light bulbs. Explain why the light would be dimmer instead of brighter. How would you make the light bulbs brighter?
5. How can you modify the electric circuit to perform other functions? What would those other functions be?