

Student 1 Example:

I taught my roommate about the pinhole camera experiment last night. We took the shade off of a lamp in our living room and I went through the basic steps with her. I asked her what she thinks she would see through the pinhole camera and then she tested it. She was confused at first and I helped her along the way to understand why the light bulb is upside down and I even drew the process for her to better understand. This experiment was fun to do with her because usually she understands science a lot better than I do, so it was nice to know teach her something that she didn't understand.

Before I demonstrated this experiment with my roommate, I conducted it with group members in class. After we had all looked through the pinhole and realized that the bulb was indeed upside down, we drew a picture on the white board to help our understanding of this perplexing find. We drew the pinhole camera directed at the light bulb with an eye looking into the camera. We then incorporated the three powerful ideas about light into our drawing. Karrin, a group member of mine, drew a straight line from the bulb to the eye to show that light travels in straight lines directly from the source. Our group then realized that by using another powerful idea: light travels in all different directions; we could conclude that the light coming from the bottom of the bulb and the top of the bulb traveled diagonally. This proves why the light bulb was flipped when we saw the image through the pinhole camera. Because these two powerful ideas were proven, we concluded that the third idea (light bounces off of objects in different directions) could also be proven true in this experiment. As a group we found that the light bulb is upside down while looking through the pinhole camera because of the powerful ideas of light.

Student 2 Example:

I recreated the pinhole camera experiment for my friend, Erika. We turned off all the lights in our living room, took the lamp shade off of our lamp and placed it in the middle of our coffee table. I didn't tell her what she was doing, or why, I just handed her the camera, and told her to look at the reflection of the light on the wax paper, and to tell me what she saw. She was confused for a minute, but then realized, with some prodding, what she was looking at. She thought it was really cool, but was now even more confused. She asked me how it happened and I answered with "How do you think it happened?" in order to get her to think more in depth about it. It surprised me that one of her first thoughts was about the foil having some effect on the reflection. This idea was starting to lean more toward the direction I wanted her to go in. We talked about the foil and

how it reflected the light away from the hole, and how the hole allowed just certain beams of light in. I asked her questions about which light beams she thought she was seeing, if they were visible in lines toward the pinhole. Eventually, she said that the angle of the hole must have allowed only certain beams in, and she asked me to hold the camera in place and she moved her finger from the bulb to the hole, as if she were tracing a beams path into the hole. Just like that, she got it, she realized that the light from the top of the bulb, the light from the bottom of the bulb and light from the center of the bulb were all traveling on a constant path through the hole. That is why the lightbulb was upside down! It was really interesting to listen to her thought process as she went, because it was so similar to mine. It took about 20 minutes for her to figure it out, and she was so excited when she did. It was also interesting to let her figure it out on her own, rather than me just having her look through the pinhole camera, and then say "This is why that happened, the end".