13 October 2020 – Kentucky 4-H Virtual Experience – Is There a Fork in the Road

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00:00:44.310 --> 00:00:54.300
Torey Earle: Hi everybody, welcome to the Kentucky 4-H Virtual Experience. Today we're going to concentrate on SET, or Science, Engineering and Technology programs.

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00:00:55.050 --> 00:01:05.550
Torey Earle: My name is Torey Earle and I am an Extension Specialist for 4-H Youth Development with University of Kentucky College of Agriculture, Food and environment Cooperative Extension Service.

3
00:01:10.530 --> 00:01:22.290
Torey Earle: The activity, we're going to do today comes from the 4-H Electric Excitement curriculum book one, the Magic of Electricity and it's called, Is There a Fork in the Road.

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00:01:23.160 --> 00:01:33.870
Torey Earle: In this activity, you will learn a little bit more about how electricity flows in a circuit and different types of circuits, including series and parallel circuits.

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00:01:36.030 --> 00:01:44.790
Torey Earle: As we talked about in one of our previous activities, a circuit is a complete flow of electricity from positive to negative.

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00:01:45.390 --> 00:01:57.570
Torey Earle: In order for electricity to do work, it has to flow in a complete circuit, but sometimes those circuits have to branch off and the two types we're going to look at today are series and parallel circuits.

7
00:01:58.530 --> 00:02:09.840
Torey Earle: In a series circuit the electricity flows directly from positive to negative all the way through the circuit. It never branches to a different area.

8
00:02:10.950 --> 00:02:22.950
Torey Earle: But in a parallel circuit, the circuit itself may branch and each one of these circuits is used for different purposes, and we're going to look at each one of them today and have a react.

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00:02:34.170 --> 00:02:43.920
Torey Earle: The supplies that you'll need for your activity today with series and parallel circuits. You will need a couple of D cell batteries.

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00:02:45.360 --> 00:02:48.360
Torey Earle: And a couple of D cell battery holders.

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00:02:49.860 --> 00:02:55.680
Torey Earle: You'll also need to lamp sockets for 1.5 volt.

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00:02:56.790 --> 00:03:02.700
Torey Earle: Lamps, you'll need the 1.5 volt lamps themselves to go into the lamp sockets.

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00:03:05.070 --> 00:03:20.550
Torey Earle: And you'll need either some copper doorbell wire which you see right here, but for convenience sake. Today, I'm going to use wires with alligator clips on them so I can connect and disconnect them quickly.

14
00:03:22.590 --> 00:03:32.280
Torey Earle: These items can be found at local hardware stores or you can order them online. They're relatively inexpensive.

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00:03:33.420 --> 00:03:53.940
Torey Earle: The whole setup that I've got here is probably about $6 so if you choose to use the doorbell wire. It's going to be even less expensive than using the wires. The alligator clips, but you will also need to have a small screwdriver to loosen and tighten the screws on the lamps.

16
00:03:56.400 --> 00:04:06.120
Torey Earle: As we start today. We're just going to look at the most basic of circuits, one battery one bulb. And in order to get the bulb to burn.

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00:04:08.100 --> 00:04:17.820
Torey Earle: we'll connect the positive lead of the battery to one side. I'll just touch it to the one side and the negative lead to the other.

18
00:04:21.330 --> 00:04:22.410
Torey Earle: And the light burns.

19
00:04:24.420 --> 00:04:40.140
Torey Earle: This shows that electricity is doing work it's traveling through or from battery through the light bulb, providing it electricity and then coming back into the negative side of the battery. That's the simplest of circuits.

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00:04:42.990 --> 00:04:47.580
Torey Earle: In our second circuit. We're going to look at today we're going to use two batteries.

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00:04:49.050 --> 00:04:58.650
Torey Earle: To bulb holders with bulbs and in order to get the bulbs to light up. We're going to have to make sure that our circuit connects from

22
00:04:59.190 --> 00:05:14.100
Torey Earle: The positive side of this battery into the bulb, through the bulb to the second bulb, from the second bulb back to the negative side of battery number two, and then that the two batteries are connected together positive to negative.

23
00:05:16.290 --> 00:05:31.530
Torey Earle: Doing this, I'm going to use the alligator clips to, again, make it a little more convenient, a little quicker to hook up. So, my first thing to do is take one of my alligator clips to the positive side of battery number one.

24
00:05:33.390 --> 00:05:40.260
Torey Earle: Then I will clip it to a terminal on bulb number one.

25
00:05:43.740 --> 00:05:44.910
Torey Earle: From bulb number one.

26
00:05:47.520 --> 00:05:54.510
Torey Earle: I will clip now alligator clip to the second terminal on bulb number one.

27
00:05:55.590 --> 00:06:02.190
Torey Earle: And two, the first terminal on bulb number two this is starting my circuit. I'm going from positive

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00:06:03.900 --> 00:06:06.840
Torey Earle: Into the bulb through the bulb to the second bulb.

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00:06:09.000 --> 00:06:10.470
Torey Earle: I'll take my alligator clip.

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00:06:12.990 --> 00:06:17.160
Torey Earle: clip it on to the second terminal on bulb number two.

31
00:06:18.390 --> 00:06:20.490
Torey Earle: And then we'll

32
00:06:21.570 --> 00:06:38.370
Torey Earle: Connect it to battery number two. Now, we still don't have a complete circuit because these two leads positive ion battery number two to negative on battery, number one, are not touching. So, let's move our light bulbs back a little bit.

33
00:06:39.540 --> 00:06:42.690
Torey Earle: And touch those two together and see what happens.

34
00:06:44.850 --> 00:06:46.620
Torey Earle: And we have two lights lighting up.

35
00:06:47.820 --> 00:06:49.380
Torey Earle: So, we have a complete circuit.

36
00:06:50.940 --> 00:06:56.340
Torey Earle: What I'm going to do to hold these together. I'm going to use another alligator clip.

37

00:06:57.840 --> 00:07:01.200
Torey Earle: Clip it just like that, so it holds those two wires together.

38
00:07:02.280 --> 00:07:05.010
Torey Earle: Now this is a series circuit.

39
00:07:06.150 --> 00:07:13.860
Torey Earle: electricity flows from positive all the way through the circuit back to negative. There is no branch in the circuit.

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00:07:15.540 --> 00:07:30.840
Torey Earle: But one of the unique things about a serious circuit is if I remove one of the bulbs. The whole circuit goes out because electricity is no longer flowing in a complete circle but I put the bulb back in

41
00:07:31.890 --> 00:07:33.840
Torey Earle: And it works again.

42
00:07:34.920 --> 00:07:37.590
Torey Earle: Series circuits are used for

43
00:07:38.700 --> 00:07:45.420
Torey Earle: Various things, but probably one of the most common ones that they can be used for our holiday light.

44
00:07:46.620 --> 00:07:50.010
Torey Earle: If you take one bulb out of a strand of holiday lights.

45
00:07:51.120 --> 00:07:52.260
Torey Earle: All of the bulbs go out

46
00:07:53.970 --> 00:08:02.850
Torey Earle: Put it back in. It completes the circuit again and the bulbs work. So, that is an example, a real-life example of a series circuit.

47
00:08:05.220 --> 00:08:06.360
Torey Earle: Our next example.

48
00:08:07.980 --> 00:08:20.580
Torey Earle: We're going to have two bulbs one battery, but each one of the bulbs is going to get the same amount of electricity flowing through it and this is called a parallel circuit.

49
00:08:22.650 --> 00:08:31.230
Torey Earle: In a parallel circuit electricity will branch off from a source. So, we're going to need to clip.

50
00:08:32.430 --> 00:08:34.020
Torey Earle: One of our alligator clips

51
00:08:37.020 --> 00:08:39.030
Torey Earle: To the positive side.

52
00:08:40.350 --> 00:08:42.960
Torey Earle: Of the battery and one terminal on the bulb.

53
00:08:44.550 --> 00:08:49.200
Torey Earle: And we'll make the clip. Another alligator clip to

54
00:08:51.420 --> 00:08:55.800
Torey Earle: The second terminal on the bulb and to our battery.

55
00:09:00.720 --> 00:09:02.460
Torey Earle: And you see that the light bulb burns.

56
00:09:04.620 --> 00:09:10.740
Torey Earle: Now, how do we get the other light bulb to burn. We're going to make a branch off the circuit.

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00:09:12.180 --> 00:09:14.970
Torey Earle: So, I'm going to clip.

58
00:09:16.470 --> 00:09:18.900
Torey Earle: To the positive side of the battery.

59
00:09:21.540 --> 00:09:23.700
Torey Earle: And a terminal one on the bulb.

60
00:09:25.770 --> 00:09:28.260
Torey Earle: And I'm going to clip to

61
00:09:30.510 --> 00:09:31.950
Torey Earle: The negative side of battery.

62
00:09:33.660 --> 00:09:36.720
Torey Earle: And to the second terminal on the second bulb.

63
00:09:38.400 --> 00:09:39.840
Torey Earle: And I have two lights that burn.

64
00:09:42.270 --> 00:09:51.030
Torey Earle: If you remember in the series circuit if we took one of the light bulbs out, it broke the circuit, or it disconnected the circuit. So, it would not work anymore.

65
00:09:51.960 --> 00:10:03.990
Torey Earle: Let's see what happens if we take one of the light bulbs out for the parallel circuit. The other light bulb remains burning. That's because it is still in a complete circuit.

66
00:10:05.220 --> 00:10:07.380
Torey Earle: The second light bulb has

67
00:10:08.580 --> 00:10:31.440

Torey Earle: A branch off of the battery itself so light bulbs will continue to burn or well, everything will continue to work if one part of that circuit goes up one branch goes out the other branch still works. This is a parallel circuit and it is used very, very commonly in wiring houses and

68
00:10:32.760 --> 00:10:35.760
Torey Earle: Structures, because you don't want

69
00:10:37.290 --> 00:10:50.490
Torey Earle: A circuit to go out because are all of the lights to go out or all the electricity to go off just simply because one thing in the circuit quits working or has a disconnect in that circuit.

70
00:10:51.780 --> 00:11:01.710
Torey Earle: So, series and parallel circuits used for different things. And this is an example of how each one of them works.

71
00:11:03.390 --> 00:11:19.830
Torey Earle: The last circuit. I want to build in this activity is going to involve to boundaries to bulbs that we're going to run from positive to one terminal on the bulb out to the negative of the other battery.

72
00:11:21.030 --> 00:11:29.070
Torey Earle: From the positive of this battery terminal on this bulb. And from this terminal back to the negative of the battery. We're going to see what happens when we do it.

73
00:11:31.470 --> 00:11:33.900
Torey Earle: So, first clip onto the positive

74
00:11:35.490 --> 00:11:36.990
Torey Earle: The battery one

75
00:11:38.160 --> 00:11:41.460
Torey Earle: Clip on to Terminal on bulb one.

76
00:11:43.980 --> 00:11:47.430

Torey Earle: Come out of terminal two on bulb two

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00:11:48.870 --> 00:11:50.250
Torey Earle: or bulb one, excuse me.

78
00:11:51.810 --> 00:11:54.000
Torey Earle: To the negative terminal.

79
00:11:55.020 --> 00:11:55.890
Torey Earle: On battery two

80
00:11:58.710 --> 00:11:59.850
Torey Earle: From battery two

81
00:12:02.100 --> 00:12:03.210
Torey Earle: I will clip on to

82
00:12:04.290 --> 00:12:05.280
Torey Earle: Positive terminal.

83
00:12:08.910 --> 00:12:12.330
Torey Earle: Terminal on bulb one, bulb two excuse me.

84
00:12:14.370 --> 00:12:16.830
Torey Earle: Second terminal on bulb two

85
00:12:19.530 --> 00:12:21.540
Torey Earle: To our battery.

86
00:12:24.120 --> 00:12:26.490
Torey Earle: What do you predict will happen if I remove a bulb.

87
00:12:27.720 --> 00:12:30.150

Torey Earle: You think it will continue to burn or

88
00:12:31.740 --> 00:12:37.830
Torey Earle: Our circuit will go out. So, what kind of circuit is this series or parallel?

89
00:12:40.110 --> 00:12:41.250
Torey Earle: If you said series

90
00:12:42.360 --> 00:12:49.440
Torey Earle: You are correct, because if one part of the circuit is removed the entire circuit does not work.

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00:12:51.480 --> 00:12:58.770
Torey Earle: What you see here is a visual representation of the two different types of circuits we talked about today, the series and the parallel circuit.

92
00:13:00.870 --> 00:13:02.280
Torey Earle: You have power source.

93
00:13:03.510 --> 00:13:06.420
Torey Earle: Positive going to a switch.

94
00:13:07.530 --> 00:13:23.820
Torey Earle: When the switch is connected electricity will flow into one lamp from one lamp out to the second lamp and from the second lamp back out to the negative of the battery.

95
00:13:25.260 --> 00:13:26.580
Torey Earle: In the parallel circuit.

96
00:13:27.840 --> 00:13:37.380
Torey Earle: positive electricity will flow out to the switch, when the switch is connected will flow into one.

97
00:13:38.490 --> 00:13:50.190

Torey Earle: Light bulb. But you see here, it has a parallel line that will go to the second bulb. So, if this one was removed the second bulb would still work.

98
00:13:51.690 --> 00:13:57.630
Torey Earle: parallel line connecting the negative to the negative back to the negative of the battery.

99
00:13:58.650 --> 00:14:11.460
Torey Earle: So, this gives you a visual representation of what each of the circuits would look like in a little cleaner manner than we did with our alligator clips and batteries.

100
00:14:12.720 --> 00:14:27.300
Torey Earle: Putting them together gives you a better idea of how they work. So, this you can see what they look like what we did with our hands on is putting them together to see how they work.

101
00:14:28.590 --> 00:14:41.040
Torey Earle: Well, how did you do? Series in parallel circuits, you've had a chance to see how both of them work you've had a chance to build both of them. And you've learned a little bit more about what each one is used for

102
00:14:42.360 --> 00:14:45.900
Torey Earle: As you would go through more of the electricity activities. We're going to do

103
00:14:46.950 --> 00:14:58.200
Torey Earle: Keep in mind that electrical safety is important before testing a circuit, please make sure that the circuit is disconnected from a power supply.

104
00:14:59.430 --> 00:15:08.850
Torey Earle: Now with our batteries, the voltage is relatively low. So, you run a very, very minimal risk of shock with that. But if you would work with

105
00:15:10.110 --> 00:15:21.360
Torey Earle: A higher voltage circuit, say 120-volt circuit like you would have in a house. You want to make sure that you disconnect or

106
00:15:22.140 --> 00:15:30.810
Torey Earle: Cut the circuit off before you would start working on it. I hope you've enjoyed doing the activity today on series and parallel circuits.

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00:15:31.590 --> 00:15:40.440
Torey Earle: And we look forward to working with you again on some more electricity activities in the future. Thank you for joining me today.

108
00:15:41.400 --> 00:15:57.030
Torey Earle: For the Kentucky 4-H Virtual Experience focused on Science, Engineering and Technology. For more information about the 4-H SET Program, please check out your local University of Kentucky Cooperative Extension Service.