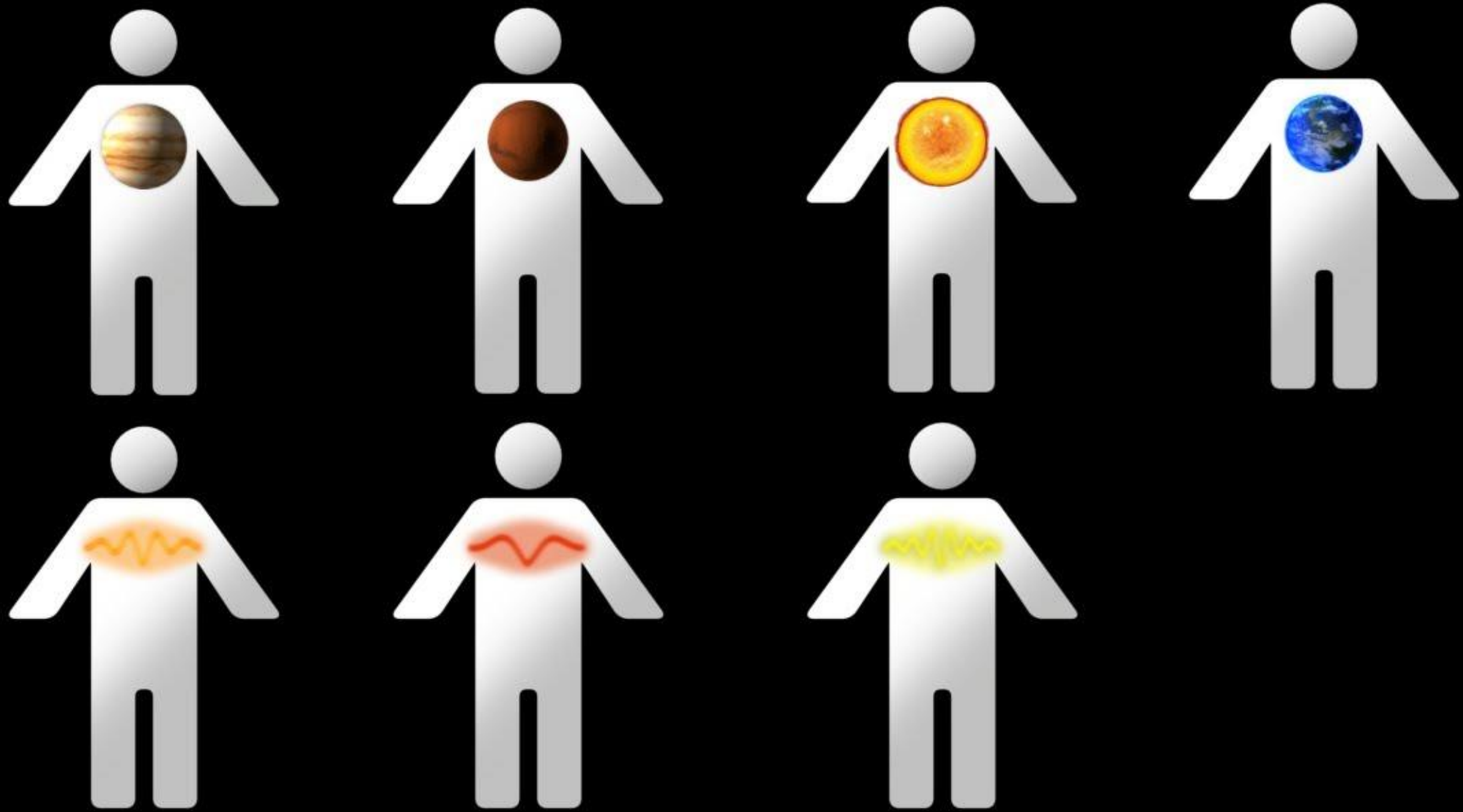

1
00:00:12,040 --> 00:00:04,010
Music

2
00:00:12,060 --> 00:00:16,060
This is a kinesthetic model to help

3
00:00:16,080 --> 00:00:20,070
participants understand that all the information we obtain about objects in the universe is carried

4
00:00:20,090 --> 00:00:24,100
to us by light; and that it takes time for light to travel to us from those objects.

5
00:00:24,120 --> 00:00:28,130
The farther away they are the longer it takes. This activity uses

6
00:00:28,150 --> 00:00:32,140
seven people: one to represent Earth, which is receiving all the information;

7
00:00:32,160 --> 00:00:36,160
three to represent other objects in the solar system; and three to represent rays of

8
00:00:36,180 --> 00:00:40,190
light coming from those objects. To set up this activity

9
00:00:40,210 --> 00:00:44,210
all of the objects stand in a straight line, starting with Earth. For this demonstration

10
00:00:44,230 --> 00:00:48,240
we will not worry about orbits and the sun being at the center of the solar system

11
00:00:48,260 --> 00:00:52,260
but only represent the distances between the objects and Earth. The sun should be

12
00:00:52,280 --> 00:00:56,290
8 steps away from Earth, Mars should be 12 steps away from Earth, and Jupiter

13
00:00:56,310 --> 00:01:00,330

should be 35 steps away from Earth.

14
00:01:00,350 --> 00:01:04,360
For the next step the light rays should stand with their respective objects as the messengers

15
00:01:04,380 --> 00:01:08,390
that will carry information and the Earth should turn his back to the entire line.

16
00:01:08,410 --> 00:01:12,410
Now the person representing the sun should perform an action, such as waving

17
00:01:12,430 --> 00:01:16,440
her hands. The sun's light ray then carries information about that action

18
00:01:16,460 --> 00:01:20,460
to Earth and tells them about the suns action, so that Earth now knows what the sun

19
00:01:20,480 --> 00:01:24,480
was doing. However after the light ray leaves the sun stops

20
00:01:24,500 --> 00:01:28,530
waving her hands and performs another action such as patting her head.

21
00:01:28,550 --> 00:01:32,550
But the light ray has already left the sun, and so Earth will not know anything about this new action

22
00:01:32,570 --> 00:01:36,590
unless a new light ray leaves the sun and comes to Earth with this new information.

23
00:01:36,610 --> 00:01:40,630
These same steps are repeated with both Mars and Jupiter. Each time

24
00:01:40,650 --> 00:01:44,650
the light ray takes longer to reach earth as the objects are farther away. And each time

25
00:01:44,670 --> 00:01:48,690
the only information Earth is able to learn is carried by that light ray. In order to

26
00:01:48,710 --> 00:01:52,720
learn about the new actions carried out by the objects another light ray would have to bring that information

27
00:01:52,740 --> 00:01:56,760
to Earth. It is important to note that in reality the light rays in this

28
00:01:56,770 --> 00:02:00,790
activity might actually be generated by the object like with the sun, or they might

29
00:02:00,810 --> 00:02:04,810
be reflected from somewhere else, like with the planets. The only relevant

30
00:02:04,830 --> 00:02:08,840
thing for our model is where they are coming from most recently not where they

31
00:02:08,860 --> 00:02:12,860
originated, so we keep it simple.