Slinky physics experiment

For our experiment, we chose to look at the physics of slinkys in an interesting and interesting example. For the material, we used 6 text books, stopwatch, weight scale, ruler, 2 different slinkys of different sizes and volumes. Physical Laboratory: Slinky Physics and Motion (Handout) Purpose: To consider the correlation between the size and weight of an object affecting its speed. Background: The translation dynamics are the product of the mass and velocity of an object in it (p = mv). Similar to velocity, linear dynamics are a number of vectors in which the vector's density is the distance between two points and includes the direction of movement from point A to B that will be shown in the experiment below. According to Newton's Law 2, the rate of change in the momentum of a particle is relative to the force the result acts on the particle and in the direction of that force. In this case, the direction will be gravity at a falling 90 degree angle. Mass is a dependent variable in an experiment where the heavier the mass, the faster it will move when the same amount is given. The height from which the object falls will also be changed to see if the correlation between the size and volume of the object is changed as the height increases or decreases as well. From a sustainable point of view, the correlation between its size and volume and speed is applied to many energy concepts such as the size and volume of a model being changed to improve optimal speed and fuel efficiency. Procedure: Stacks of six books such as stairs Measuring the height of the book and the height of the inclination Determine the volume of each slinky Put one end slinkys at the top of the stack and the other end on the next step Push the slinky with the same motivation per test and track how long it takes to walk down the roll Release the slinkys through the step when it is at a 90 degree angle and the fascinating pull of momentum is pulling the slinky down the steps Do this 3-5 different test height of the book steps by taking away one or two books and doing 3 tests at the speed calculation altitude : d/t Using the P=MV equation in which P is the amount (mass and movement), M is the mass, and V is the velocity, the equation shows the dynamic proportional to an object of mass and proportional to the velocity of the object. Record tests in data format on lab newsletter Data: Smaller Slinky: Volume (g) 207 Distance (Test 1): Distance 0.23m (Test 2) .23m Distance (Test 3) .23m Time in seconds: 1.1 Time in seconds: 1.1 Larger Slinky: Volume (g) 1 24.5 Distance (Test 1): Distance 0.23m (Test 2) .23m Distance (Test 3) .23m Time in seconds: 1.8 Time in seconds: 1.7 Time in seconds: 1.8 Velocity: 0.23 m / 1.1 seconds = 0.21 m /s (smaller slinky, blocks 207 grams) Velocity: 0.23 m / 1.77 seconds = 0.13 0.13 (larger slinky, volume: 124.5 grams) * Put into excel for graphical representation analysis: Do different volumes of slinkys change velocity? Yes a) If so why do you think this is true? The slinky with a larger volume of 207 grams goes faster at 0.21 m/s. The heavier the mass, the faster the slinky goes down the steps With the compression and vertical waves that the slinky have in motion, heavier masses are pulled down at higher speeds because the natural momentum of gravity pulls heavier masses down the step at a faster rate. Here is a graphical representation of the velocity and volume of slinky physical graphs * Factors that contribute to slinky motion: longtiudinal waves, compression, mass and gravitational drag momentum * Doing this experiment with students from other classes is a great learning experiment. They all joined ready and ended up getting the same results we got and understood why our hypothesis was correct. Learning from their experiments is also a perfect way to integrate everything we learned during the semester and really put everything together. We have included a lot of variables in sustainability from the simple laws of physics, to photovalactic cells, and greenhouses. Which end will win? Phrawr/Flickr When you drop a Slinky, what falls to the ground first: top, bottom, or everything at once? Derek Muller, who created the popular YouTube channel Veritasium, first took on this confusing physical question in a 2011 video. At the Google Science Fair on Monday, which Muller hosted, he repeated this rally on stage - and also with a giant, rainbow-colored Slinky, he fell from the top Googleplex.So that's it? The results may surprise you. First, place your bet on what you think will happen. Now, the physical view takes place in the GIF below: Am. J. Phys. 80, 1051 (2012) Rod Cross, a physics professor at the University of Sydney, starred in a scientific paper on modeling a falling Slinky in 2012 (PDF). A Slinky is a loose stress spring. If you let the whole thing uncoil and hang down, the tension is enough to hold up the bottom against the traction of gravity. Because Slinky crashed from the top, Cross explains in his study, it takes time for the wave of movement to spiral down and communicate to the bottom where the top falls - and that the tension is no longer there. The time required for normal Slinkies to collapse, he calculated, was about 0.3 seconds. During that time the bottom basically floats in the air. Muller explains more about what's happening in the video: The interesting thing to note about this phenomenon is not just the property of Slinkies. It is an asset of all objects. You can have a really long steel bar and when you let go of your head, really start accelerating down and the last second. It takes time for that relaxation to travel through any material. You need that wave of compression to basically pass through the entire object. A slinky just makes that nice and visible to us. Here it is again, from the top of the Googleplex: See the full coverage of the Fair in the video below. Muller's segment begins at about 11:30. Get the latest Google share price here. Tie the fishing line to the chair. Slide the slinky onto the fishing line, and then tie the other end of the fishing line to another chair. Pull the chairs apart until the line is taut. Optionally, the rest slinky on a smooth top of the table. If you use a top of the table, using only 1/2 of a plastic slinky, otherwise friction will make the experiment difficult. Grab the head of the slinky in your hand. Extend the slinky to between 1 and 2 meters long. Move your hands together and then separate, just like you're clapping. Notice the movement of the slinky. Your hands move a lot while the center of the slinky moves very little. The center is a button. You can attach a small flag of ice cover to the center of the slinky to make it easier to see that the center does not move. Next notice the distance between the slinks (in turn) of the slinky. When the slinks are stuck close together the high pressure slinky patterns in a gas, where the atoms are closer together. When the slinks are far apart, the slinky models are low pressure in a gas. Let's call tight distance high pressure slinks and wide distance low pressure slinks. Note that the pressure change is the largest in the center where the slinks alternately bundle up and spread out, and where the movement from side to side of the flag is the least. Rhythm count of this motion: 1,2,3,4,1,2,3,4,... Move both hands in the same direction, if the slinky stretching right-left moves both hands to the left then to the right. (One of our teachers described this as the sound of a hand clapping twice.) Slinky motion notifications are called longitudinal motion. Find the hand movement frequency that produces the largest movement of the center of the slinky for the smallest movement of your hand. Rhythm count of this motion: 1,2,3,4,1,2,3,4,... Notice that the center of the slinky is an antinode, your hands are almost buttons. The flag marks the center whip back and back. Note that in the slinky center move back and back but the distance between the slinks near the center does not change. The center is an anode of motion but a node (a place with no change) pressure. At the buttons move near your hands however the slinks bundle together and then spread out: the pressure varies greatly. The handsets are pressure analyses. Also note that when one hand is at high pressure, the other hand is low. The end then exchanges. High pressure hands become a pressure and vice versa. In other words, otherwise, bundle up near one hand while they spread out in the other. PROGRAM SCIENCE, EVENTS & WORKSHOPS A slinky metal two people and a bit of Copyright Room 1 Two people hold two heads of a slinky and walk about five metres apart. 2 One person moves the slinky end up and down while the other keeps their finish steady. 3 See the slinky - how many waves form in between the two? What if you go faster or slower? How many ways can you make the travel wave? Animation by Dr. Dan Russell Notice that the particles move up and down, but they don't travel with the wave itself? This illustrates the important point that most waves are an energy transfer, not a material transfer. Think of those who stand in a line and jump up and down: Animation by Dr. Dan Russell Who doesn't move with the wave, but they help to overcome the same wave. This type of wave is called a horizontal wave. There are several waves that can be created by slinky. One of them is a wave of standing. Standing waves can be found in a tube that has been struck on the surface. In this wave some slinky were moving quickly and some locations were not moving at all. Non-moving locations are called nodes. The most moving positions are called antinodes. Dr. Dan Russell Sound's animation radiates through the air (or liquid) in a more complex way. The animation above represents a horizontal wave where the material is up and down only. See below for another illustration that represents the sound moving through the air. Try extending the slinky between the two. One person is now not short, sharp, pushing the motion forward with their slinky finish towards the other. You'll see spring sending pulses of 'spring contracts' backwards and forwards throughout the slinky. This is the same way the sound passes through the air. Note that when the 'contract impulse' moves backwards and the slinky forward performs the same motion, i.e. moving backwards and forwards locally as well. This represents the dynamic (moving) energy transmitted from the air molecular to the air molecular, allowing the sound to move through the air with small local disturbances in the air as the sound passes through the area. See below for an animation: Animation by Dr. Dan Russell Look at animations and choose a 'particle' to observe. This is called vertical waves. Think when a deep, low, sound from a large stereo or subwoofer 'hits' your chest. The local air around your body pushes at you as the energy from the waves reaches you. Of course, this doesn't mean that ALL the air around the floating sound moves to where you're standing 30 meters away, just that the energy that spreads through the air disturbs you locally around you. In essence, air (or liquid) is constantly introduced and removed from the local area. Check out the animations below from a Audio source point, with audio energy traveling radially around the audio source, is similar to what happens to a canned speaker. Animation by Dr. Dan Russell turns to test more about the variables here Try a plastic slinky instead. How many standing waves can you form when you speed up the slinky shake? What happens if you try another type of spring? If you shake the slinky face aside, does the wave doe still form? Form?

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