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| Jack and the GiantStEm LessonEngineering Design Challenge | Grade Level: 4 |
| **Lesson Objective:** Students will create an instrument and a code so the giant’s wife can secretly communicate with Jack. | **Benchmark Standard:** SC.4.P.10.3Investigate and explain that sound is produced by vibrating objects and that pitch depends on how fast or slow the object vibrates. |
| **Essential Question:**How can you change the way strings vibrate to change the sound and create an instrument with two or more pitches?  | **Vocabulary:** SoundEnergyPitchVibrate  | **Vocabulary Activities:**Use the vocabulary when discussing the instruments.  |
| **Preparation Directions:****Engage:**  Share the edited version of the Jack and the Giant story. This can be done as a read aloud or used in an ELA lesson.Discuss ways the giant’s wife could have let Jack know when it was safe or unsafe to come out of hiding.Discuss, they could have made a secret code using sounds from the harp.**Procedures:**1. Explain to students that they are going to make an instrument that the ogre’s wife can play to tell Jack the following things:
* Giant is awake
* Giant is asleep
* Hide- the giant is coming your way.
1. Show student’s the Morse code poster. Explain the dots are short sounds and the dashes are sustained sounds. This code is used to communicate. Explain that they will use high and low sounds to make a code. They will create 3 different sound combinations to represent:
* Giant is awake
* Giant is asleep
* Hide- the giant is coming your way.
1. Share the Request for Proposals (RfP) from Jack and the EDC planning sheet.
2. After plans are complete, give students access to rubber bands, containers, and other materials.
3. Students build instruments and create codes following the EDC model.
 | **Materials:**Rubber bands of various sizesRecycled containersVarious makerspace materials**Sample Questions:**How were you able to change the pitch of the rubber band? Does a higher pitch sound vibrate faster or slower than a lower pitched sound?Can you make the pitch higher? How?Can you hear the difference between the pitch of each rubber band?Is there a way you can write the code on paper so that Jack and the woman can remember them later? |
| **Assessment:**Students should be able to demonstrate and explain that a shorter rubber band vibrates faster and make a higher pitch sound, while a longer rubber band vibrates more slowly and makes a lower pitched sound. 1. Extend: Challenge students to write their code so that someone could play it back without having heard it.
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**Morse Code**



**Jack and the Giant**

There was once upon a time a poor widow who had an only son named Jack. They used to be very rich, but a horrible ogre killed her husband and took their fortune.

 Now all they had was a cow named Milky-White. All they had to live on was the milk the cow gave every morning, which they carried to the market and sold - until one morning Milky-White gave no milk.

“What shall we do, what shall we do?” said the widow, wringing her hands.

“Alright, mother,” said Jack. “It’s market day today, and I’ll soon sell Milky-White, and then we’ll see what we can do.”

So he took the cow, and off he started. He hadn’t gone far when he met a funny looking old man, who said to him, “Good morning, Jack.”

“Good morning to you,” said Jack, and wondered how he knew his name.

“Well Jack, where are you off to?” Said the man.

“I’m going to market to sell our cow there.”

“Oh, you look the proper sort of chap to sell cows,” said the man. “I would trade you these five magic beans for that cow.”

“Go along,” said Jack. “You take me for a fool!”

“Ah! You don’t know what these beans are,” said the man. “If you plant them overnight, by morning they grow right up to the sky.”

“Really?” said Jack. “You don’t say so.”

 “Yes, that is so. If it doesn’t turn out to be true you can have your cow back.”

“All right,” said Jack, and handed him over Milky-White, then pocketed the beans.

Jack went home and showed the beans to his mother.

“What!” Exclaimed Jack’s mother. “You been such a fool! As for your precious beans, here they go out of the window. Now off with you to bed with no supper!”

So Jack went upstairs to his little room in the attic, sad and sorry he was, to be sure. At last he dropped off to sleep.

When he woke up, the room looked so funny. The sun was shining into part of it, and yet all the rest was quite dark and shady. Jack jumped up and went to the window. What do you think he saw? Why, the beans his mother had thrown out of the window into the garden had sprung up into a giant beanstalk which went up and up and up until it reached the sky. The man spoke truth after all!

The beanstalk grew up quite close past Jack’s window, so all he had to do was to open it and give a jump onto the beanstalk which ran up just like a big ladder. Jack climbed, and climbed, and climbed, and climbed, and climbed, and climbed, and he climbed until at last he reached the sky. When he got there, he found a long broad road going as straight as a dart. He walked along, and walked along, and he walked along until he came to a great big tall house, and on the doorstep there was a great big tall woman.

“Good morning, ma’am,” said Jack, quite politely. “Could you be so kind as to give me some breakfast?” For he was very hungy.

“It’s breakfast you want, is it?” said the great big tall woman. “It’s breakfast you’ll be if you don’t move off from here. My man is an ogre and there’s nothing he likes better than boys boiled on toast. You’d better be moving on or he’ll be coming.”

“Oh! please, do give me something to eat. I’ve had nothing to eat since yesterday morning, really and truly” said Jack. “I may as well be boiled as die of hunger.”

Well, the ogre’s wife was not half so bad after all, so she took Jack into the kitchen, and gave him a hunk of bread and cheese and a jug of milk. Jack hadn’t half finished these when thump, thump, thump! The whole house began to tremble with the noise of someone coming.

“Goodness gracious me! It’s my old man,” said the ogre’s wife. “What on Earth shall I do? Come along quick and jump in here.” She bundled Jack into the oven just as the ogre came in. He was a big one, to be sure. At his belt he had three calves strung up by the heels, and he unhooked them and threw them down onto the table and said:

"Fee-fi-fo-fum,

I smell the blood of an Englishman,

Be he alive, or be he dead,

I’ll have his bones to grind my bread."

“Nonsense, dear,” said his wife. “You’re dreaming.”

The giant took out two big bags of gold and sat down silently counting. Jack, thinking he was alone, tried to sneak out. Fortunately, the woman saw him before the giant did and hid him quickly. At last the ogre’s head began to nod and he fell asleep.

Jack then crept out on tip-toe from the oven, and as he was passing the ogre, he took one of the bags of gold from under his arm, and off he ran until he came to the beanstalk, and then he threw down the bag of gold, which of course fell into his mother’s garden. He climbed down and down until at last he got home and told his mother and showed her the gold and said, “Well, mother, wasn’t I right about the beans? They are really magical, you see.”

They lived on the bag of gold for some time, until at last they came to the end of it, and Jack made up his mind to try his luck once more at the top of the beanstalk. So one fine morning he rose up early, and got onto the beanstalk, and he climbed, and climbed, and climbed, and climbed, and climbed, and he climbed until at last he came out onto the road again and up to the great tall house he had been to before. There, sure enough, was the great tall woman a-standing on the doorstep.

“Good morning,” said Jack, as bold as brass, “could you be so good as to give me something to eat?”

“Go away, my boy,” said the big tall woman, “or else my man will eat you up for breakfast.”

Jack was so insistent that she took him in and gave him something to eat. He had scarcely begun munching it as slowly as he could when thump! thump! They heard the giant’s footstep, and his wife hid Jack away in the oven.

All happened as it did before. In came the ogre as he did before, said, “Fee-fi-fo-fum,” and had his breakfast off three boiled oxen.

Then he said, “Wife, the hen that lays the golden eggs.” She brought it, and the ogre said, “Lay,” and it laid an egg all of gold. The ogre sat petting the chicken and Jack thought he was asleep, so he tried to sneak out and was nearly caught.

Then the ogre began to nod his head and fell asleep. Jack crept out of the oven on tip-toe and caught hold of the golden hen and was off.

When he got home he showed his mother the wonderful hen and said “Lay” to it; and it laid a golden egg every time he said “Lay.”

Well it wasn’t long before that Jack made up his mind to have another try at his luck up there at the top of the beanstalk. One fine morning he rose up early and got to the beanstalk, and climbed, and climbed, and climbed, and he climbed until he got to the top.

This time the door was open and he walked inside. The ogre’s wife saw him and silently warned him to hide.

 “Fee-fi-fo-fum, I smell the blood of an Englishman,” cried out the ogre. “I smell him, wife, I smell him.”

“Do you, my dearie?” said the ogre’s wife. “I have not seen him”.

The ogre sat down to the breakfast and ate it, but every now and then he would mutter, “Well, I could have sworn –” and he’d get up and search the larder and the cupboards and everything, only, luckily, he didn’t think of the copper pot.

After breakfast was over, the ogre called out, “Wife, wife, bring me my golden harp and play music for me.” She brought it and began to play most beautifully. The music went on for a long time.

Then Jack lifted up the copper lid very quietly and got down like a mouse and crept on hands and knees until he came to the table, when up he crawled, caught hold of the golden harp and dashed with it towards the door. But the ogre was still awake!

Jack ran as fast as he could, and the ogre came rushing after, and would soon have caught him, only Jack had a start and dodged him a bit and knew where he was going. When he got to the beanstalk the ogre was not more than twenty yards away when suddenly he saw Jack disappear. When he came to the end of the road he saw Jack underneath climbing down for dear life.

The ogre swung himself down onto the beanstalk, which shook with his weight. Down climbed Jack, and after him climbed the ogre. By this time Jack had climbed down, and climbed down, and climbed down until he was very nearly home. He called out, “Mother! Mother! Bring me an axe, bring me an axe!” His mother came rushing out with the axe in her hand, but when she came to the beanstalk she stood stuck still with fright, for there she saw the ogre with his legs just through the clouds.

Jack jumped down and took hold of the axe and gave a chop at the beanstalk which cut it half in two. The ogre felt the beanstalk shake and quiver. Then Jack gave another chop with the axe, and the beanstalk was cut in two and began to topple over. Then the ogre fell down and broke his crown, and the beanstalk came toppling after.

Jack showed his mother his golden harp that had once belonged to his father, and with playing the harp and selling the golden eggs, Jack and his mother became very rich, and they lived happy ever after.

Jack needs to reclaim the riches that the giant stole from his family.

The giant’s wife will help him, but they need to communicate in secret code so the giant will not know.

You will create an instrument that can be used to play three different combinations of sounds that they can use instead of talking.

• Giant is awake

• Giant is asleep

• Hide- the giant is coming your way.

Secret Code Sounds:

Each code must contain at least 2 notes.

1. Giant is **awake**
2. Giant is **asleep**
3. **Hide**- the giant is coming your way.

Dear Students, RfP

 Jack is in search of instruments to play secret code music on. These instruments must:

1. Create a vibration which will produce a sound.
2. Be made using items commonly found in recycle bins and in classrooms.
3. Each group of 4 must produce at least 3 different pitches.
4. You must be able to change the amplitude by playing the instrument in different ways.
5. You must create and play the 3 secret codes.

All proposals must be submitted as models.

 Have a musical day,

 Jack