

# How Does a Microphone Work?

## Summary

Monica and Elton want to form a singing group. Since Monica will play the drums while Elton sings, they need to use a microphone. The children want to know how a microphone works so they will get the correct kind for their band. Their teacher suggests a dynamic microphone for their application. The children have \$25.00 saved. They will need to find out if they have enough money to buy a microphone, and if they will need to buy any other equipment for their upcoming show.

## Time Frame

1 class periods of 45 minutes each

## Group Size

Large Groups

## Life Skills

Thinking & Reasoning, Communication

## Materials

Picture of Dynamic Microphone Interior

## Background for Teachers

The student must first have an understanding of the basic principles of sound. Sound travels in wave lengths, which determine the pitch of the sound. The sounds we hear are caused by minute pressure changes in the air surrounding us. The air transmits those pressure changes very accurately over long distances. A microphone takes the varying pressure waves in the air and converts them into varying electrical signals. The different kinds of microphone technologies determine how this conversion is accomplished.

## Intended Learning Outcomes

As a result of this lesson, students will be able to understand that sound is made from pressure changes in the air called sound waves; that microphones change the sound waves into electrical signals; that by using a graph they will be able to select the right kind of microphone for their needs.

## Instructional Procedures

1. Sound Before we can understand how a microphone works, we need to have a basic understanding of sound. Sound is the result of minute pressure changes in the air that surrounds us. The changes in the air are called acoustical movement. The air can carry the acoustical energy or movement (sound waves) over long distances very accurately. Our ears catch the sound and translate the waves into electrical signals that our brain interprets as speech, music or other kinds of noise. 2. Microphones convert sound waves into Electrical Signals. Elton will want to make his voice heard over the drums without having to strain it or sound like he has to shout. A microphone will amplify his vocal sounds. This means that his voice will sound louder without his having to physically change his voice. 3. The process of converting sound (acoustic energy) into electric signals is how a microphones work. There are many types of microphones. The sound waves are absorbed from the air. There is a diaphragm in the center of the microphone. This is usually a coiled wire or thin piece of metal. The pressure of the sound wave caused the diaphragm to move as it does it makes contact

with an electromagnet. The magnet induces the current to flow in the wire. This creates a small current of electricity that comes out of it. The electrical current produces the same sound only louder, or amplified. Their teacher suggests that they use a type of microphone called a dynamic microphone. The Dynamic microphone: (show picture)uses an electromagnet and a voice coil. When sound energy pushed against the voice coil, it, in turn, pushed against the diaphragm. The sound waves push the diaphragm back and forth on the electromagnet which changes the sound energy into electrical energy. The electrical energy coming out makes the sound energy amplified, louder but not distorted (changed from its recognizable sound). Dynamic microphones are rugged, durable and reliable. They need no batteries or external power supplies. They do need to put into a microphone input on an amplifier or speaker. They are not expensive and can range in price from \$15.00 to well over \$100.00. 4. Based on what they have just learned, Elton and Monica want to buy a dynamic microphone. They have saved \$25.00 towards their purchase. But they have also discovered that they will need to rent or buy an amplifier. An amplifier will cost a minimum of \$300.00. They can rent one for \$25.00 per performance. They wanted to perform at the city talent show in two weeks. A local discount store is selling an inexpensive dynamic microphone for \$16.85 plus 6.25% tax. If they buy this microphone, how much more money will they need to save so that they can rent an amplifier for their show in two weeks?

### Extensions

The children could research other types of microphones. How do they compare to the dynamic microphone; did the teacher make the best suggestion for their application? Monica and Elton hope to become a success and sing out at least once a week for the next year. If you were Monica or Elton, would want to buy your own equipment, or would you continue to rent it?

### Assessment Plan

The students should be able to describe how a microphone works; how sound waves are changed to electrical current energy. They should be able to discuss why the dynamic microphone is the best type to use for a performance application. Students must be able to determine how much the microphone will cost, how much money they have left from the initial amount of \$25.00, and how much more Elton and Monica will need to save to be able to rent an amplifier for their show.

### Bibliography

<http://electronics.howstuffworks.com.htm> <http://www.audio-technica.com/using/mphones/guide/middoes.html> [http://www.pa.msu.edu/~science/ask\\_st/030393.html](http://www.pa.msu.edu/~science/ask_st/030393.html)

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