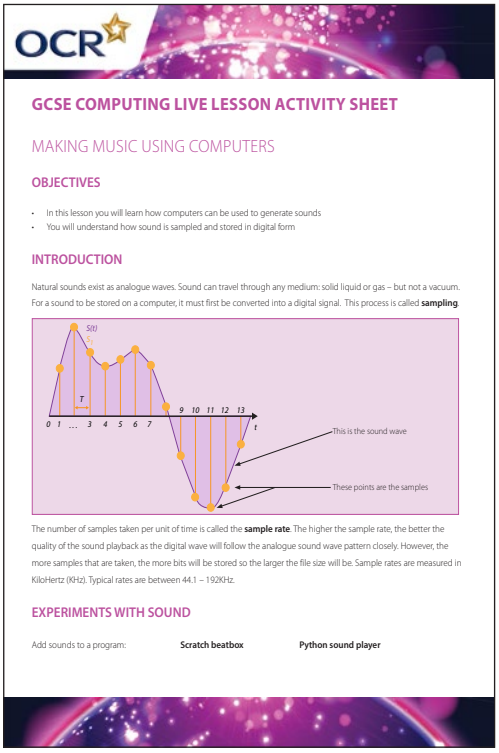
GCSE COMPUTING LIVE LESSON TEACHERS' INSTRUCTIONS

MAKING MUSIC USING COMPUTERS



GCSE COMPUTING LIVE LESSON ACTIVITY SHEET

MAKING MUSIC USING COMPUTERS

OBJECTIVES

- In this lesson you will learn how computers can be used to generate sounds
- You will understand how sound is sampled and stored in digital form

INTRODUCTION

Natural sounds exist as analogue waves. Sound can travel through any medium: solid liquid or gas – but not a vacuum. For a sound to be stored on a computer, it must first be converted into a digital signal. This process is called **sampling**.

The number of samples taken per unit of time is called the **sample rate**. The higher the sample rate, the better the quality of the sound playback as the digital wave will follow the analogue sound wave pattern closely. However, the more samples that are taken, the more bits will be stored so the larger the file size will be. Sample rates are measured in KiloHertz (KHz). Typical rates are between 44.1 – 192KHz.

EXPERIMENTS WITH SOUND

Add sounds to a program: **Scratch beatbox** **Python sound player**

RESOURCES:

Raspberry Pi computers

MakeyMakey

Pieces of fruit

PC with Audacity installed

Loudspeakers/headphones

Microphone

Items capable of making sound

Learning Objectives: At the end of the session, pupils will be able to:		
1.	A451.2.1.2 o –	Understand the need for input and output devices
2.	A451.2.1.2 p –	Describe suitable input devices for a wide range of computer controlled situations (part)
3.	A451.2.1.2 q –	Describe suitable output devices for a wide range of computer controlled situations (part)
4.	A451.2.1.4 n –	Explain how sound can be sampled and stored in digital form
5.	A451.2.1.4 o –	Explain how sampling intervals and other considerations affect the size of a sound file and quality of playback (part

Success Criteria	
All:	Will be able to describe how sound is input into a computer, stored as digital data and how it is output as audible sound. Will be able to use a program to play sounds stored on a computer.
Most:	Will be able to vary the sample rate of a sound to optimise file size and sound playback quality. They will also apply Audacity effects.
A few:	Will edit the Python and Scratch programs to create new sounds and use the Makey Makey to devise new ways of triggering sound events.

Engage Learners: The main part of the lesson will consist of a circus of learning activities.	**Challenge:** Students will be able to edit the Scratch and Python programs to customise the GUI and sounds. They will experiment with different sample rates and effects to create the desired sound.
Independent Learning: Students will use the activity guide to work their way through the activities in pairs.	**Feedback AFL:** Plenary questions and verbal feedback during the practical session. Challenge and recap questions in worksheet. Homework sheet.

KEYWORDS

Input Output Analogue Digital Sample Sampling Interval MIDI Frequency Pitch Amplitude

Lesson part	Teacher or student led?	Activity
Group introduction (approx. 10 mins.)	Teacher	Discussion: how can we make music using computers? How can we store sound digitally on a computer for later playback? How can we alter a digital sound file? What devices can we use to trigger sounds to be played? Introduce circus of activities. Define keywords: analogue, digital, input, output. Explain how analogue sound is sampled to create a digital file and how sampling rate affects file size and playback quality. Introduce activities.
Circus of activities (approx. 40 mins.)	Student	Students work around the activities: • Makey Makey fruit piano • Audacity sound recording and editing • Scratch beatbox program • Python music box program
Plenary (approx. 10 mins.)	Student	Each team to discuss the success of their activities. Key questions: "So, what have we found out today?", "What could we do next with this project?", "What can we do to increase the playback quality of digitally stored sound?",