Lesson 2.2 - Music Box

Overview

During this lesson, students will gain understanding of how mechanisms for storing music have evolved over recent history and now they enable people to enjoy music at any time and without having the skill to play it themselves. They will learn about musical notation using the sol-fa system and simple musical notation using staves. Students will integrate and exhibit learning by creating and storing melodies using a Sequencer, a widely-used music-creation tool.

Key Information

Level 2: (Ages 9-10) US Grades 3 or 4

Time: 45/90 minutes

Warm-Up	5 minutes
Mini-lesson	10 minutes
Worked Example	7 minutes
Challenge 1	7 minutes
Challenge 1 - Debug	5 minutes
Challenge 2	7 minutes
Tidy Up / Exit Ticket	4 minutes

Lesson Topics

- **Music**
  - Perform music
  - Create and compose music
  - How music is created, produced and communicated
  - The history of music storage devices
  - Musical notation
    - (sol - fa)
    - stave
- **English Language Arts**
  - How change occurs, change-making inventions in history
- **Engineering Design**
  - Designs can be conveyed through models
  - A situation that people want to change can be approached through technology
  - There is always more than one possible solution to a problem
- **Computing**
  - Inputs, outputs, debugging

Learning Objectives

- ***As a result of this lesson, students will be able to***
  - Understand the history of the storage of data, especially music
  - Appreciate musical skill
  - Understand that music is composed of notes
  - Use the names of note using sol-fa notation
  - Play simple melodies
  - Make a Sequencer using SAM

Materials

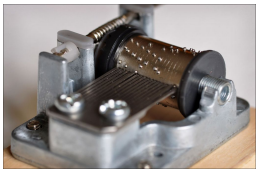
- Sam Labs Kit
- SAM Labs Student Workbook
- Videos:
    - A music box: https://youtu.be/pL-BHqG3plk
    - A phonograph: https://youtu.be/Z41CRHtQSj8
    - Vinyl: https://youtu.be/kHC_Aga1t88

Warm Up – Storing music — 5 minutes

Storing music

Objective: Understand the concept of storing music.

Procedures: Explain that, until very recently, as many people could not play a musical instrument and as there was no Internet, YouTube, radio, etc. people needed to find ways of **storing** music so that anyone could enjoy music anywhere, even if they could not play. Ask if they have seen any of these media for storing music. Elicit or explain that nowadays much music is stored on the Internet and we listen to it on YouTube, Spotify or other streaming services. Show short videos of a musical box, phonograph or record player to support your explanation of older media. Students could conduct separate Internet research to reinforce this knowledge.




Sample photo ideas: A music box, vinyl, cassette tape, a disc, a usb stick

Link forward: The teacher identifies two Key Concepts: making music composition easier and more accessible, being able to store music for later listening

Mini-lesson — 10 minutes

How a sequencer can make music-making easier and is a form of music storing.

Objective: Students learn how a Sequencer can make music-making easier and can also store music.

Procedures: Recap that to play any instrument requires skill and skill comes from practice. While being able to play an instrument is a wonderful thing, it is hard work and takes time. Sometimes people want to compose or play music in an easier way. Sometimes people want to listen to someone else's music. We are going to look at a SAM block called a Sequencer, which enables us to:

- **compose** music at our own pace, even if we are not very skilled
- **store** it for listening later or in a different place
- and then have it **play**, for anyone, anywhere.

Explain that, just as the Number block can contain a number and the Text block can contain a word or a sentence, the Sequencer block can contain a series of notes, or a melody.

At the end of the mini-lesson, students match or define keywords in their workbooks (2 minutes).

Key Words

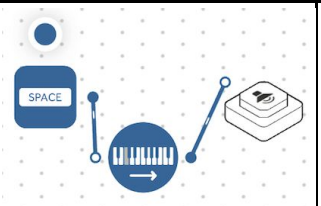
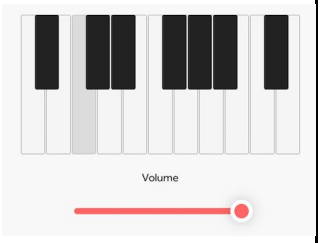
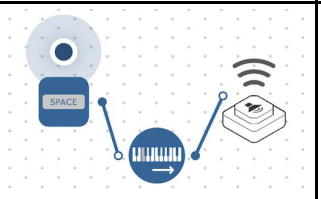
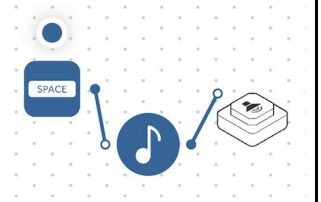
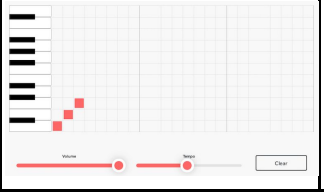
- Instrument
- Skill
- Practice
- Sequencer
- Store
- Record (verb and noun)

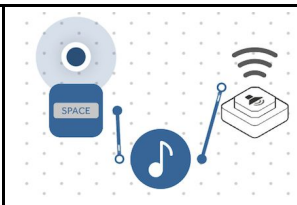
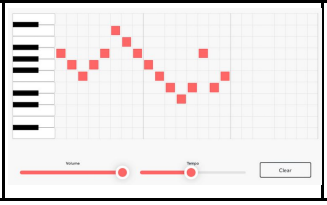
Let's Discuss: *What are the difficulties in playing a musical instrument? Where is the music you listen to stored? In your workbooks or with a partner, record, discuss, or share how you listen to music and where that music is stored.*

Link forward: The teacher prepares students for composing and storing music by making and using a Sequencer

Worked Example — 7 minutes

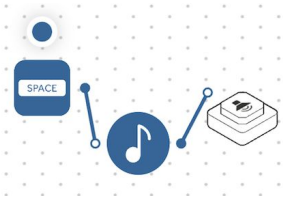
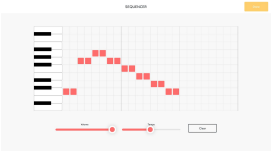
Make a sequencer that plays three notes.

Instructions	Workspace	Notes for Teachers
Step 1. Connect a Key Press, a Note block and a Buzzer.		*The Key Press activates the Note block, which contains a note, this is then sent to the Buzzer, which will play that note.*
Step 2. Open the Note Settings and chose a note by touching it.		*Depending on you and your student's knowledge of musical notation: The Sound block offers notes from A – D. The complete range is A, B, C, D, E, F, G, A, B, C, D. Sharps (♯) and flats (♭) ie., the black notes, are not supported.*
Step 3. Close the Settings and press the Key Press.		*The chosen note, stored in the Note block will be played whenever the Key Press is used*
Step 4. Substitute the Note block for the Sequencer block.		*The Note block contains one note. The Sequencer contains a 'sequence' of notes. The Sequencer does not hold the sounds, just the instruction for the Buzzer block.* In this way the Sequencer is similar to an old player piano roll or a musical box cylinder
Step 5. Open the Settings of the Sequencer block and choose 3 notes.		*The Sequencer allows us to choose from A – D, or if you prefer from La – Re +1 octave. Thus, students can play a C Major scale C – C+1 (do, re, mi, fa, so, la, si, do in sol fa), or a minor scale A – A + 1*

Step 6. Close the Settings and hold the Key Press.		*At this point, unless students are familiar with the notes on a keyboard, allow them to choose any notes. If they are more knowledgeable, allow them to chose notes that make a melody*
Step 7. Play around with your different notes.		*The Sequencer is cleared (all notes removed) using the 'Clear ' Button*

Challenge 1 — 7.5 minutes

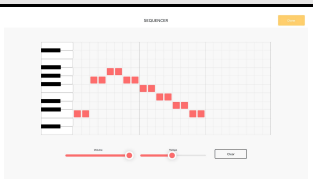
Compose, store and play a melody using a Sequencer.

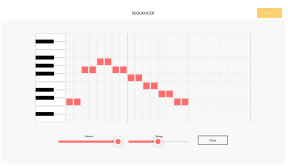
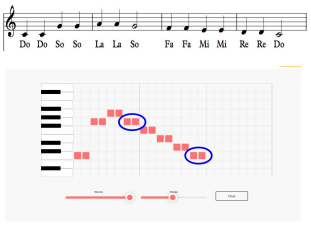
Instructions	Workspace	Notes for Teachers
Step 1. Make a copy of the same system.		*If we don't make a copy, we will lose previous work. This time we are going to program the Sequencer with a more complex series of notes, enough to make a melody*. Play or sing '*Twinkle twinkle little star*' before beginning or Students can hear the complete song at this link: https://en.wikipedia.org/wiki/Twinkle,_Twinkle,_Little_Star
Step 2. Open the Sequencer and record the melody.		*'Twinkle twinkle little star' is a simple melody that can be played on a Major scale without sharps or flats (black notes). Notice the double note on the notes corresponding to the words 'star' and 'are'. This is because the Sequencer only supports quarter notes (or crotchets). So a double note is necessary to make one half note (or minim)*
Step 3. Close the Settings and press the Key Press to play your melody.		*The Song may be too fast or slow or not sound quite right, we will adjust this in the next step.*

Checks for understanding: *What does each square represent in the Sequencer? What does each column represent? What does each row represent? Where do the Sequencer instructions go to make music?*

Challenge 1 - Debug it — 7 minutes

Adjust Tempo and Volume.

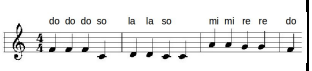
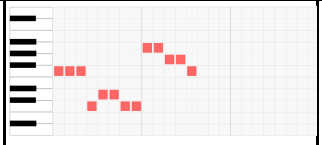
Instructions	Workspace	Notes for Teachers
Step 1. Listen carefully to your song.		*Your song may not sound quite right, the rhythm may be out, It may be too fast or too slow, It may be too soft or too loud.* Students discuss in groups what, if anything, is not quite right with their first attempt.

Step 2. If the song is too quick or slow or too loud or soft, you can adjust this in the Sequencer setting using the Volume or Tempo sliders.		*'Tempo' is an Italian word and Italian is the international language of music and it means 'time'. So when we make the Tempo faster or slower, the song plays slower or faster.*
Step 3. If the rhythm is not quite right you may have to adjust the length of some of the notes to make them double.		*As can be seen from the stave on the left, the 7th and 14th notes are half notes. Ask some (a few) students with a sense of rhythm to beat out a 4 / 4 (1, 2, 3, 4) rhythm with their hands or fingers. Play or sing the the song along to the rhythm and point out that there are two claps on 'star' and 'are' because these are two beats, whereas all the other notes are one beat.*

Checks for understanding: *How can we use the settings to adjust the playback of our song? What do tempo and volume control?*

Challenge 2 — 7 minutes

Compose, program, store and play another song.

Instructions	Workspace	Notes for Teachers
Step 1. Listen to this song or read the music or the sol-fa.		*The song is the first few bars of 'Old MacDonald'. Again, simple to play in a Major scale. Students can listen here: https://upload.wikimedia.org/wikipedia/commons/7/71/Old_McDonald_Had_a_Farm.ogg*
Step 2. Open a new project and program it in the sequencer.		*Here we see a slight weakness of the sequencer in that it can only represent single notes of the same value, so longer notes must be represented by repeated notes*
Step 3. Listen. How does it sound? Play your song for the rest of the class.		*Music: performing with a musical instrument*

Extension Ideas:

- **History**
  - Research further other forms of storing music and their progress:
    - music boxes (1 song)
    - player pianos (many songs but cumbersome)
    - vinyl records (20 songs)
    - tapes (50 songs)
    - CDs (100s of songs)
    - USBs. 1000s of songs
    - online: no limit
- **Computing**
  - Music as an algorithm. We program the sequencer with a series of instructions.
- **ELA**
  - An informative text on the History of music storage. People's wish for music caused change as the resultant inventions enabled music everywhere/anywhere. History studies the past and helps plan the future.

Checks for understanding: *If we don't play an instrument, how does the Sequencer allow us to compose music?. How does a Sequencer allow us leave off and return later without losing our work?*

Tidy Up / Exit Ticket — 4 minutes

Reinforcing the learning objectives of the lesson, students can reflect on key takeaways by completing and submitting an exit ticket.

