Radical Remix: Intro to EarSketch

CEISMC
Georgia Tech Center for Education Integrating Science, Mathematics, and Computing

MODULE 1
INTRODUCTION TO EARSKETCH

OBJECTIVE

Students will learn how to navigate the Earsketch platform and run a basic script.

KEY LEARNINGS

- There are many connections between coding and composing music.
- An **algorithm** is a process or set of rules to be carried out by a computer. Algorithms can be written with computer code.
- **DAWs** (Digital Audio Workstations) are specialized computer software for recording, editing, and playing digital audio files or clips. EarSketch is a DAW that allows audio clips to be placed on a timeline using computer code.
- **Sections** are related musical units consisting of multiple measures. Each section expresses an idea or feeling
- A **script** is a series of instructions that is executed in a specific order by a computer. An EarSketch script consists of comments, setup, music, and finish sections.
- The **API** is a set of tools to accomplish a specific programming task.

RESOURCES

Student Workbook - Google

COMPUTER SCIENCE STANDARDS

- **2-AP-10** Use flowcharts and/or pseudocode to address complex problems as algorithms. (6-8)
- **3-AP-13** Create prototypes that use algorithms to solve computational problems by leveraging prior student knowledge and personal interests. (9-10)
- **3B-AP-10** Use and adapt classic algorithms to solve computational problems. (11-12)

TEACHER PREPARATION

Time: 1 hour 10 minutes (1.5 periods)

1. Make sure that each student can access the EarSketch website - earsketch.gatech.edu - from their device. EarSketch will not work on a mobile device (iPad, phone) or offline, so each student will need to have access to a computer and reliable internet access.
2. Complete all student work as a student:
    a. Read articles and think about connections between music and technology.
    b. Review the Coding Cha-Cha Slide Activity. (Optional)
    c. Create an account on EarSketch (register in the right corner of the platform home page).
    d. Watch "Producing from a Laptop"
    e. Go through the EarSketch Quick Tour. Familiarize yourself with EarSketch terminology. Then, watch the introductory video on the EarSketch Workspace.
    f. Review how to create a script and copy code into the script. Practice printing a command.

ENGAGE

Coding and Music - What is the Connection? (12 minutes)

Say: Are you ready to become the next big music producer? Do you want to remix beats from top recording artists and learn how to code while composing your song? We are going to spend the next few days exploring how music and computer science can help you tell your story and show the world what matters to you.

"That's right! Here is your chance- in the Radical Remix competition you will have the opportunity to remix beats from the soundtrack from Renee Montgomery's "A Radical Act" with beats from the EarSketch library and your own beats to create your own unique song. However, you won't be creating this remix in a recording studio or your school's band room. Instead, you'll be composing on the computer using code. By coding your song, you will have the opportunity to win Amazon Gift Cards, Headphones, and one-on-one sessions with top music producers.

"Wait, Code? Yes, code... the music industry is infused with computer programmers, from sound engineers to streaming site developers. Combining music and computer science is the next step in recording innovation and creativity. Today, you will learn how to navigate the coding platform we will use to remix music and write a basic script."

" Musicians and coders are working together more and more to produce some of today's top hits. Don't believe me? Read one of the articles linked in your student notebook and answer the big question- 'Why is coding important to the future of the music industry?' Be sure to cite at least one piece of evidence from the articles and answer on page 1 of your notebooks."

Assign one of these three articles for the class to read.

- Why Every Band Needs a Computer Coder
- Composing Code: Why Musicians Make Great Software Developers
- Composing in Code: Musician-Programmers are Changing the Way Music is Made

After students have read the articles, you can facilitate their discussion:

- Break students up into small groups and have each group read and discuss the article in their group.
- Divide the class to each read an article. Engage in full class discussion to share learnings.
- Choose one article, read as a class, and engage in whole group discussion.

As a class, you want to answer the question: **Why is coding important in the future of the music industry? (You may want to post this question on a class whiteboard and add responses.)**

"It is possible to be both a programmer and a rock star. So, let's get started coding and composing. You will be using a platform called EarSketch to get started on this journey."

EXPLORE

What is EarSketch? What is code? (10 minutes)

"Students have been remixing beats using code for almost 15 years on EarSketch. Do you want to hear some of their songs? Here is a song from one of our competition winners: **Eryon -SoundCloud Song** Play audio: (Note: This is a SoundCloud link)

“Wasn't that song awesome? This was our grand prize winners from the 2021 EarSketch Remix Competition. The song was composed entirely through code on the EarSketch platform using audio clips from recording artists Ciara, Pharrell, and Common. You can check out her code **here**." (You share the link with your students or project the code)

"Are you ready to try out your coding skills to compose some awesome beats just like you just heard? Go to earsketch.gatech.edu. Click on the **video** on the homepage to hear from students just like you who use EarSketch and are coding music. They started off as EarSketch beginners just like you."

Show video: **EarSketch Intro Video** (Scroll down and play video— you can download ahead of time or project full screen)

Explore: OPTIONAL Introduction to coding activity (10 minutes)
If you have more time, consider completing the following optional activity to introduce students to the basics of coding. If not, skip to the explain section.

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"Wait, have you guys coded before? Do you know what it means to code? Maybe you used Scratch or Code.org before and have done some coding. If you haven't, no worries — we are going to start with something I know you how to do: **dancing!** Is everyone ready to learn how learning the steps of a dance is like coding? Get ready to Cha Cha!"

Show video: **Cha-Cha Slide**

"The Cha-Cha slide is just like Code! Code is a set of instructions for a computer to perform, and the Cha-Cha slide is a list of dance moves to perform! Coding is also just like a recipe! It's just a set of directions for a computer to follow."

Give directions: "Using code or "functional notation," you are going to code a dance, just like the Cha-Cha slide. On your paper, I want you to describe one dance move instruction on each line, using the following format: action(body part, direction, number of times). Come up with a dance that is at least 8 lines long."

"When you are done, pass these instructions to a friend and have them follow your algorithm line by line. Does your algorithm work as expected? If not, place a "#" on the line where your program "crashes" and improve it! For example, let's try out my dance!"

Have students try to follow the dance code you have on the screen. Then, ask students to use work time to try coding and sharing their algorithms.

Say: "The steps of the Cha-Cha slide are an algorithm. An algorithm is a process or set of rules to be carried out by a computer/person. Algorithms can be written with computer code. Your code will simply be a set of instructions, and in EarSketch, that set of instructions will tell the computer how to play music."

Students should write **algorithm** into their **digital notebook**.

EXPLAIN

Creating An Account (5 minutes)

Say: "Hopefully, you are inspired by listening to some great songs created by students just like you.
Now it is your turn - Go to **EarSketch.gatech.edu**

Click the yellow "Start Coding" button (on the EarSketch home page) to enter the EarSketch Platform.
When you enter EarSketch, you will see a "Welcome to EarSketch Quick Tour" popup, click "Skip" at the bottom to continue to explore the platform."

"All students will need to create an EarSketch Account. An EarSketch account allows you to login from any computer and always access your code. All of your work is automatically saved in EarSketch. Follow the directions to create your account; if you already have an account, please login at this time.

1. Go the top right corner and click "Create/Reset Account"
2. Click "Register a New Account"
3. Choose a username and password.
    i. We recommend that students use their school ID/password so it easy to remember
    ii. If students do not have a school ID/Password - then you can allow them to use any username with a simple password (like 123456)

- Teachers can also create class accounts and have all students login –

Ex. Username: Period1teachername
Password: 1234567

4. Students have the option to enter an email address. This is only for password recovery and is not needed.
5. Click “CREATE ACCOUNT”. Write down your name and password.

Note: If students need more help, a link to **account creation directions** and a short **video** on how to create an account are included in their notebooks (Part 2).

EXPLAIN

EarSketch DAW (10 minutes)

Say: “You learned all about the connections between code and music....and as you explore EarSketch, you will learn more. EarSketch is a Digital Audio Workstation (DAW) with special tools that allow audio clips to be placed on a timeline using computer code. A **DAW** is often the main tool for producing music on a computer and is used in most recording studios. A DAW is specialized computer software for recording, editing, and playing digital audio files. You may have heard of GarageBand, Pro Tools, or Logic Pro as examples of other DAWs”

Students should record DAW into **their notebooks.**

"Check out how a top music producer uses a DAW and his laptop to mix and record songs from some of the most popular musical artists."

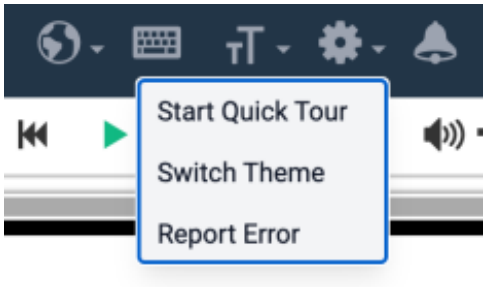
Show Video: **Producing from your laptop** (Warren "Oak" Felder)

Discuss these questions in class:

1. What are the advantages of producing music on a phone or laptop? (Produce from anywhere)
2. What DAW is Oak using? (Logic Pro)
3. How does the DAW help Oak produce music? (Layer the tracks)
4. What is surprising about the Gospel Choir in Demi Lovato's song "Sorry not Sorry"? (It's the vocals of the producers, writers voices stacked 40x)
5. How is technology the great equalizer? (no need for a studio, equipment-- It's all about creativity)

Say: "A laptop is a pretty powerful tool to produce music. Let's look at the EarSketch DAW and see how you can apply your creativity to be the next great music producer. Clear on the gear icon in the top right of your screen (right next to the bell). Click "Start Quick Tour". After the quick tour, you will explore the workspace in more detail."

Students will click through a series of 8 pop-up windows to view the different areas of the EarSketch Workspace. Give students 3–4 minutes to go through the Quick Tour. Ask students if they have any questions about the EarSketch workspace. If students want to know more about the workspace, you can direct them to this **curriculum link** that has a longer video tour and additional descriptions.



EXPLAIN — Creating a Script (7 minutes)

Say: "It's time to create your script. How many of you have heard that word before? You may have heard it used in your English Language Arts or Theatre class. A script is a written text with instructions of what to say in a play/TV show/movie. A script in coding is similar. A script is a series of instructions carried out in a specific order by a computer. Your script in EarSketch is your list of instructions for the computer to play your music, just like a script gives actors/actresses instructions on what to say when they perform."

Students should record script into their **notebooks**

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"Let's learn how to create a script in EarSketch! Follow along with me."

1. "Click on the blue text "Click here to create a new script!" in the middle of the screen to create a new script."
2. "Name the script 'EarSketch First Script' and select your desired coding language: Python or Javascript*. (This lesson plan is modeled in Python)
3. Click the blue 'Create' button. You should now see their code editor in the center of their workspace window."

***Note:** Sample code and curriculum is in Python. If your students are new to coding, we recommend starting this curriculum by choosing Python as your coding language. Python is a general-purpose computer programming language that is used by many large companies, and is one of the ten most popular programming languages in the world. Python has been used for web development by companies like Yahoo and Google. In addition to web development, Python can be used for game development, science, education, and graphics. Games that have been created with Python include Civilization 4, Battlefield 2, and Crystal Space. Other well-known companies that have made extensive use of the Python programming language include The National Weather Service, NASA, IBM, Disney, and Nokia.

Say: "Let's go over the basics of the EarSketch Blank Script

- **# description:** (This is for comments) Notes about your code. You can write the purpose of your code or notes to the listener in this section
- **from earsketch import * :** Do not delete. This is where the computer starts reading code to play music. This code tells the Digital Audio Workstation (DAW) how to prepare to make music.
- **set Tempo (120) -** This sets the timing of your song – it is measured in beats per minute and can be between 40 and 220. We'll discuss more about tempo later.
- **Music Section:** Below setTempo() is where you type your code to remix your beats.

Say: "We will be diving into each of these sections throughout the Radical Remix competition. This is just an opportunity to familiarize yourself with the parts of your script."

"All scripts are automatically saved in the scripts browser in the Content Manager (left menu). If you click on the scripts browser right now, you should see the name of today's script at the top of the list in the scripts browser."

"You will never lose your work in EarSketch. When you close your web browser today, you can open up EarSketch tomorrow, login to your account, and find your script in your scripts browser. You can also recover any scripts deleted by accident or search script by owner or name."

EXPLAIN

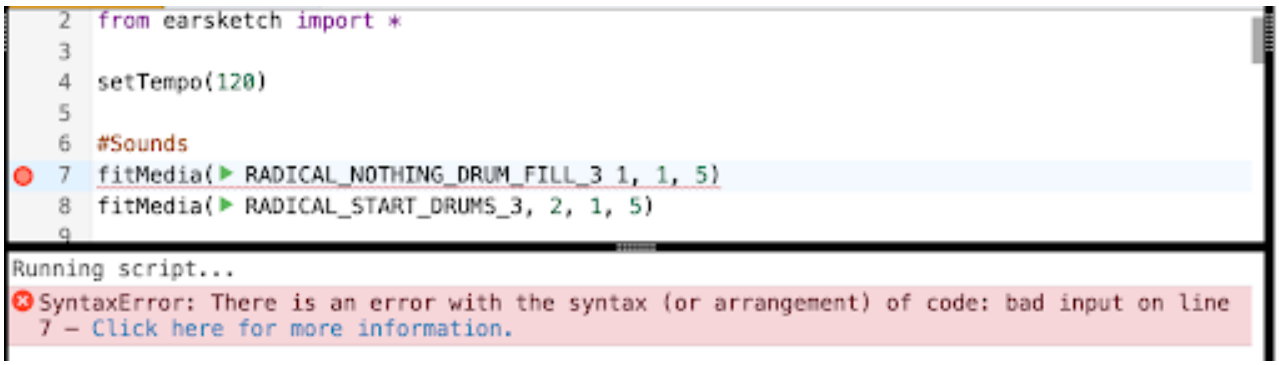
Run and Play (8 minutes)

Say: “EarSketch is all about coding and composing, so let’s add a few lines of code that will insert sound files into your script. These lines of code will be tracks in your DAW. Type (or copy) this code into your script on line 8”

1. “Type #Sounds on LINE 6

```
1  # description:
2  from earsketch import *
3
4  setTempo(120)
5
6  #Sounds
7
```

1. Type (or copy from Student Workbook) the **fitMedia() functions on LINES 7 and 8**. . fitMedia() is the function that tells the computer to play a sound on a track from a start measure to an end measure**. We recommend that the student copies these lines to save time and prevent errors.**
   a. **fitMedia(RADICAL_NOTHING_DRUM_FILL_3, 1, 1, 5)**
   b. **fitMedia(RADICAL_START_DRUMS_3, 2, 1, 5)**
   c. fitMedia() may automatically populate when entering this code. You can delete the text inside the parentheses or just copy and paste this text.
2. Click the green “Run” button in the upper right corner of the code editor.
3. If your code does not run, you may have an error. You can check the console (space below the code editor) to look for errors. If you have an error, check to make sure that you copied the code correctly. The error message in the console identifies the line of code with the error. An example of an error in the console looks like the image below (in this example, I left a comma out after the sound clip on line 7):



3. If your code ran successfully, you can now view your code in the Digital Audio Workstation (DAW). Your audio clips are shown in colorful rectangles along a timeline in the DAW.
4. To listen to your music, click the Play button (green arrow). You can also use the other buttons at the top right of the DAW to control play of your song such as reset, mute, volume, and loop. Take a few minutes to practice using these buttons

ELABORATE — Adding Soundclips (7 minutes)

Say: " Did you like your beats? Ready to add some more." It is time to let your creativity flow and add a few more beats to your code. The sounds that you coded are from the EarSketch Sound Browser. EarSketch has over 5,000 audio clips, made by artists and producers such as Young Guru, Aaron Drake, Richard Devine, Ciara, Common, Pharrell, Alicia Keys, and Khalid. You can choose from instruments such as drums, vocals, bass, guitar and many more in over 23 genres. **Sounds from the documentary - "A Radical Act" are listed under composer Aaron Drake**. Follow my directions and let's start layering those sounds"

1. Starting with line 9 (or the line below their last fitMedia()) type(or copy from the student workbook)

fitMedia(sound, 3, 1, 9)
fitMedia(sound, 4, 1, 9)
fitMedia (sound, 5, 1,9)

2. Highlight "sound" on line 9 . (Students must highlight the whole word sound!)
3. Open up the content manager. Click on "Sounds" . This opens up the sound browser
4. Use the filter to search for a sound that you like or click on any sound listed in the collection. Use the green play  button to listen to the sound.

5. If you like the sound, click the blue clipboard  and paste the sound clip into your fit Media(). The name of the sound clip will take the place of the word "sound" in your code. Ex. fitMedia(RADICAL_NOTHING_HORNS_2, 3, 1, 9)

(Post this as an example to make sure that students understand that the "name" of the sound clip replaces the word sound in their fitMedia() function. The word sound is just a placeholder)

6. Click and then play to listen to your code.

7. Repeat this on lines 10 and 11.

"You have now coded five tracks of your own song. This is a great start to using EarSketch. We hope you are hooked and ready to start your Radical Remix

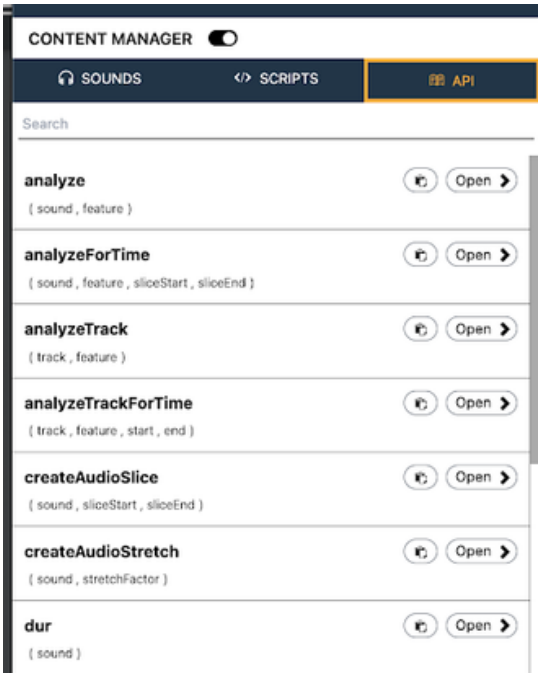
ELABORATE

Curriculum and References
(5 minutes)

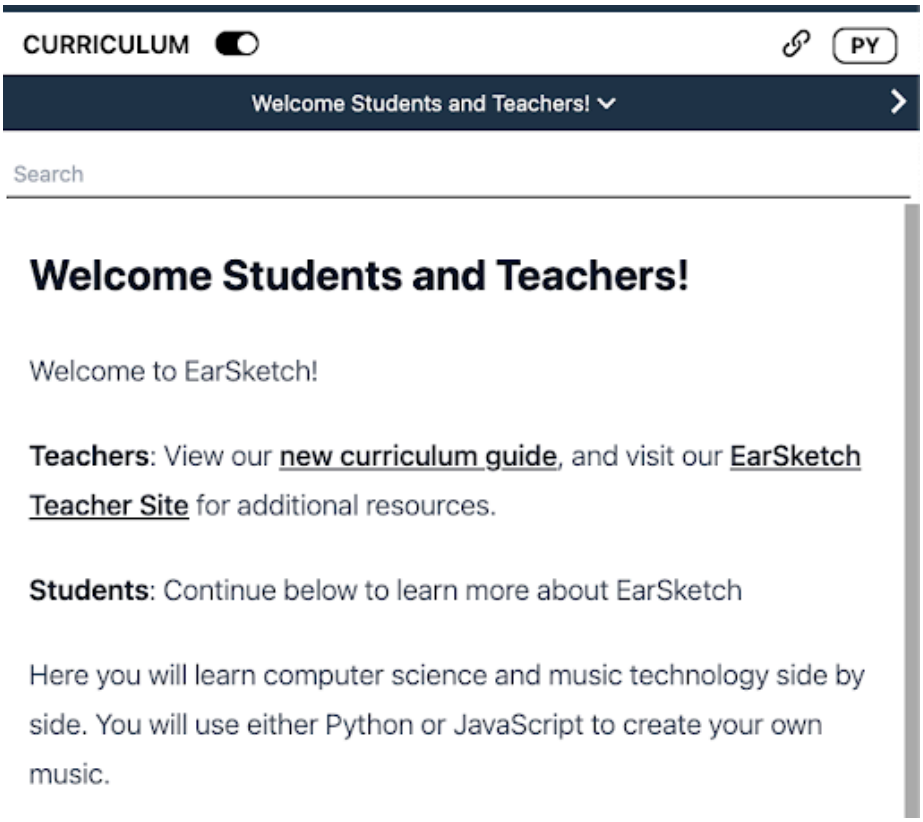
Say: "Before you take off coding, we want to provide you will a few more tools to help you in your journey. You learned that EarSketch is a DAW with extra features. So what are those extra features?

These extra features allow you to place audio clips using code. EarSketch adds extra tools within its programming languages to accomplish the goal of creating music. The code you copied above had one of those tools: fitMedia(), which inserts audio clips into the code. **This collection of tools is called an Application Programming Interface, or API.** Other examples of APIs include the Google Maps API (a set of tools for embedding maps into websites or apps) and the YouTube API (tools for embedding YouTube videos in websites)."

Open up your Content Manager (Toggle the left menu) The open book icon is the API folder. Click to view the EarSketch API and explore EarSketch functions.



In addition to the API folder, if you need any help coding in EarSketch, you can toggle open the right menu to view the curriculum . You can search by topic to watch videos and tutorials on EarSketch content. Toggle the right menu open to view the curriculum.

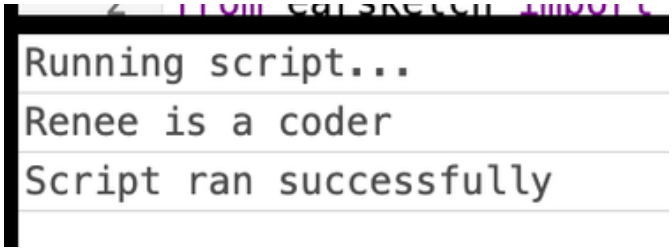


EVALUATE

Print to Console (6 minutes)

“It’s time to show your new role as a coder in your final EarSketch Task to print a command. On line 20 (or the next open line), type print "Your name is a coder". For example, if my name was Renee, I would write on line 20: print "Renee is a coder"

Ex: print("Renee is a coder")
Have the students check their console — their print command should print there.



Teacher Tips: If you have time, you can direct them to this link and have them review Chapter 1 of the curriculum. If you have extra time during this lesson, students can continue to explore the curriculum and try to insert some additional sound clips.

Congratulations, you are a coder and are ready to start your Radical Remix

You learned how to:

- Create an EarSketch Account
- Open a Script
- Find the sections of a script
- Run your code
- Play your music
- Look at the console for errors.
- Use the resources in the API and Curriculum folder