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| **Topic/Duration** | Looping in ES / 2 Class periods / 90 minutes |
| **Priority Standards** | **Georgia Music Technology**:   1. [**MSMTC6.CR.2**](https://case.georgiastandards.org/f3b94c72-9c0d-11e8-b85c-3b1a3079ae6e/437e30dc-fc39-11ea-becb-0242ac150004/1934)**-** Select and develop musical ideas for defined purposes and contexts. a. Select melodic, rhythmic, and harmonic ideas to develop into a larger work using digital tools and resources.   **Foundations of Computer Programming Standards**   1. [**MS-CS-FCP-**3.2](https://case.georgiastandards.org/00fcf0e2-b9c3-11e7-a4ad-47f36833e889/731f5cab-5d1e-46f4-bba0-c26268b93022/565) Develop a working vocabulary of computational thinking including sequences, algorithms, […] and iteration {loops (For)}. 2. **MS-CS-FCP-**4.1 Develop a working vocabulary of programming including[…], loops. 4.8 Create a computer program that implements a loop. |
| **Supporting Standards** | **Foundations of Computer Programming Standards**   1. [**MS-CS-FCP-3**](https://case.georgiastandards.org/00fcf0e2-b9c3-11e7-a4ad-47f36833e889/35695273-4888-4f59-89a5-45ef323b432f/563)Utilize computational thinking to solve problems. |
| **Student Facing Goals** | Students will be able to...   * use for loops to repeat a makeBeat() rhythm. |
| **Essential Question & Enduring Understanding** | **How can repetition be used to provide connection within a piece of music?**  *Repetition can be used to create a unified musical theme throughout the music and add space for variations on musical ideas. Repetition can also be used to create a regular sense of tempo and to solidify the rhythm of a song.*  **Why is repetition / loop structure used in computing?**  *Loops help make your code more readable by reducing the number of lines required to perform many operations, which makes writing code quicker.*  **How does looping allow your code to be more malleable?**  *If, while writing a script, you decide to make a change, looping allows you to only change one line (which will be reflected across your entire piece). If using the copy-paste method, you will have to make that change for each individual line of code, which can be an impossibly hard task depending on the length of your script.* |
| **Evidence of Learning** | **Formative**: Students will utilize for loops to rewrite a repetitive makeBeat() script. |
| **Materials** | EarSketch  Premade for-loop scripts for EarSketch |
| **Vocabulary** | * **Loops (in both a computing and music context):** Doing something repeatedly a certain number of times. * **Repetition:** Musical term used for playing the same melody/harmony multiple times. * **Iteration:** Coding term used for repeating a line (or set of lines) of code multiple times with minor changes each time through the use of loops. * **Rhythm:** Repeated patterns of sounds and silences in music. * **For:** python keyword used for looping over a range of numbers. |

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| **Resources** | |
| * [Unit 2 Lesson 4A PPT](https://gtvault.sharepoint.com/:p:/r/sites/EarSketchCSforAll2021Proposal/_layouts/15/Doc.aspx?action=edit&sourcedoc=%7Bf5631a30-82cb-4e4a-9cd8-50798d8f92a0%7D&wdOrigin=TEAMS-ELECTRON.teamsSdk.openFilePreview&wdExp=TEAMS-CONTROL) * Link 1: Good live example of looping (Embed in PPT Page 4): <https://www.youtube.com/watch?v=fcpPVu6kKiA> * Link 2: Another example: https://www.youtube.com/watch?v=Gl9GtO\_vQxw * Link 3: For-loop demonstration script   <https://earsketch.gatech.edu/earsketch2/?sharing=nC4dUk8ID8PRstmDPW1-uGeb_wyn2SomSzyqiuOlh_U>   * Link 4: Elaborate section template   <https://earsketch.gatech.edu/earsketch2/?sharing=JdoLrveJlcUu_EO4voZ45w>   * Link 5: Elaborate solution <https://earsketch.gatech.edu/earsketch2/?sharing=vbnmde3ZQ4bXyMGE6aL2cw:> * Link 6: Mini-Task template   <https://earsketch.gatech.edu/earsketch2/?sharing=cVwMYbAC8xsj8psUtKUOZw> | EarSketch Curriculum Panel (Links):  Chapter 4.1: <https://earsketch.gatech.edu/earsketch2/?curriculum=/en/v2/loops-and-layers:forloops&language=python> |

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| **Teacher Preparation** |
| 1. Look over the sample code and add in extra comments if needed to help explain the concepts to students. 2. Give the link for the For-loop demonstration to students through whatever form of email/virtual classroom system you use. The solution script can be found in the notes of the PowerPoint as well. |

Lesson Implementation

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| **Engage / Explore: Repeating a Beat in Earsketch Time: 15 *Minutes* Slides: *2-6*** | |
| **Section Goal:** Students will learn about repetition in EarSketch. | |
| **Student Activities**   * Reflect on the first essential question (Slide 2*)*. * Define repetition and rhythm. Explain how both relate to the makeBeat() function. * Go through the first block of sample code and implement the copy/paste method of repetition. | **Teacher Activities**   * Explain the purpose of repetition in music and how it relates to looping in a musical context; relate it to the first EQ in the lesson: How can repetition be used to provide a connection within a piece of music? (Slide 2) * Go through the two music examples given as videos (Link 1, Slide 4: entire video, Link 2, Slide 5: 0:00-0:50) and discuss how looping is used by the musicians in the examples with students. Allow students to express their thoughts on looping/repetition in music – Why do they think repetition is used in music? Can they think of any other songs that use repetition? * Review the first block of sample code and explain why the copy/paste method may become harder to manage as the number of repetitions increases (Slide 7*).* Questions for students to consider: is the copy/paste method of repetition efficient? How easy is it to change repeated sections after coding them? Is there a better way to add repetition to their songs? |
| **Coding Connections: N/A** | |

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| **Explain: Introduce Loops Time: 30 minutes Slides: *6-9*** | |
| **Section Goal:** Students will learn how to utilize for loops in EarSketch. | |
| **Student Activities**   * Understand why loops are a more efficient way of repeating an action in code. * Learn the proper syntax for implementing a for loop in Python (using the var in range(#,#): form) * Go through the second block of the sample code and remake it using their own beat to practice the syntax. | **Teacher Activities**   * Give students the link to the EarSketch script used to explain loops so that they can follow along (Link 3). * Explain how loops can help solve the problem of efficiently repeating coding operations (Slides 8-9). * Teach proper for loop syntax (using the var in range(#,#): form) and explain what and how a looping variable works (Slide 10). |
| **Coding Connections: N/A** | |

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| **Elaborate: Apply your Skills Time: 15 minutes  *Slide: 12*** | |
| **Section Goal:** Students will demonstrate an understanding of for loops by modifying pre-written scripts. | |
| **Student Activities**   * Rewrite a given Earsketch script to use loops anywhere a block of code is repeated. | **Teacher Activities**   * Introduce students to the for loop activity (Link 4). Take the time to answer any questions regarding for loops if necessary. * The activity consists of a pre-written song script in EarSketch - task students with replacing each repetition of code with a simple loop statement (the solution is given as an animated element on Slide 11*).* The solution script can be accessed via Link 5. |
| **Coding Connections: N/A** | |

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| **Evaluate:** Assessment / Wrapping Up  **Time: 30 minutes Slide*:*** | |
| **Section Goal: (Mini-Task)** Students will further demonstrate their understanding of for loops by utilizing them in their own scripts. | |
| **Student Activities**   * Complete the mini-task (Template in links; Link 6) | **Teacher Activities**   * Introduce the first mini-task (Drum Challenge, Slide 12). Discuss the questions in the mini-task handout as a class (Slide 13). * Help students choose a drum beat to recreate and guide them on recreating it in EarSketch. |
| **Coding Connections: N/A** | |