

Supplementing music technology education:  
music software for 10-year-old children  
according to the 2021 Model Music  
Curriculum



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## Abstract

There has been a rising insistence from education institutions and pedagogy experts to incorporate information and communications technologies (ICT) in classes. It takes place across all subject areas and music is no exception. Apart from electronic keyboards, audio recording devices etc., teachers also have music production software at their disposal. Conventionally, it is the curriculum that adheres to available software rather than vice versa, i.e., it shares software resources that fit its criteria instead of developing a specific software according to the curriculum.

I use information from the 2021 Model Music Curriculum in England with music education research, Jean Piaget's development theory and UX design principles for children to build a music education and composition prototype in Max/Msp environment. Contrary to conventional practice, the novel approach shares the burden of class planning and thus alleviates teacher workload whilst helping children understand the principles of music production.

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## Introduction

For my Creative Practice Music Project, I am combining music technology and research from the field of musical education to create interactive music software that allows 10-year-old children to grasp the basic concept of music composition. It aims to provide a theoretical background as well as playfully make some music using the learning interface. I am eager to explore this field as a majority of technology teaching sources target teenage students with a music theory background whilst keeping primary school children on the periphery.

This topic is worth researching because of the gap between classroom music and music in the outside world. On one hand, the experience of 'outside music' has broadened dramatically over the past fifty years. It has been permeated by digital technology, both software and hardware, which leads to modernising both the creation and consumption of music.<sup>1</sup> To set some examples, acoustic instruments are no longer necessary when composing. There are analogue/digital synthesisers, various plug-ins etc., that can replace them in a mix. Similarly, people are not limited to listening to live music but can opt for recorded versions via phones, CDs and music streaming services. On the other hand, educators struggle to keep pace with new technological developments. Broadly, music education tethers to the traditions of western art music, playing a musical instrument and counterpoint. Possible causes include frequent and fast technological advances, busy teachers and a lack of training. Finney et al. point out that technology offers music teachers and the young people they are teaching unprecedented scope for democratic engagement in making music, which makes diversifying music education through technology ideal.<sup>2</sup>

As for my background, I describe myself as a music enthusiast and not an expert in music pedagogy. My musical journey began at four years old when I started piano lessons. At that point, I struggled to find joy in the cycle of having to practise continuously to be able to play a piece perfectly. However, I expanded my knowledge in non-conventional music courses throughout the four years of studying music at the University of Edinburgh. Instead of analysis, composition and music performance, I was fortunate to explore music psychology, non-

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<sup>1</sup> John Finney et al., 'Introduction,' in *Music Education with Digital Technology: Education and Digital Technology*. (London: Bloomsbury Publishing, 2010), 1-6.

<sup>2</sup> Finney et al, 'Introduction,' 1-6.

idiomatic improvisation, community music, music technology and so on. I was profoundly fascinated by these subjects and the novel outlook on music that emphasized its inclusive, accessible and beneficial nature. These values rose exponentially due to the current climate: global pandemic, unstable political situations caused by inflation, wars etc. and therefore, they were the key pillars when considering ideas for my final project.

This commentary has been divided into three chapters: In Chapter One, I introduce the 2021 Model Music Curriculum, the psychology of 10-year-old children and teaching methodologies that shaped the musical and visual content of the prototype. Chapter Two begins by laying out the Triple E Framework along with UX design rules and looks at how they impacted both the interactive elements and the layout of the prototype. Lastly, Chapter Three presents the classroom climate, focusing on teachers, pupils and equipment that can influence the use of the prototype.

## 1. Music education

According to Kathryn Marsh, music education has numerous benefits. It not only aids in pupils' physical, cognitive and emotional development but also increases their engagement with the school environment.<sup>3</sup> It is a diverse and ever-evolving field due to a plethora of teaching methods, subject areas as well as the age group of learners. Upon extensive research, I settled on the music curriculum in England and the developmental psychology of 10-year-old children, which are the focus of this chapter. These aspects shaped the content of the software, which I mention here as well.

### Curriculum

A well-rounded music curriculum requires both breadth and depth of musical experience.<sup>4</sup> The former involves children part-taking in diverse musical activities, such as listening, singing, playing and composing. The latter stems from materials providing a level of challenge that match pupils' cognitive ability. It is worth bearing in mind that content is not static but is periodically updated to accommodate advances. Likewise, it varies depending on the country where children receive their education. My project revolves around the National Curriculum in England.

According to the 'Music programmes of study' published by the Department for Education, a few of the aims of studying music include gaining an understanding of music composition through inter-related dimensions, such as structure, texture, pitch etc., as well as music technology. Upon completing Key stage 2 (a category 10/11-year-old pupils belong to), they should be able to compose music using the aforementioned dimensions.<sup>5</sup> The '2021

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<sup>3</sup> Kathryn Marsh, 'Commentary: Music Learning and Teaching During Childhood: Ages 5–12,' in *The Oxford Handbook of Music Education, Volume 1*. (Oxford: Oxford University Press, 2012), 317-322.

<sup>4</sup> Janet R. Barrett and Kari K. Veblen, 'Meaningful Connections in a Comprehensive Approach to the Music Curriculum,' in *The Oxford Handbook of Music Education, Volume 1*. (Oxford: Oxford University Press, 2012), 361-380.

<sup>5</sup> Department for Education, 'National curriculum in England - Music Programmes of study: key stages 1 and 2,' accessed 15 February 2022, [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/239037/PRIMARY\\_national\\_curriculum\\_-\\_Music.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/239037/PRIMARY_national_curriculum_-_Music.pdf).

Model Music Curriculum' is non-statutory guidance for the national curriculum, which provides practical suggestions to achieve the statutory guidance.<sup>6</sup> Although my area of interest was composition, I drew from other key areas of musicianship to deliver the breath required by the curriculum in the project, i.e., singing, listening, and performing.

To comply with the notion of depth, the prototype aims to be friendly to first-time users as 10/11-year-old pupils are the first age group where composing thorough software is mentioned within the curriculum. The educational part consists of inter-related dimensions of music. Sound files in this section demonstrate the range of music styles the curriculum pushes forward. I used a metronome to explain tempo, both a loop from 'Last resort' by a Vocaloid producer Ayase and the second variation of 'Ah, vous dirais-je, Maman' by Wolfgang Amadeus Mozart as a ternary form for structure. Regarding texture, I used my trap-inspired composition, which consists of accompaniment, melody, drum pattern and sound effects. To explain dynamics, I utilised an outro of 'Tomoni' by a Japanese punk rock group Wanima, in which children can manipulate the loudness range. In terms of timbre, I expose children to various instrument families, such as brass, woodwind and string instruments as well as world instruments, which they might encounter less in a classroom. To conform to the non-statutory guidance, the compositional part consists of Max patches with 16-beat grids in G-major or e-minor. Children can compose melodies that they can subsequently enhance with chordal accompaniment and drum patterns. See Appendix 1.

### Psychology of 10-year-old children

As children are target users of the software, it is essential to provide context on their thought processes. A Swiss psychologist Jean Piaget developed the theory of cognitive development, which suggests that children's ability to acquire knowledge develops with age.<sup>7</sup> He proposed that they pass through four different stages of intellectual development before

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<sup>6</sup> Department for Education, 'Model Music Curriculum: Key Stages 1 to 3,' accessed 17 February 2022, [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/974366/Model\\_Music\\_Curriculum\\_Full.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/974366/Model_Music_Curriculum_Full.pdf).

<sup>7</sup> Michelle Anthony, 'Cognitive Development in 8- to 10-Year-olds,' *Scholastic*, accessed 21 April 2022, <https://www.scholastic.com/parents/family-life/creativity-and-critical-thinking/development-milestones/cognitive-development-8-10-year-olds.html>.

reaching adulthood. 10-year-old children fall under the penultimate phase, i.e., the concrete operational stage.<sup>8</sup>

Chief characteristics include being able to apply logic to concrete events and grasp the notion of conservation, reversibility and decentration. Children succeed in logical thinking if they have real images and materials at their disposal. This is the reason I provided concrete and easy-to-imagine visual aid to depict musical elements in the educational part of the software. In the tempo section, the mascot for the software, the 'Bongo Cat', taps the surface according to the metronome. The cat also appears in the dynamics part. To portray silence, it covers its snout. Covering its mouth with one paw as if whispering symbolises quiet volume. A picture of the cat speaking to another cat follows and represents medium volume. Lastly, holding a microphone depicts loud volume. In terms of structure, a loop sound effect is presented by a letter A in the video whilst the ternary form is represented by letters A and B. I incorporated images of musical instruments in the *Edu2* (timbre) patch as well. Furthermore, as children understand the representational use of symbols, I added a plus sign between each music button in the texture section. Highlighting the keys that belong to the chord on a piano roll in the *Accompaniment* patch is another concrete visual depiction of a musical concept. See Appendices 3, 4 and 6.

The notion of conservation refers to the fact that some properties can stay unchanged even if objects change their appearance. 10/11-year-old children recognise that some processes are capable of negating the outcomes of others. Decentralisation allows them to be aware of other people's feelings and take them into account alongside their points of view. Whilst these qualities were not fully applicable when deciding on the content for my project, they were taken into account when the creating layout and possible scenarios pupils might encounter when interacting with the software.

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<sup>8</sup> William Huitt and J Hummel, 'Piaget's theory of cognitive development' *Educational Psychology Interactive* (2003), accessed 19 April 2022, [https://intranet.newriver.edu/images/stories/library/stennett\\_psychology\\_articles/Piagets%20Theory%20of%20Cognitive%20Development.pdf](https://intranet.newriver.edu/images/stories/library/stennett_psychology_articles/Piagets%20Theory%20of%20Cognitive%20Development.pdf).

## Pedagogy

Pedagogy indicates methods of teaching to achieve goals set in the curriculum. Whilst it mainly encompasses teachers, learners and a classroom setting (which I discuss in the third chapter), this section looks into the ways they determine instructions given by the software.

Regarding the education part, I opted for the exploration method. The prototype has available sound and visual aids that children can manipulate with various commands to grasp the meanings of each element.<sup>9</sup> Teachers can intervene if desired. They might provide explanations before allowing children to explore it on their own or vice versa, i.e., free exploration followed by a discussion to ensure they understand the concepts. The *Drum Pattern* patch was modelled by guided activity, i.e., an exemplar, which students can copy. Rhythmic patterns of numerous genres appear at the top of the *Max* patch, which children can recreate in the grid below. In the *Accompaniment* patch, users choose both rhythm and chord progression. The melody grid in *All* displays the chord notes of the selected chord. This avoids choice paralysis as it shows which notes sound in tune. See Appendices 5, 6 and 8.

The material for the software was collected to match the syllabus taught in year 6. The content needs to be expressed in a way 10/11-year-old children understand. Since abstract and hypothetical thinking is not developed yet at the concrete operational stage, I provided appropriate illustrations and directions. Essentially, I avoided intangible concepts and presented easy-to-visualise content, i.e., relevant images, such as images of various instruments and step-by-step instructions for the compositional part.

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<sup>9</sup> Edwin A. Peel, 'Pedagogy,' *Encyclopædia Britannica*, accessed 25 April 2022, <https://www.britannica.com/science/pedagogy>.

## 2. Technology

Both music composition and computer-assisted instructional software offer easy control and simplified access to music.<sup>10</sup> When building these tools, creators need to ensure they support the learning process.<sup>11</sup> Therefore, the second chapter begins by introducing the Triple E Framework. It then goes on to review similar software to see how they adhere to the framework. Lastly, it ends by discussing the layout and interactive elements of the project. This part draws from user experience (UX) design principles.

### Triple E Framework

To ensure the software provides an optimal level of education, I implemented the Triple E Framework.<sup>12</sup> Developed by Professor Liz Kolb, it helps educators select tools that supplement teaching practice in a classroom setting and achieve positive learning outcomes. According to her, technology must fulfil the following principles:

1. Engage
2. Enhance
3. Extend

Firstly, *engage* refers to students' ability to focus on the task without distractions as well as having the motivation to study. *Enhance* highlights the use of technology to help pupils understand concepts in a more sophisticated manner. Lastly, *extend* emphasizes creating chances for students to learn outside conventional school settings and building a transferable skill set.

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<sup>10</sup> Thomas E. Rudolph, *Technology Strategies for Music Education* Floyd Richmond, ed. Scott Watson (Wyncote: Technology Institute for Music Educators, 2005).

<sup>11</sup> Evangelos Himonides, 'The Misunderstanding of Music-Technology-Education: A Meta Perspective,' in *The Oxford Handbook of Music Education, Volume 2*. (Oxford: Oxford University Press, 2012), 433-457.

<sup>12</sup> Richard Dammers and Marjorie LoPresti, *Practical Music Education Technology*. (Oxford: Oxford University Press, 2020), 6.

## Software review

The next step was to review similar software to investigate whether and to what extent they adhere to the Triple E Framework and identify their advantages and drawbacks.

A music software company Ableton is primarily renowned for the Ableton Live program but also created a website called [learningmusic.ableton.com](https://learningmusic.ableton.com).<sup>13</sup> It consists of numerous chapters, with each focusing on a different musical element, such as beats, notes, chords, etc. Furthermore, it is divided into smaller lessons, making the website engaging for children with limited attention spans. Text explaining music theory concepts and a grid that allows the creation of sound loops make up the core features of the lessons. The grid makes it easier to envision the music structures, which enhances the learning process. It also provides musical examples. That said, the website requires a lot of reading and the gap between the first and subsequent lessons is stark, e.g., explaining the difference between low and high pitches and the notion of whole/half steps in major/minor scales.

*Soundtrap* is another website created by a renowned music company – Spotify.<sup>14</sup> As Figure 1 shows, the interface of this digital audio workstation is easy to follow. Every row represents an individual track with a selected instrument. The horizontal axis suggests the length of the sound. Below the grid, a piano roll appears where users can denote the melody of pitched instruments, guitars, pianos etc., whilst it is replaced with a drum machine for non-pitched instruments. The log-in feature enables accessing the project from various locations, including children's homes. *Soundtrap* offers beginner-friendly options for less experienced/creative users in the form of loops with the same tempo that can be combined. Still, due to the plethora of choices, teachers' instructions are essential to avoid overwhelming first-time users.

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<sup>13</sup> <https://learningmusic.ableton.com/>

<sup>14</sup> <https://www.soundtrap.com/>



Figure 1: Soundtrap website.

Unlike previous software developed by large corporations, the last software is created by Matteo Olivo, a PhD candidate at the University Jean Monnet of Saint-Etienne.<sup>15</sup> He developed musical applications for elementary/middle school children and people with cognitive impairments in Max MSP. In the first patcher, listening exercises help users become familiar with the sounds of instruments. *Synchro* patcher lets them create their song by combining drum and bass guitar loops of the same tempo. Figure 2 depicts *Sequencer*, which uses 16-beat grids for drums, bass and instruments of choice. Each row corresponds to a different pitch. Although there is not a lot of variety in choosing different lengths of notes, it is relatively easy to use. From the layout point of view, the blue-yellow colour combination catches pupils' attention. Moreover, they gain transferable skills, e.g., they learn to interact with various icons, such as sliders, buttons etc.

<sup>15</sup> [https://www.matteoolivo.com/maxapplications\\_en.html](https://www.matteoolivo.com/maxapplications_en.html)

**CREATE THE RHYTHM, THE BASSLINE AND THE MELODIES OF THE INSTRUMENTS, AND RECORD YOUR MUSIC !**

### DRUMS

	1 MEASURE	1 MEASURE	1 MEASURE	1 MEASURE	ON / OFF	VOLUME
KICK (BASS DRUM)					<input type="checkbox"/>	1.0 dB
SNARE DRUM					<input type="checkbox"/>	-4.2 dB
CYMBAL CHARLESTON					<input type="checkbox"/>	-19 dB
CYMBAL RIDE					<input type="checkbox"/>	-25 dB
CYMBAL CRASH					<input type="checkbox"/>	-19 dB
TOM					<input type="checkbox"/>	-16 dB

### BASS

	1 MEASURE	1 MEASURE	1 MEASURE	1 MEASURE	TYPE OF BASS	BASS ON / OFF	VOLUME
SI (Si)					Fretless	<input type="checkbox"/>	-1.0 dB
LA# (LAb)					synchronised	<input type="checkbox"/>	
LA (La)							
SOL# (SOlb)							
SOL (Sol)							
FA# (FA#)							
FA (Fa)							
MI (Mi)							
RE# (RE#)							
RE (Re)							
DO# (DO#)							
DO (Do)							

Figure 2: *Sequencer patch.*

The layout of the project (drawing from UX design principles)

Donald Norman, an originator of User Experience (UX), defined the term as the end user's interaction with the company, its services and its products.<sup>16</sup> The field strives to meet their needs and evoke happiness with a simple, elegant interaction design. These criteria were considered throughout the process of building my project.

<sup>16</sup> Arvid Brane, 'User Experience Design for Children' (Master's Thesis, Umea University, 2016).

Successful UX design looks different for adults and children. The latter group is fond of expressive layouts. To be more specific, they are drawn to bright colour schemes.<sup>17</sup> For my project, I opted for a dark blue, mint and orange colour pallet, see Figure 3. It is inspired by retro computer aesthetics, as is depicted in Figure 4. Apart from being visually pleasing, light orange or mint tabs serve a separating function to ensure a clear layout.

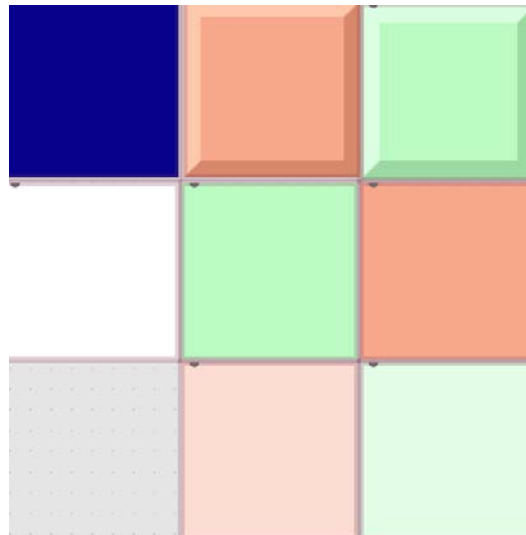


Figure 3: Colour scheme for my project.



Figure 4: Retro computer aesthetics.

Children respond better to large letters and objects. Thus, the smallest font size in the instructions tab was set to 20 points. There are two types of objects in the project. The first group represents settings and the latter presents chief building blocks. Global settings

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<sup>17</sup> Mila Kosa, 'Children-first design: why UX for kids is a responsible matter,' *UX Collective*, 6 June 2018, accessed 25 February 2022, <https://uxdesign.cc/ux-for-kids-responsible-matter-802bd12fe28c>.

(applicable to the whole patch) are next to the header, such as switch on and off, see Figure 5. The tempo was also included there if the patch contained more than one grid to prevent them from becoming out of synchronisation. As Figure 6 shows, local settings that change the volume, timbre etc., are inside the tabs. The chief building blocks of the compositional part are grids. For *Drum Pattern*, it is a sixteen by three grid with each horizontal row representing a different timbre, i.e., kick, snare drum and hi-hat, as shown in Figure 7. Vertical columns account for crochet. Users click on grey boxes, which change colour to orange. When selecting the play button, columns are highlighted one by one according to the set tempo. *Melody* patch works on the same basis. The only difference is having more rows as it represents a pitch. The lower melody contains only G-major scale notes, whereas the upper melody contains all the notes. The *Accompaniment* patch has a different layout. Pupils need to select the desired rhythm, which is depicted with black boxes of different lengths and subsequently chords from the live.tab object. They are based on the order, i.e., the first, second, etc. chord in the chord progression. Initially, I intended to use only one row of boxes to visualise chord progressions. Each box was supposed to account for a different chord and would change its length to match the time of duration, as Figures 8a and 8b show. Unfortunately, the idea was too convoluted to be realised in the MAX/MSP environment.



Figure 5: Global settings.



Figure 6: Local settings.

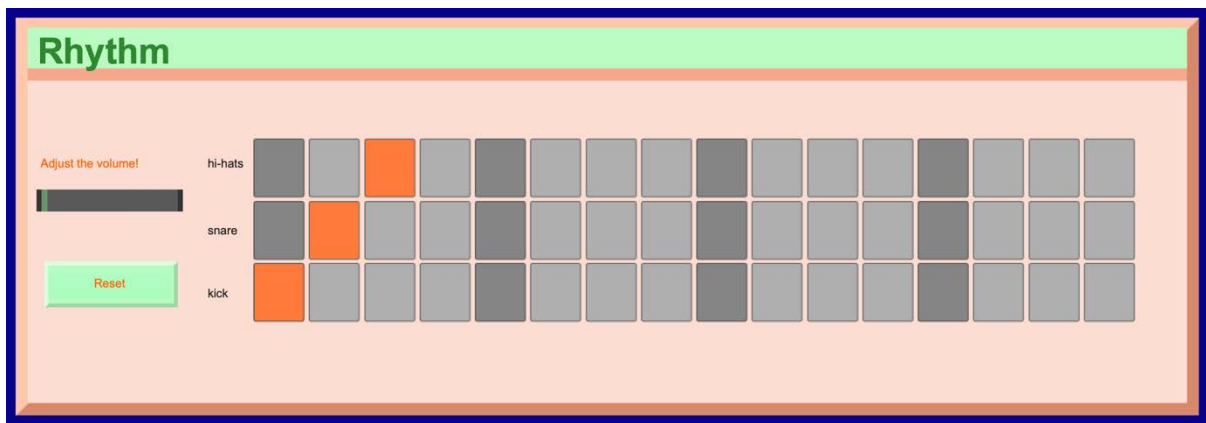
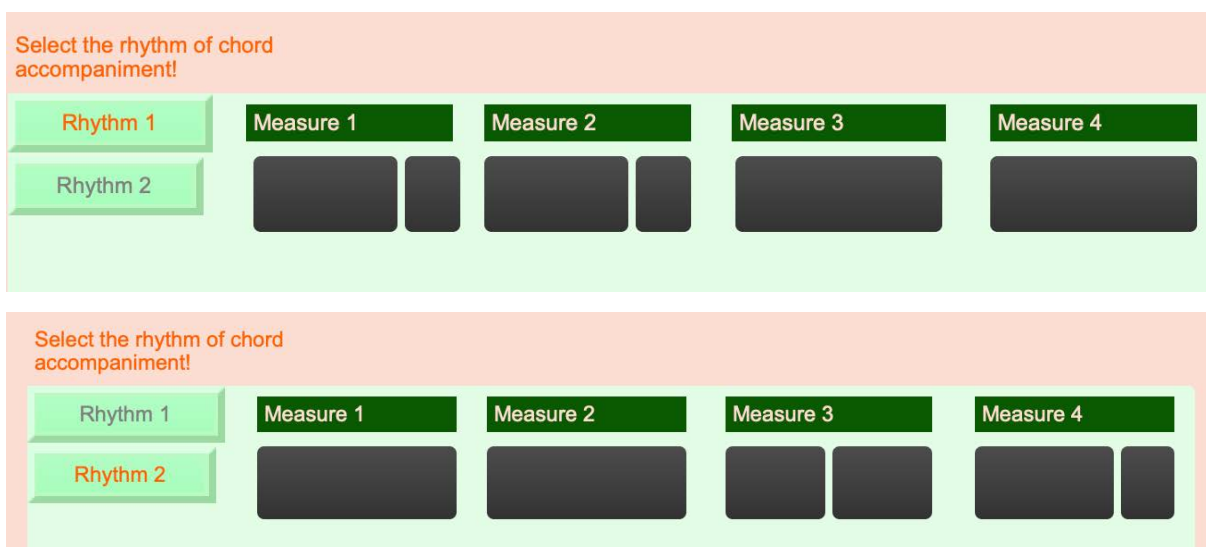


Figure 7: Drum Sequencer.



Figures 8a and 8b: The first draft of *Accompaniment* patch with multiple rhythm buttons and only one row of black boxes representing the length of the notes.

The author also expressed children's preference for intuitive gestures, such as clicking and scrolling, over complicated ones, e.g., double-clicking. Although most of the aforementioned objects in the project are manipulated with a single click, users need to double-click when choosing chords in *All* patch. Text descriptions accompany these icons to spare users of confusion.

UX concentrates on telling stories users can immerse themselves in. Rather than building a narrative, I used a mascot to encapsulate the theme of the project. Bongo cat especially emerges in the *Overview*, *Edu1* and *Edu2* patches to provide explanations in the speech bubble. Overall, it walks users through the software. Additionally, it demonstrates each element and outputs both an action as well as sound as a response to pupils' actions. Contrary to adult users, who find animation and sound effects irritating, these components entice and retain an interest in child users. It does so instantaneously without a long pause time to prevent children from getting bored.

To conclude this chapter, the prototype was built to complement music classes, not replace them. The combination of orange and mint colour with dark blue background draws children's attention, which leads to strengthened engagement with the prototype. Instant sonic responses from users' clicking on the grids (e.g., *All* and *Melody* patches), buttons (e.g., general settings in *All* patch), picture elements (e.g., *Edu1* and *Edu2* patches) and sliding the slider object (e.g., *Edu1* - dynamics) enhance their learning. The project also expands their knowledge of using ICT and popular music production methods.

### 3. Music technology in class

Music technology allows every pupil to develop their musical understanding regardless of their musical experience. The previous two chapters elaborated on the software's features, but this chapter focuses on its integration into class. In other words, it investigates a few of the practicalities of employing technology in a class and how the prototype can be incorporated.

The essay has been organised into three core themes: challenges teachers encounter in classrooms, pupils' experiences shaping the class and the logistics, i.e., equipment and facilities of primary schools. It is worth pointing out that they are intertwined and create a complex learning ecosystem whilst separate entities.

#### Teachers

Teachers' concerns vary depending on their personalities, subject expertise, experience and teaching equipment to which they have access.<sup>18</sup> The policy for English primary schools proposes that generalist teachers bear responsibility for the whole curriculum, including music. As opposed to specialist teachers who are music experts, many generalists report a lack of qualification. Often, this leads to feeling frightened to teach the subject.<sup>19</sup> That said, there are still many advantages of generalists. Due to spending an extensive amount of time with their pupils, they can adjust teaching methods based on their characteristics, family circumstances and cognitive abilities.

Similarly, many teachers lack confidence in using information and communication technologies.<sup>20</sup> Whilst this can be improved by appropriate training, the technology evolves so rapidly that teachers with busy schedules cannot keep up. That said, becoming an expert

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<sup>18</sup> Gary Beauchamp, 'New Technologies and 'New Teaching': A Process of Evolution?' in *Changing Teaching and Learning in the Primary School*, ed. Rosemary Webb. (Buckingham: McGraw-Hill Education, 2006), 81-91.

<sup>19</sup> George M. DeGraffenreid and Neryl Jeanneret, 'Music Education in the Generalist Classroom,' in *The Oxford Handbook of Music Education, Volume 1*. (Oxford: Oxford University Press, 2012), 399-417.

<sup>20</sup> Anice Paterson and Brian Ley, *Ideas in, Music Out: Using Technology in Music Education* (Matlock: National Association of Music Education, 2004).

in a few resources that suit the children suffices. After all, teachers facilitate rather than come up with novel ideas, especially in creative subjects. There are more essential qualities teachers need to possess, such as giving pupils the freedom to approach music, being open-minded, encouraging them to nurture these approaches and asking questions that allow them to reflect on their creative practice.

Teachers can decide how to incorporate the software into their classes. As mentioned in the first chapter, they can either introduce the essence of what to do before letting pupils play around with the prototype on their own or vice versa. Should anything be unclear, I filmed a series of tutorials that show how to use the software. The vocabulary in the videos caters to adults/instructors who can go through them before the class. As an alternative, however, they can also let their pupils watch them in their own time.

## Pupils

Pupils also range in personalities, experiences etc. Many possess music technology expertise, which is, in some cases, better than teachers. It stems from the fact that they are brought up in an environment with technologies at the centre of their recreational and social life, whereas teachers remember times when they did not exist. These children should be encouraged and assist their classmates. Having open access to media also means that they are acquainted with the music, have a refined music taste etc., so they might not feel impressed by simpler sounds. It directly ties into a competition between what students listen to and what they can compose with the software. Even though the prototype can not acknowledge children's preferences and allow them to share their favourite music, it aids in active participation in the music-making process, which results in increased confidence, motivation, and greater appreciation for music as an artform in children.<sup>21</sup> Perhaps it can serve as a primer that simplifies the transition to using more advanced software, such as *Soundtrap* mentioned in the review section in the second chapter.

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<sup>21</sup> Eve Harwood and Kathryn Marsh, 'Children's Ways of Learning Inside and Outside the Classroom,' in *The Oxford Handbook of Music Education, Volume 1*. (Oxford: Oxford University Press, 2012), 321-340.

While a majority of the pupils are technologically literate, we should bear in mind the opposite side of the spectrum as well. Most children own computers, smartphones etc., but if they do not, it should be taken into account as they might experience a challenge with grasping the software. A prolonged time should be dedicated to the educational part as well as the Instructions tab on the left-hand side of the software to tackle the issue.

### Class logistics

Although the use of technology is highly encouraged, it is not possible without the right equipment, which depends on the school's annual budget and longer-term investment in music technology. This was taken into account when building my project as I wanted to make it as accessible as possible to all schools. The only necessary equipment for this software is a computer and possibly headphone sets to block out distractive sounds. If teachers decide to go over the software, an interactive whiteboard or a projector might come in handy. Seeing as it is not necessary to use MIDI keyboards, synthesisers, amplifiers or any other music equipment, the computer lab is an ideal place to use the prototype. In addition, it does not take up a lot of space, which prevents issues teachers report the most while working with technology, i.e., the computer running out of battery, crashing, becoming slow (if it is old) or even internet glitches.

Max/MSP is expensive for schools to buy. However, the software can be turned into a Windows and OSX compatible standalone application to make my project free to use. As a result, schools only need to download the application for the appropriate operating systems instead of purchasing Max/MSP. This approach is 'free as in beer' as everyone can use the product but not modify the code.<sup>22</sup> Alternatively, the 'free as in speech' system entails open sourcing the code with an appropriate license and keeping it on GitHub. This seems to be a better option as it makes the software both free to enjoy and develop, allowing enthusiastic educators and other software developers to take the work forwards.

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<sup>22</sup> Justin Garrison, 'What Does "Free as in Speech" or "Free as in Beer" Really Mean?' *How-to Geek*, 15 November 2014, accessed 4 May 2022, <https://www.howtogeek.com/howto/31717/what-do-the-phrases-free-speech-vs.-free-beer-really-mean/>.

To sum up, parties involved in education impact the software's efficacy and attainment of teaching goals. I outlined possible concerns, including the attitude of both teachers and pupils towards music, technology, available equipment, as well as solutions in the project that alleviate the issues. To elaborate, I accompanied the project with video tutorials to instruct teachers. Features of the software, such as size and downloadability, were also considered to adhere to classroom climate. As Figure 8 shows, I put step-by-step instructions alongside miniature icons that appear in main tabs to aid teachers with explaining how to use the software. Additionally, I used a different colour scheme for the tab, i.e., green and white, to make it stand out to children.

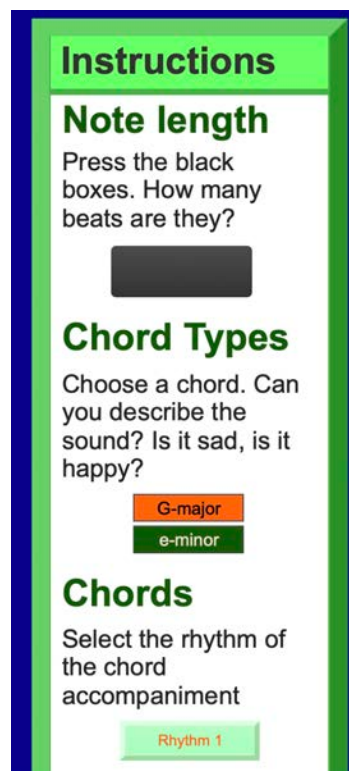


Figure 8: Instruction tab in *Accompaniment* patch.

## Conclusion

In comparison with other music apps, this prototype simplifies the process of music production for 10/11-year-old children by setting a limited number of options from which to choose. As a by-product, it also provides a structure to lessons as instructions are based on the curriculum and thus lifts a weight off generalist teachers' shoulders. The simplicity and clear outline ensure greater versatility as the software can be enjoyed by a wide array of users across different settings, other than music lessons and pupils, including music therapy sessions and community music sessions.

This commentary encapsulated the entire process, commencing with the music content in the first chapter, followed by the prototype development process in the second chapter. The last chapter outlined existing issues in the classroom environment and measures applied in the software that tackled them. By completing this project, I accumulated knowledge from several fields, including music technology, music pedagogy, psychology of children, UX design etc. Moreover, the construction process equipped me with practical skills. I am now aware of the fun but also tedious work that goes into finding appropriate photos, removing background from the pictures and editing videos to make the prototype visually appealing.

A natural progression of the project is more social and entails carrying out qualitative and quantitative market research. The steps involve finding participants to test the software, followed by conducting interviews or letting them fill in a questionnaire and refining the project based on the results. Furthermore, additional research could be concentrated on the business side to transition into commercialising the product. In like manner, the project could expand to developing similar software for each school year, different countries' curricula or even teaching methods. Even though Max is a generic visual-coding tool that offered an opportunity to build and explore this project, it could pivot to other platforms, e.g., creating a designated website etc. Developing the project is an ever-lasting process and I am excited about exploring these possibilities in the future!

## Bibliography

- Anthony, Michelle. 'Cognitive Development in 8- to 10-Year-olds.' *Scholastic*. Accessed 21 April 2022. <https://www.scholastic.com/parents/family-life/creativity-and-critical-thinking/development-milestones/cognitive-development-8-10-year-olds.html>.
- Barrett, Janet R., and Kari K. Veblen. 'Meaningful Connections in a Comprehensive Approach to the Music Curriculum.' In *The Oxford Handbook of Music Education, Volume 1*, 361-380. Oxford: Oxford University Press, 2012.
- Beauchamp, Gary. 'New Technologies and 'New Teaching': A Process of Evolution?' In *Changing Teaching and Learning in the Primary School*. Edited by Rosemary Webb, 81-91. Buckingham: McGraw-Hill Education, 2006.
- Brane, Arvid. 'User Experience Design for Children.' Master's Thesis. Umea University, 2016.
- Dammers, Richard and Marjorie LoPresti. *Practical Music Education Technology*. Oxford: Oxford University Press, 2020.
- DeGraffenreid, George M. and Neryl Jeanneret. 'Music Education in the Generalist Classroom.' In *The Oxford Handbook of Music Education, Volume 1*, 399-417. Oxford: Oxford University Press, 2012.
- Department for Education. 'National curriculum in England - Music Programmes of study: key stages 1 and 2.' Accessed 15 February 2022. [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/239037/PRIMARY\\_national\\_curriculum\\_-\\_Music.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/239037/PRIMARY_national_curriculum_-_Music.pdf).
- Department for Education. 'Non-statutory guidance for the national curriculum in England - Model Music Curriculum: Key Stages 1 to 3.' Accessed 7 November 2021. [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/974366/Model\\_Music\\_Curriculum\\_Full.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/974366/Model_Music_Curriculum_Full.pdf).
- Garrison, Justin. 'What Does "Free as in Speech" or "Free as in Beer" Really Mean?' *How-to Geek*, 15 November 2014. Accessed 4 May 2022. <https://www.howtogeek.com/howto/31717/what-do-the-phrases-free-speech-vs.-free-beer-really-mean/>.
- Harwood, Eve and Kathryn Marsh. 'Children's Ways of Learning Inside and Outside the Classroom.' In *The Oxford Handbook of Music Education, Volume 1*, 321-340. Oxford: Oxford University Press, 2012.
- Himonides, Evangelos. 'The Misunderstanding of Music-Technology-Education: A Meta Perspective.' In *The Oxford Handbook of Music Education, Volume 2*, 433-457. Oxford: Oxford University Press, 2012.

- Huitt, William and J Hummel. 'Piaget's theory of cognitive development.' *Educational Psychology Interactive* (2003). Accessed 19 April 2022. [https://intranet.newriver.edu/images/stories/library/stennett\\_psychology\\_articles/Piagets%20Theory%20of%20Cognitive%20Development.pdf](https://intranet.newriver.edu/images/stories/library/stennett_psychology_articles/Piagets%20Theory%20of%20Cognitive%20Development.pdf).
- Kosa, Mila. 'Children-first design: why UX for kids is a responsible matter.' *UX Collective*, 6 June 2018. Accessed 25 February 2022. <https://uxdesign.cc/ux-for-kids-responsible-matter-802bd12fe28c>.
- Marsh, Kathryn. 'Commentary: Music Learning and Teaching During Childhood: Ages 5–12.' In *The Oxford Handbook of Music Education, Volume 1*, 317-322. Oxford: Oxford University Press, 2012.
- Paterson, Anice and Brian Ley. *Ideas in, Music Out : Using Technology in Music Education*. Matlock: National Association of Music Education, 2004.
- Peel, Edwin A. 'Pedagogy.' *Encyclopedia Britannica*. Accessed 25 April 2022. <https://www.britannica.com/science/pedagogy>.
- Rudolph, Thomas E. *Technology Strategies for Music Education Floyd Richmond*. Edited by Scott Watson. Wyncote: Technology Institute for Music Educators, 2005.

#### Sound files

- Ayase. 'ラストリゾート.' *YouTube* video, 3:08. Posted by 'Ayase - Topic' on 22 November 2019. Used without permission. <https://www.youtube.com/watch?v=pbvghdehgkk>.
- Mozart, Wolfgang Amadeus. '12 Variations of Twinkle Twinkle Little Star (Ah, vous dirai-je, Maman).' *YouTube* video, 13:20. Posted by 'Mike Che' on 2 April 2020. Used without permission. <https://www.youtube.com/watch?v=mlq3wkUmXjw>.
- Wanima. 'WANIMA – とともに (OFFICIAL VIDEO).' *YouTube* video, 3:45. Posted by 'pizzaofdeathofficial' on 29 July 2016. Used without permission. <https://www.youtube.com/watch?v=qag4ewos4TE>.

#### Images

- Accessed 5 March 2022. Used without permission. <https://www.bandsupplies.co.uk/collections/bells/products/double-agogo-bells>.
- Accessed 5 March 2022. Used without permission. <https://www.classicfm.com/discover-music/instruments/explained-beginners-guide/clarinet/>.
- Accessed 13 March 2022. Used without permission. [https://www.clipartkey.com/view/wxTwh\\_beths-music-notes-half-note-transparent-background/](https://www.clipartkey.com/view/wxTwh_beths-music-notes-half-note-transparent-background/).

Accessed 13 March 2022. Used without permission.

[https://commons.wikimedia.org/wiki/File:Dotted\\_half\\_note\\_with\\_upwards\\_stem.svg](https://commons.wikimedia.org/wiki/File:Dotted_half_note_with_upwards_stem.svg).

Accessed 5 March 2022. Used without permission.

<https://www.ensiklomusika.com/post/what-are-wind-instruments>.

Accessed 5 March 2022. Used without permission. <https://www.gear4music.sk/sk/Drevene-a-plechove-dychove-slaikove/Sitar-by-Gear4music/19QX>.

Accessed 5 March 2022. Used without permission.

<https://hcpss.instructure.com/courses/116665/pages/the-string-family>.

Accessed 13 March 2022. Used without permission.

<https://hellomusictheory.com/learn/types-of-musical-notes/>.

Accessed 10 March 2022. Used without permission. <http://justfunfacts.com/interesting-facts-about-the-xylophone/>.

Accessed 6 March 2022. Used without permission.

<https://www.lokshop.ga/ProductDetail.aspx?iid=144805074&pr=59.88>.

Accessed 6 March 2022. Used without permission.

<https://www.lokshop.ga/ProductDetail.aspx?iid=122518083&pr=59.88>.

Accessed 5 March 2022. Used without permission. <https://www.musik-produktiv.com/gb/pearl-export-20-high-voltage-blue-complete-drumset.html>.

Accessed 13 April 2022. Used without permission. [https://mystickermania.com/sticker-packs/memes/bongo-cat?utm\\_source=pinterest&utm\\_medium=sticker&utm\\_campaign=pinterest](https://mystickermania.com/sticker-packs/memes/bongo-cat?utm_source=pinterest&utm_medium=sticker&utm_campaign=pinterest).

Accessed 2 March 2022. Used without permission. [https://open3dmodel.com/3d-models/3d-model-japanese-taiko-drum\\_44127.html](https://open3dmodel.com/3d-models/3d-model-japanese-taiko-drum_44127.html).

Accessed 13 April 2022. Used without permission.

<https://www.redbubble.com/i/sticker/Microphone-Bongo-Cat-Meme-by-breadinator3000/35167778.EJUG5#&gid=1&pid=3>.

Accessed 2 March 2022. Used without permission. <https://rghardiestore.com/RGH00-Hardie-bagpipes>.

Accessed 13 March 2022. Used without permission.

<https://www.twinkl.sk/illustration/crotchet-music-note-ks3>.

Accessed 4 March 2022. Used without permission. <https://virtualpiano.net/virtual-organ-online/>.

### Video sources

Accessed 13 April 2022. Used without permission.  
<https://gfycat.com/dishonestfaithfulfinwhale>.

### Software for the project

Accessed 15 December 2021. <https://learningmusic.ableton.com/>.

Accessed 15 December 2021. [https://www.matteoolivo.com/maxapplications\\_en.html](https://www.matteoolivo.com/maxapplications_en.html).

Accessed 15 December 2021. <https://www.soundtrap.com/>.

Canva

iMovie

LogicProX

Max

Preview

## Appendices

## Appendix 1 – Planning the content for the project

Music Programmes of study	Max patch name	Musical content	Visual content
	Overview		<ul style="list-style-type: none"> <li>Introducing the 'Bongo cat'</li> </ul>
<p>Inter-related dimensions of music, e.g., tempo, texture, dynamics, structure etc.</p> <p>Diverse music examples, e.g., music traditions, pop music genres etc.</p>	Edu1	<p>Tempo</p> <ul style="list-style-type: none"> <li>metronome</li> </ul>	<ul style="list-style-type: none"> <li>the 'Bongo cat' tapping the table</li> </ul>
		<p>Texture</p> <ul style="list-style-type: none"> <li>trap-inspired composition</li> <li>drums, accompaniment, melody, sound effects 1 and 2</li> </ul>	
		<p>Dynamics</p> <ul style="list-style-type: none"> <li>Wanima 'Tomoni'</li> <li>Silent</li> <li>Quiet</li> <li>Medium</li> <li>Loud volume</li> </ul>	<p>the 'Bongo cat'</p> <ul style="list-style-type: none"> <li>Covering its snout</li> <li>Whispering</li> <li>Talking</li> <li>Using a microphone</li> </ul>
	<p>Structure</p> <ul style="list-style-type: none"> <li>Loop =Ayase 'Last Resort'</li> <li>Ternary form =W. A. Mozart 'Ah, vous dirais-je, Maman'</li> </ul>	<p>Videos</p> <ul style="list-style-type: none"> <li>Letters A</li> <li>letters A + B</li> </ul>	
	Edu2	<p>Timbre</p> <ul style="list-style-type: none"> <li>orchestral + world instruments</li> </ul>	<ul style="list-style-type: none"> <li>Pictures of instruments</li> </ul>
<p>16-beat melodic phrases</p> <p>Compose melodies in G-major</p> <p>Chordal and rhythmic accompaniment</p>	Drum Pattern	<ul style="list-style-type: none"> <li>16x3 grid</li> <li>Hi-hats, snare, kick drum</li> <li>Disco, hip-hop, rock, jazz, pop drum patterns</li> </ul>	
	Accompaniment	<ul style="list-style-type: none"> <li>Chords</li> <li>Rhythm</li> <li>G-major</li> </ul>	<ul style="list-style-type: none"> <li>Piano keys</li> <li>Musical notes types</li> </ul>
	Melody	<ul style="list-style-type: none"> <li>upper melody =all notes =16x13 grid</li> <li>lower melody =chord notes =16x8 grid</li> </ul>	

		<ul style="list-style-type: none"><li>• G-major</li></ul>	
	All	<ul style="list-style-type: none"><li>• drum pattern grid, accompaniment and upper melody grid combined</li></ul>	

Appendix 2 – Overview patch

The interface is set against a light green background with a dark blue border. On the left, a vertical orange bar contains the text "Let's learn music!". A white cat character with pink paw pads is positioned in the center. To its left, a speech bubble asks "What are some elements of music?". Below this are five green buttons labeled "Timbre", "Texture", "Structure", "Dynamics", and "Tempo". To the right of the cat, another speech bubble says "We are going to compose:". Below it are three green buttons labeled "Drum Pattern", "Accompaniment", and "Melody". An orange arrow labeled "Press mel" points to the "Drum Pattern" button.

**Instructions**

Press every button that looks like this!



Appendix 3 – Edu1 patch

### Education part 1 - Tempo, Texture, Structure and Dynamics

#### Instructions

Press this button to start!

Change the number value!

40

Press every button that looks like this!

Text

Move the slider!


Press every picture!

#### Tempo

40

Change the number value!

It is Beats Per Minute (BPM)



#### Texture



Press mel

Drums + Accompaniment + Melody + Sound Effect 1 + Sound Effect 2

#### Structure

Loop





Ternary Form

#### Dynamics

Press mel

Move the slider!







-17 dB

Education part 2 - Timbre

**Instructions**

Press every picture!



Look at the speech bubble. What is the name of the instrument?

**TUBA**

**Other Instruments**



**Brass Instruments**



Press me!

What is the name of the instrument?

**SITAR**

**Drums**



**String Instruments**



**Woodwind Instruments**



**World Instruments**



Appendix 5 – Drum Pattern patch

Composition part 1- Drum Pattern

Instructions

Example

Press the drum loop you want to recreate!



The upper grid shows the drum pattern!



Try it out!

Copy the pattern on the grid below!



Change the tempo!



Change the volume!



Press this button to move to beat 1!



Press this button to listen to the drum loop!

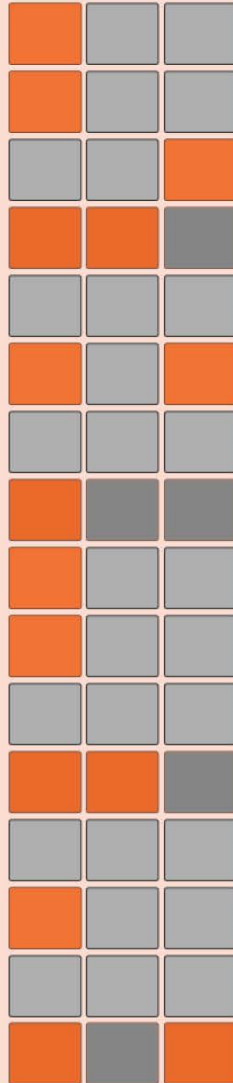


Example

Choose a drum pattern!



Observe the pattern!



hi-hats  
snare  
kick

Try it out!

Adjust the tempo!



Adjust the volume!



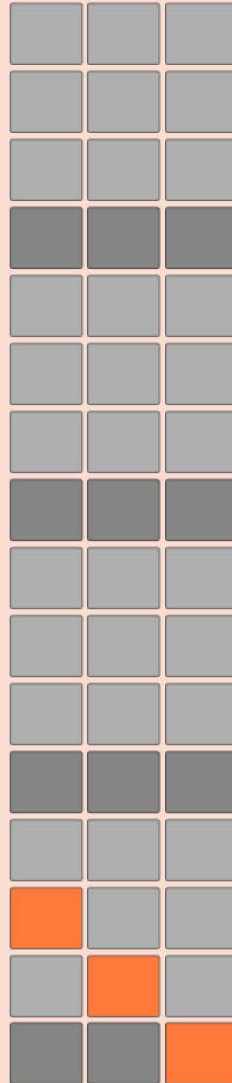
Start from the beginning!



Reset



Copy the drum pattern below!



hi-hats  
snare  
kick

Appendix 6 – Accompaniment patch

Composition part 2 - Accompaniment

Instructions

Note length

Press the black boxes. How many beats are they?



Chord Types

Choose a chord. Can you describe the sound? Is it sad, is it happy?



Chords

Select the rhythm of the chord accompaniment



Select the chords!



Change the tempo!



Select the timbre for the accompaniment!



Change the volume!



Press on this button to move to beat 1!



Press this button to hear the chord accompaniment!



Note length

Chord Types

Chords

Chord Types



