Coding in the Music Classroom

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Why Coding?

"Digital proficiency will be a foundation skill, as important as reading and numeracy.
It will increasingly be the determinant of employment prospects and opportunity."

http://www.alp.org.au/futuresmartschools

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Why Coding?

"The only barriers to our success is imagination… You have to dream, and what you have with your coding skills are the languages in which to dream.
…The job you have in 10 or 20 years' time may not even exist today.
… I encourage everyone to get involved, not only to embrace technology, but to be curious and inquisitive about how you can leverage technology to change and shape the world.

Malcolm Turnbull

http://www.abc.net.au/news/2015-05-15/hundreds-of-students-learn-coding/6473344

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Is it relevant to Music Education?

How does this government push impact Music Education?

Should it impact us?

Is it an authentic music education?

Is it *'real music'*?

Should we be advocating STEAM as opposed to STEM?

How do we prepare the next generation for our music industry?

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Andrew Sorensen Keynote: "The Concert Programmer" - OSCON 2014 https://www.youtube.com/watch?v=yY1FSsUV-8c

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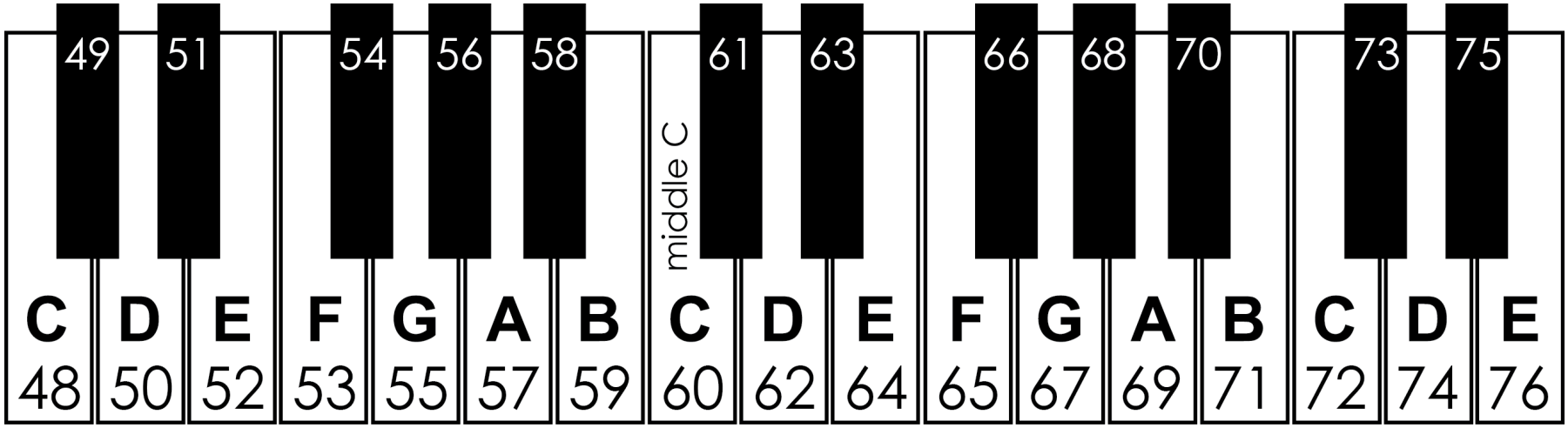
The Midi Note Chart



Numbers represent sequential placement on the keyboard.
i.e. middle C is the 60th note on the keyboard.

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```
(define left-hand
  (λ (beat ps ds)
    (play sampler (car ps) 80 (car ds))
    (callback (*metro* (+ beat (* .5 (car ds)))) 'left-hand (+ beat (car ds))
              (rotate ps -1)
              (rotate ds -1))))

(left-hand (*metro* 'get-beat 4) (list 55 55 57 59) (list 1))
```

```
* newb          Extempore 7098                    02:04 1.00    8 : 31   All
```

```
* *extempore*   Shell:run                         02:04 1.00  19625 :  0  Bottom
#f
```

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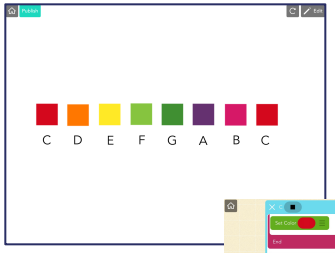
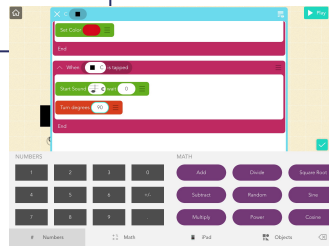
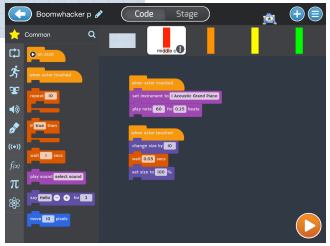
Overwhelmed?

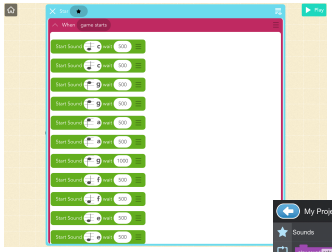
Lets take it back a step or two using coding programs that are less intimidating, more manageable, with almost instant success, feedback & gratification for you and me.

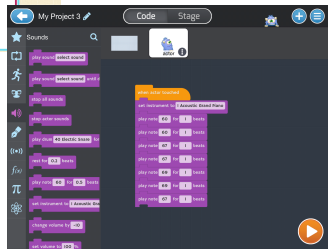
With all programs I have:
Coded simple music rhythms and songs
Coded a simple app to play as a musical instrument











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The Arts - Music

Learning Intention

We will…

1. Code a music instrument, melodic or percussion, which when tapped, changes its look in some shape or form and includes more than one sound/tone/note.
2. Arrange a 3 or 4 part composition of a simple song, writing specifically for the music apps created by members of your group.

Success Criteria: **I can…**	Australian Curriculum
Recognise the correct coding blocks needed for different notes and/or percussion sounds.	Year 3/4 Develop aural skills by exploring, imitating and recognising elements of music including dynamics, pitch and rhythm patterns (ACAMUM084) Year 5/6 Explore dynamics and expression, using aural skills to identify and perform rhythm and pitch patterns (ACAMUM088)
Code correctly for my instrument to play rhythm and/or melodic patterns.	Year 3/4 Develop aural skills by exploring, imitating and recognising elements of music including dynamics, pitch and rhythm patterns (ACAMUM084) Year 5/6 Explore dynamics and expression, using aural skills to identify and perform rhythm and pitch patterns (ACAMUM088) Year 7/8 Develop musical ideas, such as mood, by improvising, combining and manipulating the elements of music (ACAMUM093)
Play a song on my musical instrument app.	Year 3/4 Practise singing, playing instruments and improvising music, using elements of music including rhythm, pitch, dynamics and form in a range of pieces, including in music from the local community (ACAMUM085) Year 5/6 Develop technical and expressive skills in singing and playing instruments with understanding of rhythm, pitch and form in a range of pieces, including in music from the community (ACAMUM089) Year 7/8 Perform and present a range of music, using techniques and expression appropriate to style (ACAMUM096)
Write and arrange a composition for my group to play using more than one app.	Year 3/4 Create, perform and record compositions by selecting and organising sounds, silence, tempo and volume (ACAMUM086) Year 5/6 Rehearse and perform music including music they have composed by improvising, sourcing and arranging ideas and making decisions to engage an audience (ACAMUM090) Year 7/8 Develop musical ideas, such as mood, by improvising, combining and manipulating the elements of music (ACAMUM093)

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Mathematics – Coding Music

Learning Intention

Code a known song calculating the difference between different note lengths and identifying patterns to be repeated.

Code a music instrument, melodic or percussion, plays has the ability to play a rhythm pattern using more than one sound/tone/note.

Success Criteria: **I can…**	Australian Curriculum
Investigate how coding blocks can be used to play difference note lengths and create repeated patterns	Pattern and Algebra Year 5 Describe, continue and create patterns with fractions, decimals and whole numbers resulting from addition and subtraction (ACMNA107) Year 6 Continue and create sequences involving whole numbers, fractions and decimals. Describe the rule used to create the sequence (ACMNA133)

The Arts – Music Composing

Learning Intention

We will…

Code a known song calculating the difference between different note lengths and identifying patterns to be repeated.

Success Criteria: **I can…**	Australian Curriculum
Recognise the correct coding blocks needed for different notes and/or percussion sounds. **Notate** a song/composition of a nursery rhyme.	Year 3/4 Create, perform and record compositions by selecting and organising sounds, silence, tempo and volume (ACAMUM086) Year 5/6 Rehearse and perform music including music they have composed by improvising, sourcing and arranging ideas and making decisions to engage an audience (ACAMUM090) Year 7/8 Structure compositions by combining and manipulating the elements of music using notation (ACAMUM095)

Digital Technologies

Learning Intention

Code a music instrument, melodic or percussion, which when tapped, changes its look in some shape or form and includes more than one sound/tone/note.

Success Criteria: **I can…**	Australian Curriculum
Follow step by step instructions to code a musical instrument app.	Year 3/4 Define simple problems, and describe and follow a sequence of steps and decisions (algorithms) needed to solve them (ACTDIP010) Year 5/6 Design a user interface for a digital system (ACTDIP018) Year 7/8 Design the user experience of a digital system, generating, evaluating and communicating alternative designs (ACTDIP028)
Identify mistakes and fix them.	Year 3/4 Define simple problems, and describe and follow a sequence of steps and decisions (algorithms) needed to solve them (ACTDIP010) Year 5/6 Implement digital solutions as simple visual programs involving branching, iteration (repetition), and user input (ACTDIP020) Year 7/8 Implement and modify programs with user interfaces involving branching, iteration and functions in a general-purpose programming language (ACTDIP030)
Design my own musical instrument app.	Year 3/4 Implement simple digital solutions as visual programs with algorithms involving branching (decisions) and user input (ACTDIP011) Year 5/6 Design a user interface for a digital system (ACTDIP018) Year 7/8 Design the user experience of a digital system, generating, evaluating and communicating alternative designs (ACTDIP028)
Code different actions/functions.	Year 3/4 Implement simple digital solutions as visual programs with algorithms involving branching (decisions) and user input (ACTDIP011) Year 5/6 Design, modify and follow simple algorithms involving sequences of steps, branching, and iteration (repetition) (ACTDIP019) Year 7/8 Design algorithms represented diagrammatically and in English, and trace algorithms to predict output for a given input and to identify errors (ACTDIP029)
Change my coding when needed.	Year 3/4 implement simple digital solutions as visual programs with algorithms involving branching (decisions) and user input (ACTDIP011) Year 5/6 Design, modify and follow simple algorithms involving sequences of steps, branching, and iteration (repetition) (ACTDIP019) Year 7/8 Design algorithms represented diagrammatically and in English, and trace algorithms to predict output for a given input and to identify errors (ACTDIP029)
Describe how my app meets the needs of my audience.	Year 3/4 Explain how student solutions and existing information systems meet common personal, school or community needs (ACTDIP012) Year 5/6 Explain how student solutions and existing information systems are sustainable and meet current and future local community needs (ACTDIP021) Year 7/8 Evaluate how student solutions and existing information systems meet needs, are innovative, and take account of future risks and sustainability (ACTDIP031)

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Easy Coding Apps & Software

Hopscotch - simple iPad app with limited features
based out of NYC
www.gethopscotch.com

Tynker - online computer web-based & iPad app version
based out of California, USA
www.tynker.com

Scratch - computer based software program.
available online and as 'Offline Editor'
based at the MIT media lab, MA, USA

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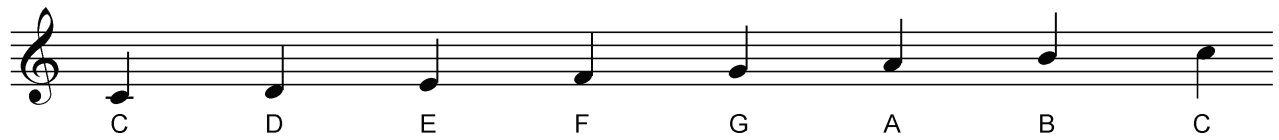

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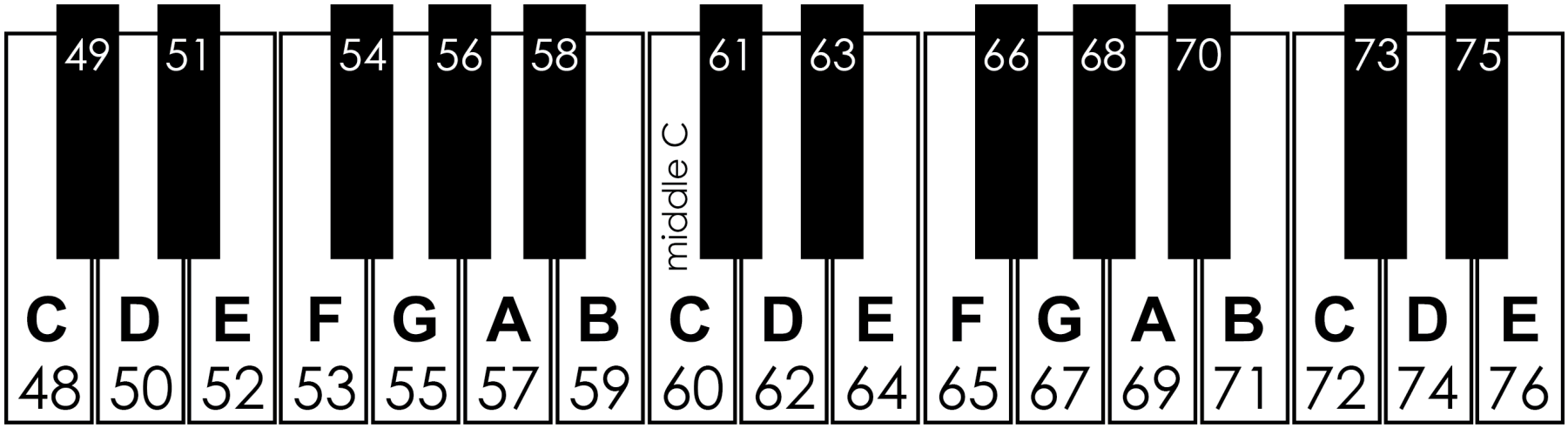

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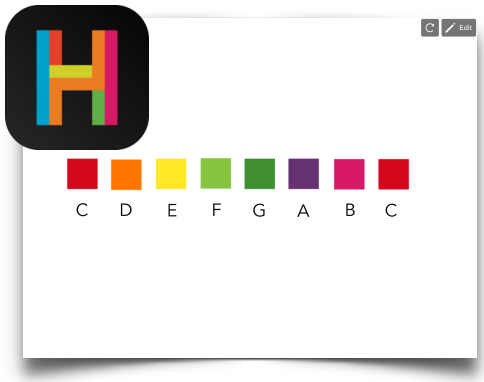
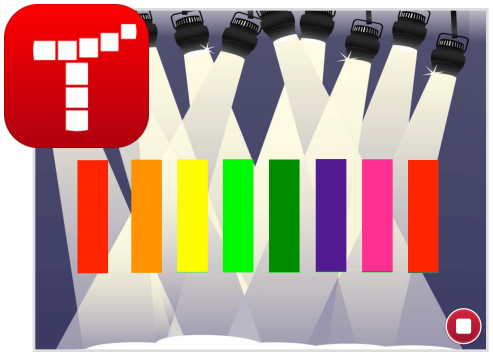


Twinkle, Twinkle Little Star



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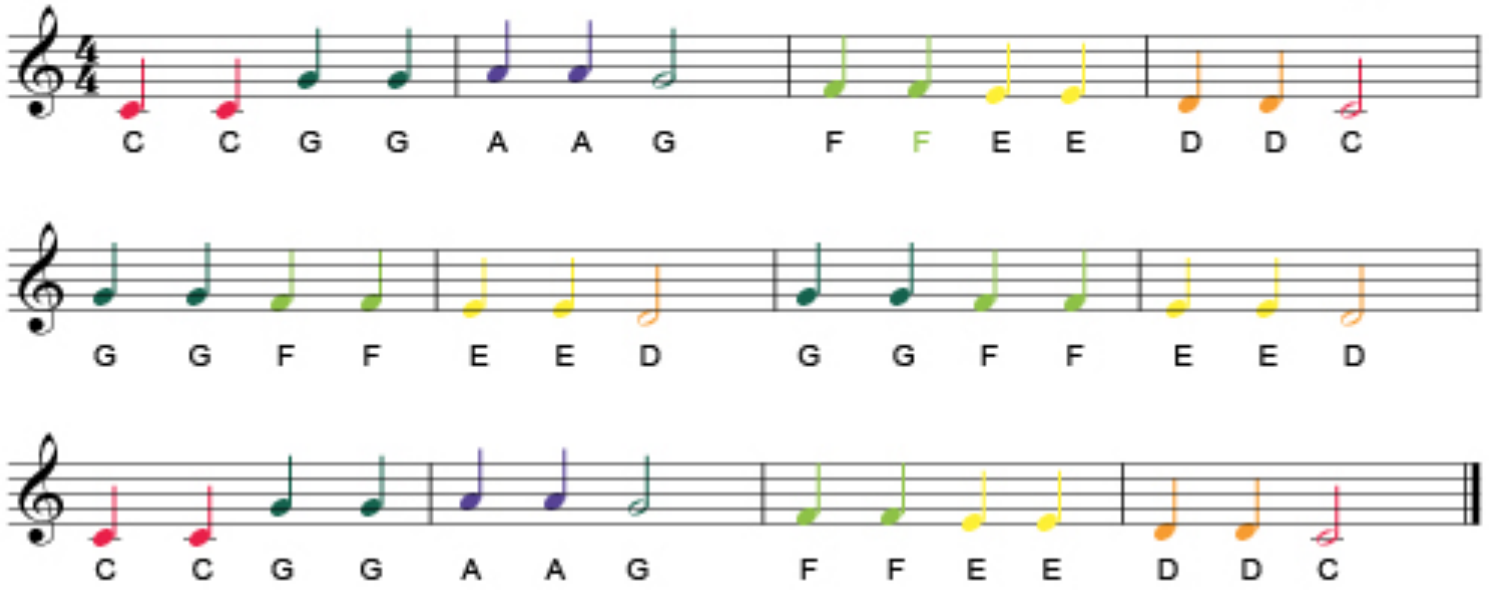

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Students coded their own Boomwhacker coloured piano. Then coded their own percussion app.

In groups students then arranged their own version of a simple song, incorporating all the instruments in their group.

See my blog post and publication

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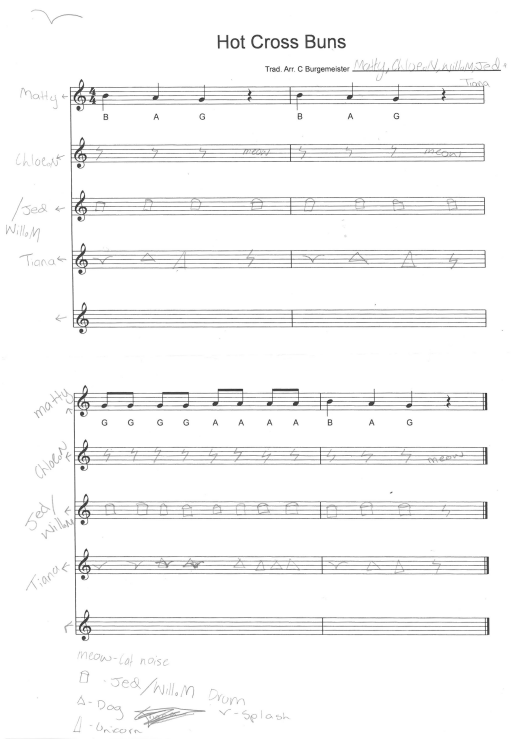
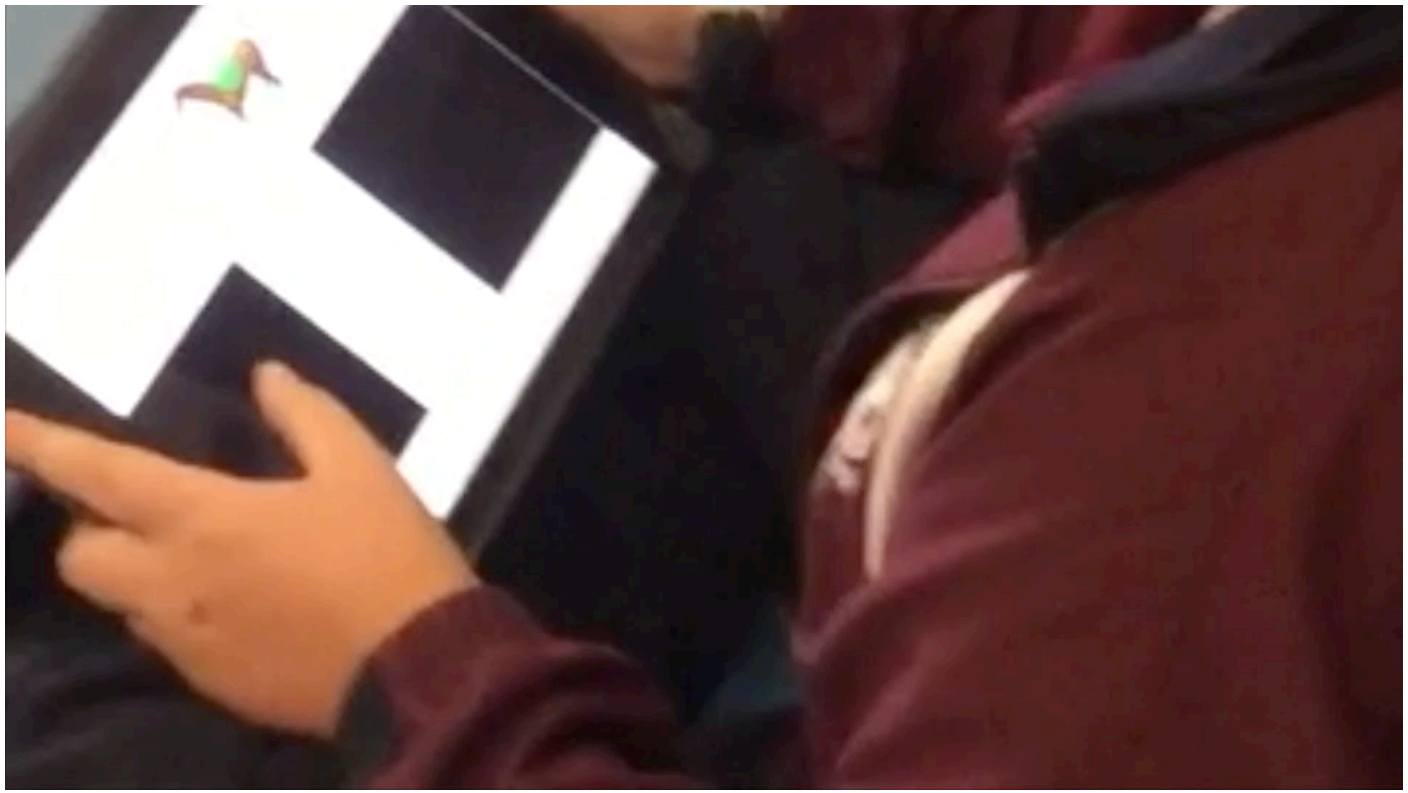
Hopscotch Student Examples





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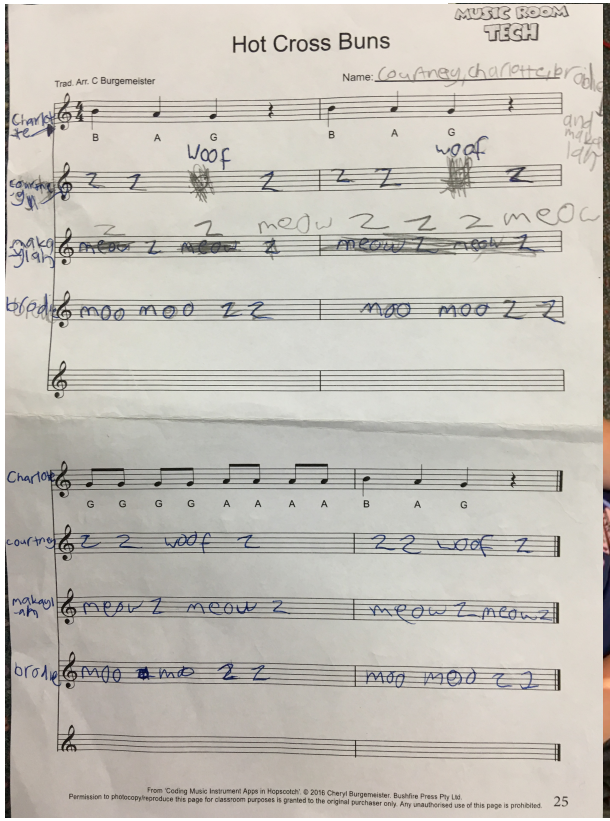
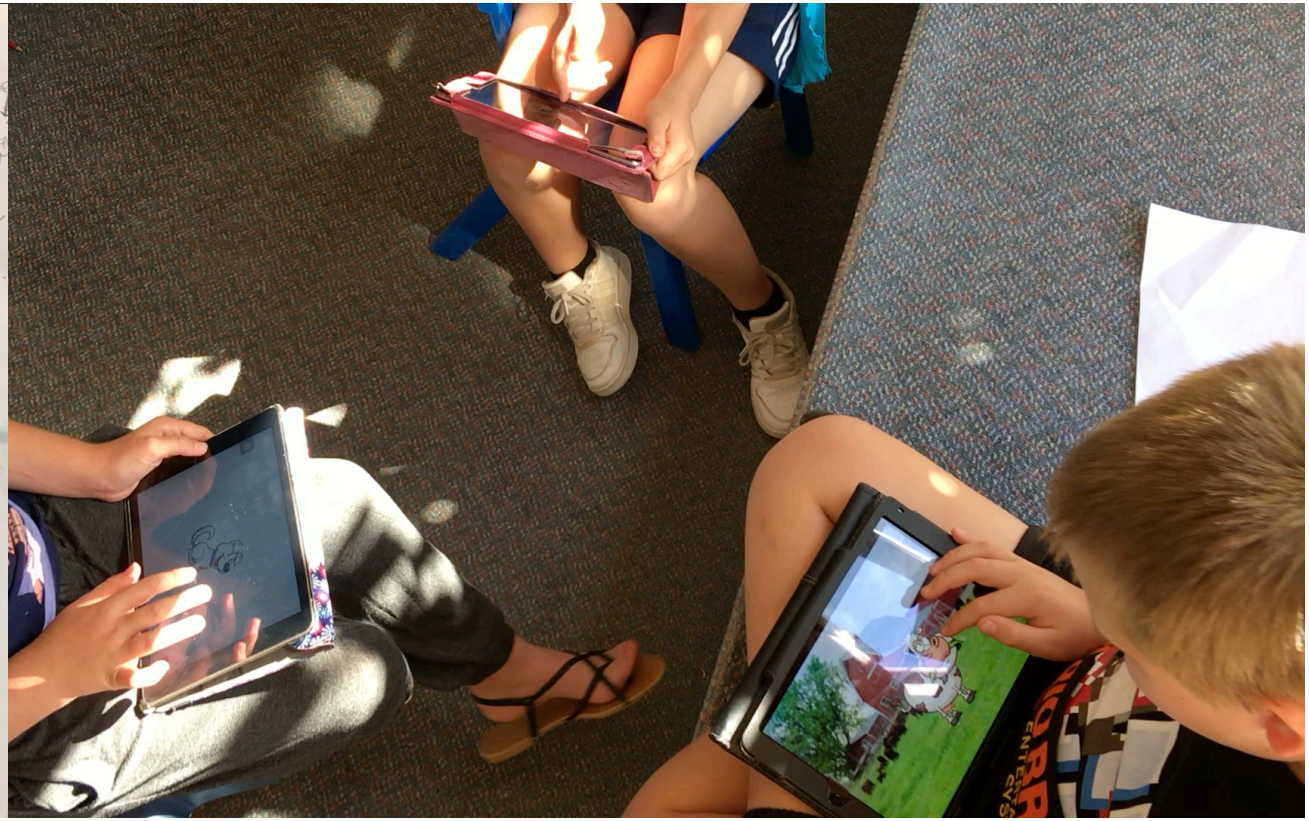
Tynker Student Examples: Arranging





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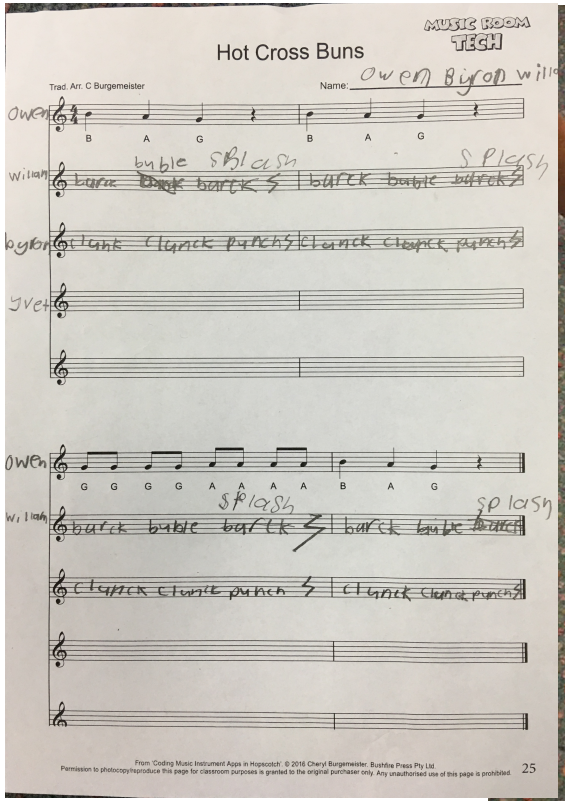
Tynker Student Examples: Finished product/performance



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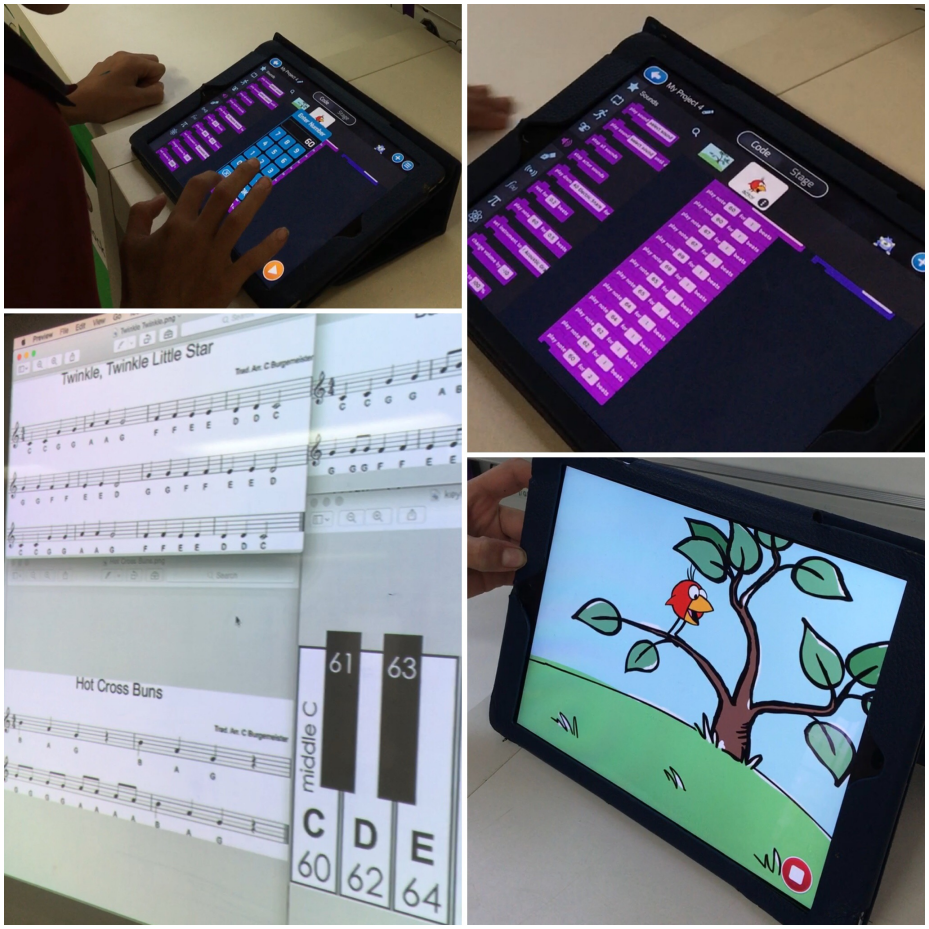
Composition

Students composed by placing sound blocks in a sequence,changing the values to change notes and duration.

See my blog post and publication



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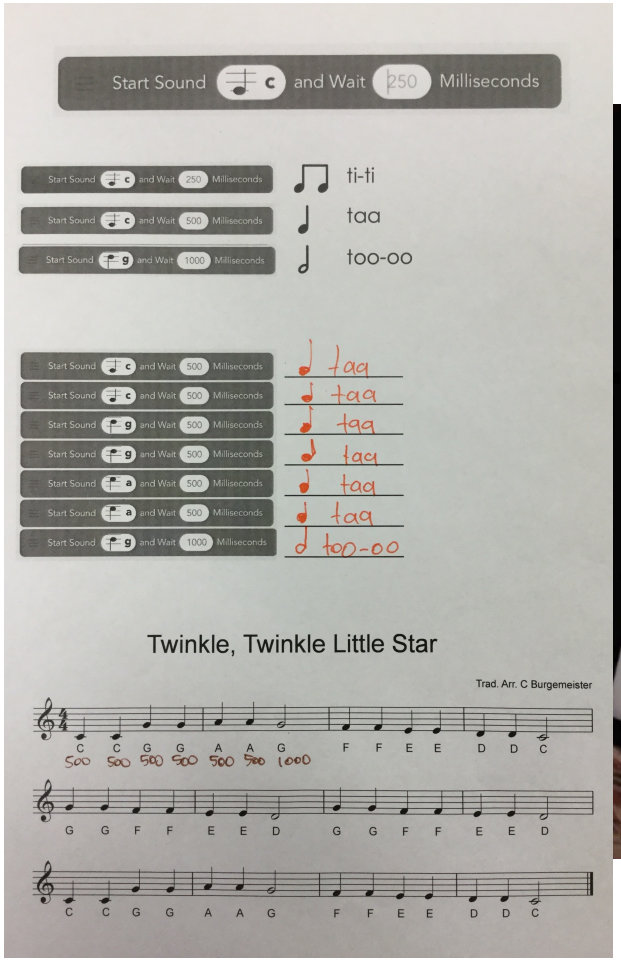
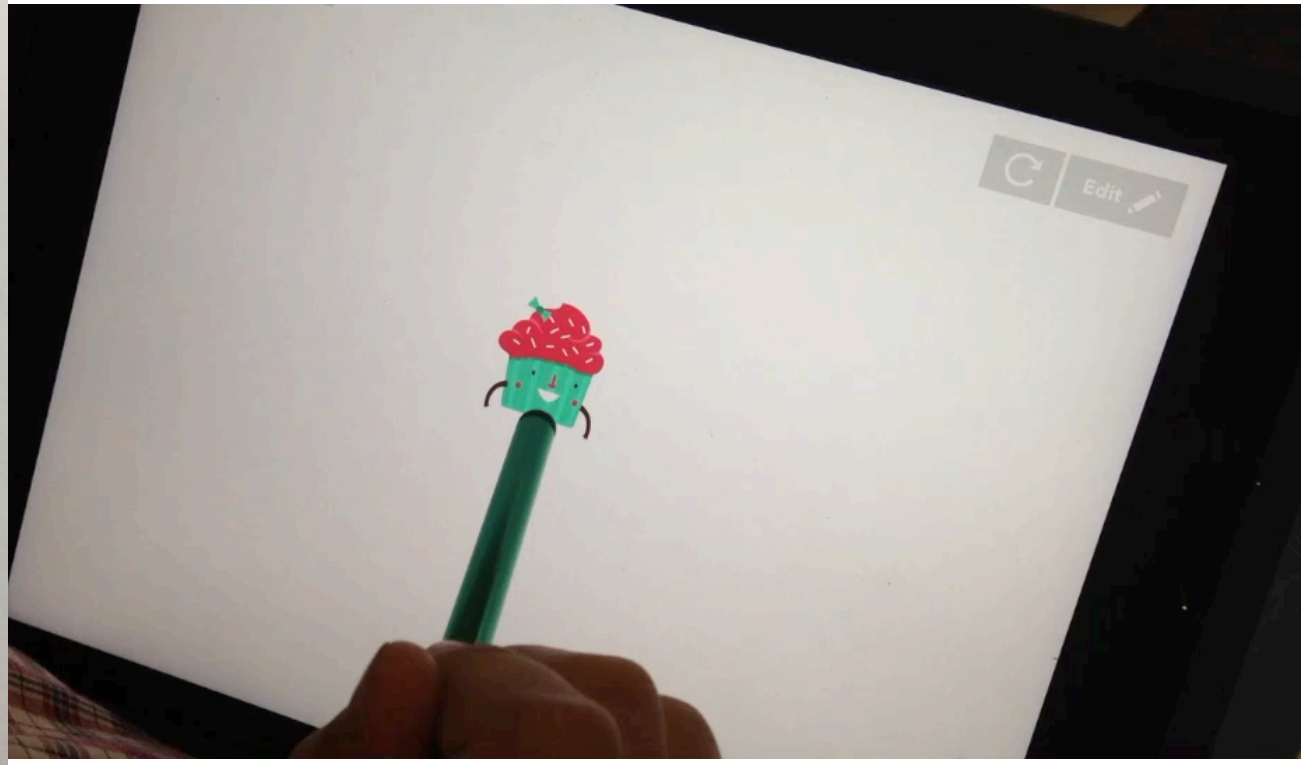
Hopscotch Student Examples





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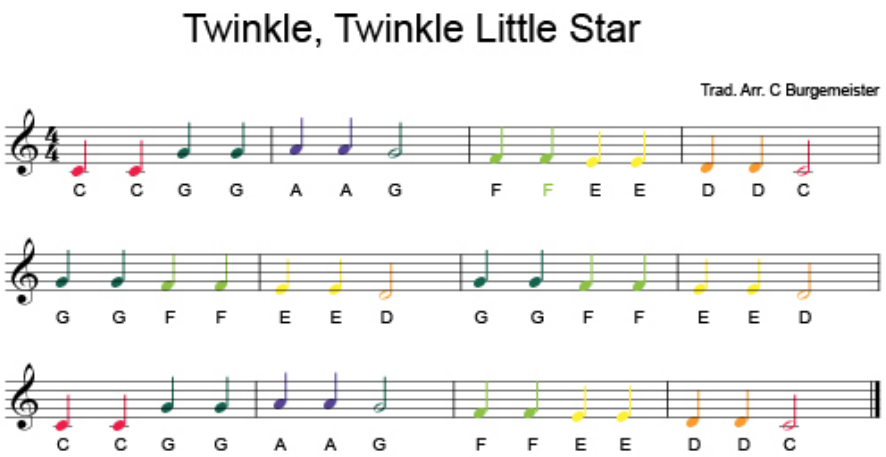

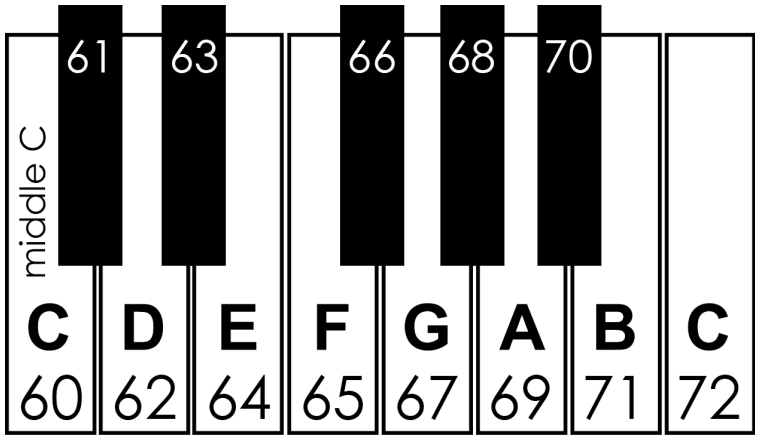

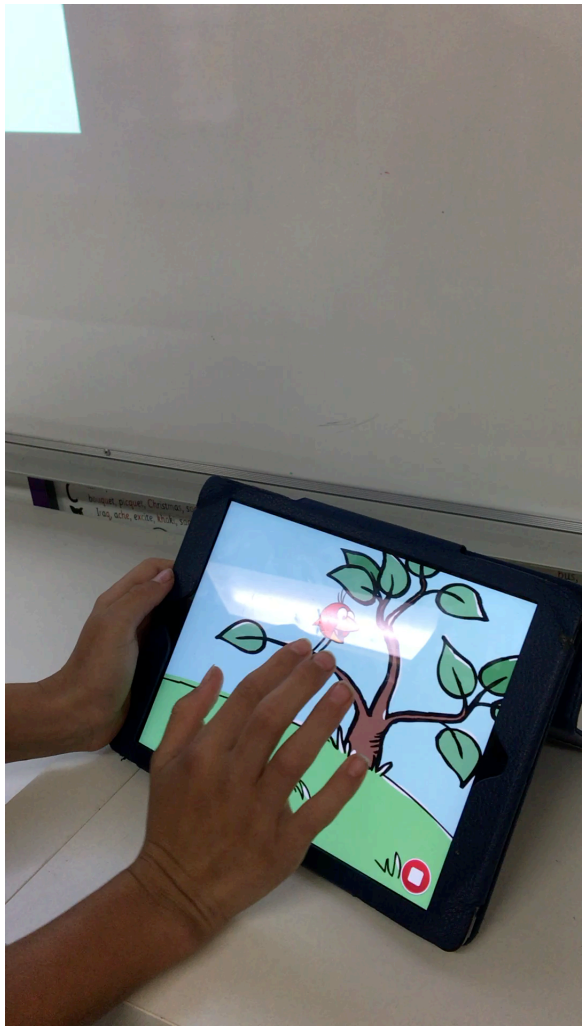

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Coding in the Music Classroom Scratch

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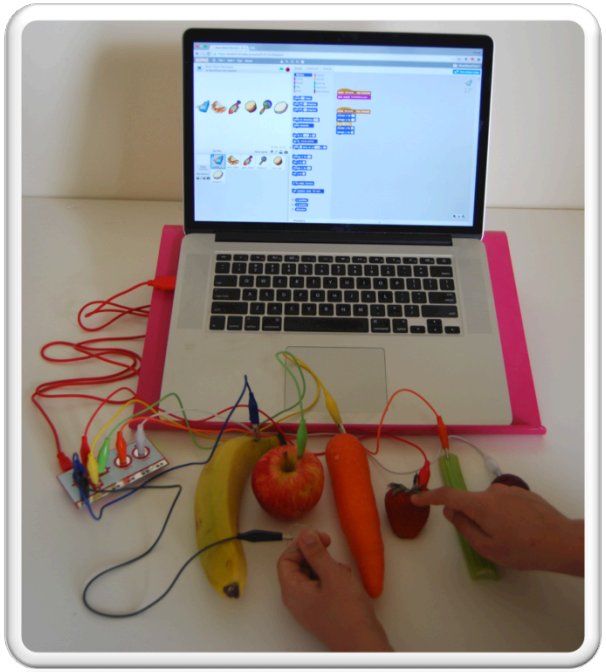

Students coded their own virtual instrument, percussion or melodic.

They then designed their physical instrument out of conductible materials and connected the Makey Makey to the computer and their instrument design.

Students presented this to the school for other students and parents to play their instrument.

See my blog post and publication

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Learning Intention

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2. Arrange a 3 or 4 part composition of a simple song, writing specifically for the music apps created by members of your group.

Success Criteria: **I can…**	Australian Curriculum
Recognise the correct coding blocks needed for different notes and/or percussion sounds.	Year 3/4 Develop aural skills by exploring, imitating and recognising elements of music including dynamics, pitch and rhythm patterns (ACAMUM084) Year 5/6 Explore dynamics and expression, using aural skills to identify and perform rhythm and pitch patterns (ACAMUM088)
Code correctly for my instrument to play rhythm and/or melodic patterns.	Year 3/4 Develop aural skills by exploring, imitating and recognising elements of music including dynamics, pitch and rhythm patterns (ACAMUM084) Year 5/6 Explore dynamics and expression, using aural skills to identify and perform rhythm and pitch patterns (ACAMUM088) Year 7/8 Develop musical ideas, such as mood, by improvising, combining and manipulating the elements of music (ACAMUM093)
Play a song on my musical instrument app.	Year 3/4 Practise singing, playing instruments and improvising music, using elements of music including rhythm, pitch, dynamics and form in a range of pieces, including in music from the local community (ACAMUM085) Year 5/6 Develop technical and expressive skills in singing and playing instruments with understanding of rhythm, pitch and form in a range of pieces, including in music from the community (ACAMUM089) Year 7/8 Perform and present a range of music, using techniques and expression appropriate to style (ACAMUM096)
Write and arrange a composition for my group to play using more than one app.	Year 3/4 Create, perform and record compositions by selecting and organising sounds, silence, tempo and volume (ACAMUM086) Year 5/6 Rehearse and perform music including music they have composed by improvising, sourcing and arranging ideas and making decisions to engage an audience (ACAMUM090) Year 7/8 Develop musical ideas, such as mood, by improvising, combining and manipulating the elements of music (ACAMUM093)

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Digital Technologies – Makey Makey

Learning Intention

Code a music instrument, melodic or percussion, which when tapped, changes its look in some shape or form and which when connected to a Makey Makey becomes a physical instrument to play more than one sound/tone/note.

Success Criteria: **I can…**	Australian Curriculum
Follow step by step instructions to code a musical instrument app.	Year 3/4 Define simple problems, and describe and follow a sequence of steps and decisions (algorithms) needed to solve them (ACTDIP010) Year 5/6 Design a user interface for a digital system (ACTDIP018) Year 7/8 Design the user experience of a digital system, generating, evaluating and communicating alternative designs (ACTDIP028)
Identify mistakes and fix them.	Year 3/4 Define simple problems, and describe and follow a sequence of steps and decisions (algorithms) needed to solve them (ACTDIP010) Year 5/6 Implement digital solutions as simple visual programs involving branching, iteration (repetition), and user input (ACTDIP020) Year 7/8 Implement and modify programs with user interfaces involving branching, iteration and functions in a general-purpose programming language (ACTDIP030)
Design my own musical instrument app.	Year 3/4 Implement simple digital solutions as visual programs with algorithms involving branching (decisions) and user input (ACTDIP011) Year 5/6 Design a user interface for a digital system (ACTDIP018) Year 7/8 Design the user experience of a digital system, generating, evaluating and communicating alternative designs (ACTDIP028)
Code different actions/functions.	Year 3/4 Implement simple digital solutions as visual programs with algorithms involving branching (decisions) and user input (ACTDIP011) Year 5/6 Design, modify and follow simple algorithms involving sequences of steps, branching, and iteration (repetition) (ACTDIP019) Year 7/8 Design algorithms represented diagrammatically and in English, and trace algorithms to predict output for a given input and to identify errors (ACTDIP029)
Change my coding when needed.	Year 3/4 implement simple digital solutions as visual programs with algorithms involving branching (decisions) and user input (ACTDIP011) Year 5/6 Design, modify and follow simple algorithms involving sequences of steps, branching, and iteration (repetition) (ACTDIP019) Year 7/8 Design algorithms represented diagrammatically and in English, and trace algorithms to predict output for a given input and to identify errors (ACTDIP029)
Describe how my app meets the needs of my audience.	Year 3/4 Explain how student solutions and existing information systems meet common personal, school or community needs (ACTDIP012) Year 5/6 Explain how student solutions and existing information systems are sustainable and meet current and future local community needs (ACTDIP021) Year 7/8

Design and Technologies – Makey Makey

Learning Intention

Code a music instrument, melodic or percussion, which when tapped, changes its look in some shape or form and which when connected to a Makey Makey becomes a physical instrument to play more than one sound/tone/note.

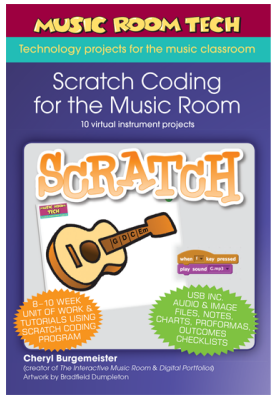
Success Criteria: **I can…**	Australian Curriculum
Investigate and identify how the Makey Makey works with conductible materials and open/closed circuits	Year 3/4 Investigate how forces and the properties of materials affect the behaviour of a product or system (ACTDEK011) Year 5/6 Investigate how electrical energy can control movement, sound or light in a designed product or system (ACTDEK020) Year 7/8 Analyse how motion, force and energy are used to manipulate and control electromechanical systems when designing simple, engineered solutions (ACTDEK031)
Design an instrument with conductible materials to successfully connect to a Makey Makey	Year 3/4 Select and use materials, components, tools, equipment and techniques and use safe work practices to make designed solutions (ACTDEP016) Year 5/6 Select appropriate materials, components, tools, equipment and techniques and apply safe procedures to make designed solutions (ACTDEP026) Year 7/8 Select and justify choices of materials, components, tools, equipment and techniques to effectively and safely make designed solutions (ACTDEP037)
Plan, using the proforma, the coding required for my app and the physical design for a Makey Makey instrument.	Year 3/4 Plan a sequence of production steps when making designed solutions individually and collaboratively (ACTDEP018) Year 5/6 Develop project plans that include consideration of resources when making designed solutions individually and collaboratively (ACTDEP028) Year 7/8 Use project management processes when working individually and collaboratively to coordinate production of designed solutions (ACTDEP039)
Identify mistakes and fix them. **Evaluate** the success of my design.	Year 3/4 Critique needs or opportunities for designing and explore and test a variety of materials, components, tools and equipment and the techniques needed to produce designed solutions (ACTDEP014) Evaluate design ideas, processes and solutions based on criteria for success developed with guidance and including care for the environment(ACTDEP017) Year 5/6 Critique needs or opportunities for designing, and investigate materials, components, tools, equipment and processes to achieve intended designed solutions (ACTDEP024) Negotiate criteria for success that include sustainability to evaluate design ideas, processes and solutions (ACTDEP027) Year 7/8 Critique needs or opportunities for designing and investigate, analyse and select from a range of materials, components, tools, equipment and processes to develop design ideas (ACTDEP035) Independently develop criteria for success to evaluate design ideas, processes and solutions and their sustainability (ACTDEP038)

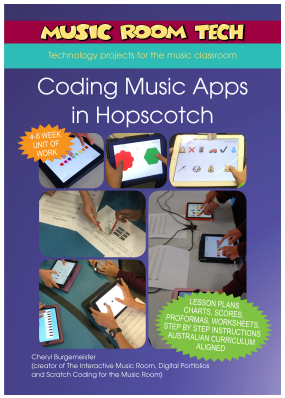
Science – Makey Makey	
Learning Intention Code a music instrument, melodic or percussion, which when connected to a Makey Makey becomes a physical instrument to play more than one sound/tone/note.	
Success Criteria: **I can…**	Australian Curriculum
Investigate and identify how the Makey Makey works with conductible materials and open/closed circuits	Year 3 Natural and processed materials have a range of physical properties that can influence their use (ACSSU074) Year 6 Electrical energy can be transferred and transformed in electrical circuits and can be generated from a range of sources (ACSSU097)

Mathematics – Coding Music	
Learning Intention Code a known song calculating the difference between different note lengths and identifying patterns to be repeated. Code a music instrument, melodic or percussion, plays has the ability to play a rhythm pattern using more than one sound/tone/note.	
Success Criteria: **I can…**	Australian Curriculum
Investigate how coding blocks can be used to play difference note lengths and create repeated patterns	Pattern and Algebra Year 5 Describe, continue and create patterns with fractions, decimals and whole numbers resulting from addition and subtraction (ACMNA107) Year 6 Continue and create sequences involving whole numbers, fractions and decimals. Describe the rule used to create the sequence (ACMNA133)

How Do I Get Started?

- Online tutorials or You tube
- Play with it yourself
- Check out my blog posts
- Purchase my step by step publications
- Purchase Makey Makey's at www.edtechs.com.au





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