

Designing Music Composing Software for Middle School Students: A Collaborative Project

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PERFORMATICS

- connecting Computer Science to Art, Music, and Theatre through interdisciplinary courses that highlight computational thinking
- originally conceived to attract and retain CS majors by connecting theory to practice
- but also exposes non-CS majors to computing at a higher level than typically seen in General Education (“GenEd”) computer literacy courses

4



Performamatics: Focus for Today: CS + Music

- GUI Programming + Music Methods
- Sound Thinking



5



Performamatics: Interdisciplinary Course Models

- Synchronized
 - pairings of upper-level courses for majors
 - joint project developed within the two courses
 - courses remain independent
- Hybrid
 - courses open to all students across the university
 - General Education (“GenEd”) credit
 - integrated, two instructors in the classroom

6



Interdisciplinary Courses Must Benefit Both Disciplines

• Benefits for Music Ed Students

- Getting a feel for what's involved in building technology applications for the classroom
- Gaining insight into students growing up under the influence of media
- Seeing the interdependence of sound, images, and technology



7

Interdisciplinary Courses Must Benefit Both Disciplines

• Benefits for CS Students

- Applying CS concepts
- Working in an interesting application domain
- Interacting with students who think differently
 - CS view: code-centric
 - Music view: usability
- Gaining a strong exposure to human factors



8

Interdisciplinary Courses Must Benefit Both Disciplines

- **Benefits for both Music Ed and CS Students**
 - Addressing creative challenges
 - Finding a common language
 - Getting out of their comfort zones

FAERI'S AIRE and DEATH WALTZ Words and Music by John Stump
Based on a Cro-magnon skinning chant Arranged by Accident (rotate embouchures) *tr*

The image shows a complex musical score with multiple staves. The top staff is for Violin, with instructions like 'Adagio cantabile with a rock tempo feel' and 'Solo'. The middle staff is for Glockenspiel, with 'Tutti' and 'Cool Timpani with small fan'. The bottom staff is for Ukelele, with 'Slovenly' and 'Tempo VI'. There are also instructions for Rigotoni and Bongos. The score includes various musical notations such as notes, rests, and dynamics (mf, fz, dim, f, p).

9



2009 Synchronized Course: Focus on Composition

- **For CS students (GUI Programming)**
 - Develop a rudimentary version of a music composition program for middle schoolers
 - *Examples:* Super Duper Music Looper, GarageBand, Jam2Jam, NoteFlight
- **For Music students (Gen. Music Methods)**
 - Become familiar with standard software development processes
 - Work with middle schoolers using software

18



2009 Synchronized Course: Problems

- For CS students (GUI Programming)
 - support for creating music in Java
 - documentation on music extensions to Java
 - complexity of thread synchronization
 - version control with multiple coders
 - understanding requirements
 - balancing time spent on various “black holes”
- For Music students (Gen. Music Methods)
 - expressing needs to CS students
 - maintaining interest during development cycles

19



2009 Synchronized Course: Lessons Learned

- Coding requirements must be assessed carefully to ensure feasibility
- Project must have relevance to students from both majors
- Students in both classes must have equal “buy-in”
- Significant effort is required to educate Arts students about CS and vice-versa

20



2009 Synchronized Course: Challenges to Success

- Finding time for professors to work together in the course planning stages
- Scheduling combined classes in which students can work together
- Finding time for students to get together outside of class
- Designing projects where both classes are fully engaged in the entire work, instead of each working only in their own area

21



2009 Synchronized Course: A Particularly Big Challenge



22



2009 Synchronized Course: Addressing Challenges

- Explore more creative projects than straight composition (which CS majors had trouble understanding)
- Explore ways to get Music majors more involved in the software development
- Definitely explore software platforms other than Java ... particularly Scratch
- Get middle school teachers involved! ☺

23



Connecting Computer Science to the General Music Curriculum: A Interdisciplinary Approach to Technology



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Connecting Computer Science to the General Music Curriculum: A Interdisciplinary Approach to Technology

Tokyo – St. Mary's International School



Marie Gleason-Tada, Instructional Tech. Specialist
Parker Middle School, Chelmsford, MA

27



2009 - 2010 Curriculum Projects for General Music and Computer Science Classrooms: Constructing Knowledge

- Grade 6: Impromptu (TuneBlocks)
- Grade 7: Found Instruments & Drumsteps
- Grade 8: Scratch

SCRATCH

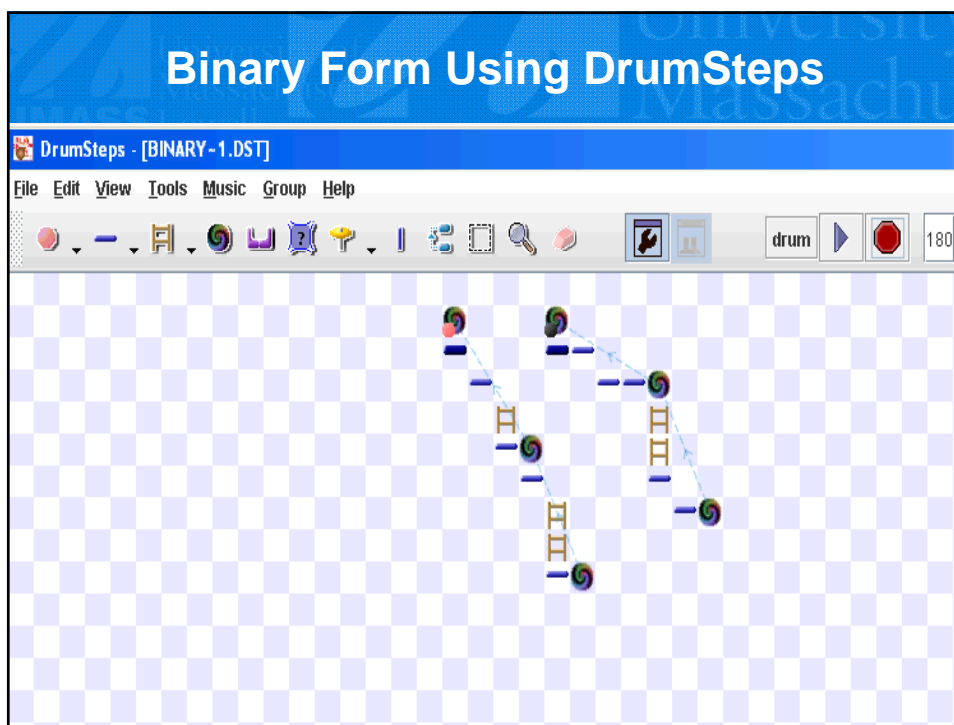
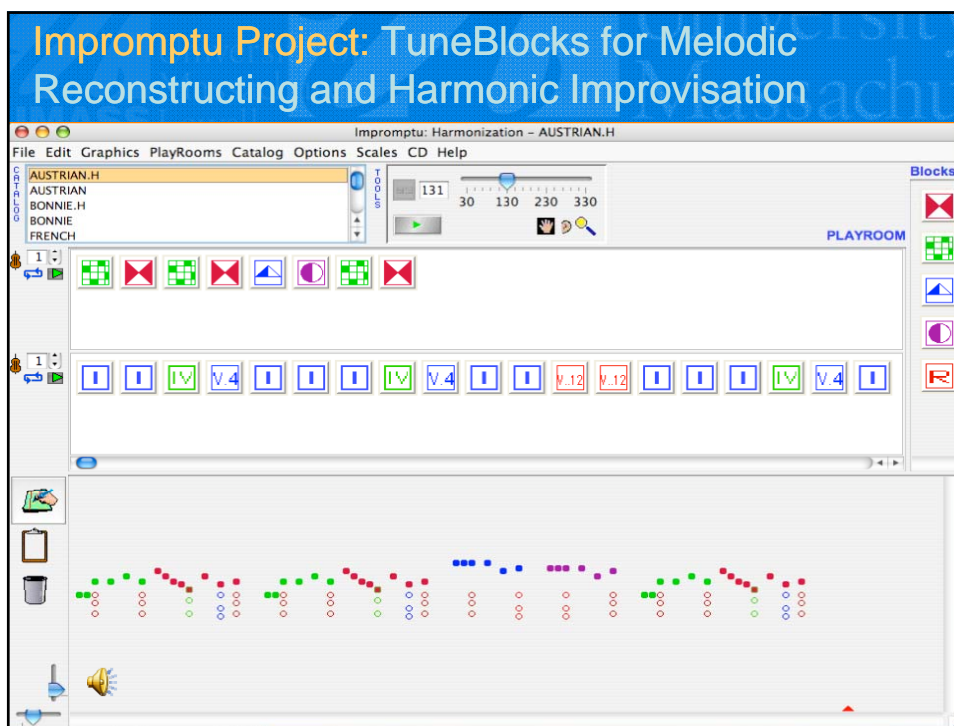
* *students constructing knowledge for themselves.*

Drumsteps

* *students generating knowledge and meaning from their experiences.*


Found Instruments

tuneblocks.




Middle School Technology Integration

- Work with teachers and students in all subject areas
- Help students and teachers progress in technology skills while engaging in class lessons
- Provide challenging and stimulating experiences with technology for learning, interest, and productivity



36



Constructionist Learning Experiences

Constructing music to put in PowerPoint is fun with the DrumSteps program!

You don't even have to know how to read notes!

Drumsteps



37

I'll make three MIDI files with different moods and tempo to use on the **Walking**, **Running**, and **Dancing** slides!

38

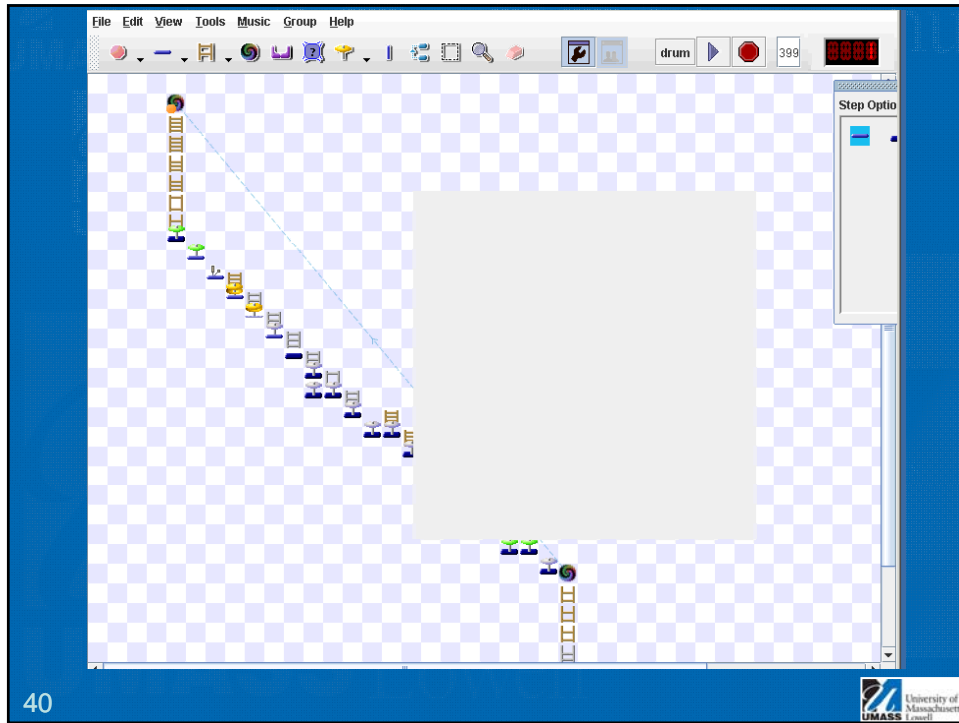


Dancing

We're dancing on the top of the world

39

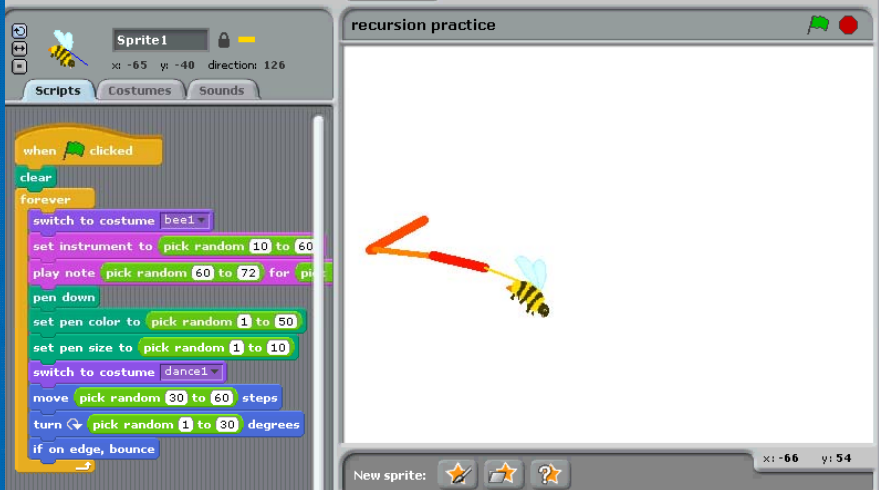




The Scratch website banner features the "SCRATCH" logo in orange and blue, with the tagline "imagine • program • share". Navigation links include "home", "projects", "galleries", "support", and "forums". A login/signup section says "Login or Signup for an account". A flow diagram shows "Snap together blocks" (with examples: "when clicked", "move 10 steps", "play sound pop") leading to "to create stories, games and animations" (with the Scratch cat icon), which then leads to "and share your creations on the web" (with a globe icon). The number "41" is in the bottom left corner, and the "University of Massachusetts Lowell" logo is in the bottom right corner.

Scratch is a program in the tradition of Logo that was developed at the MIT Media Lab. It is a free download.

A bee creates music while making random moves around the screen.



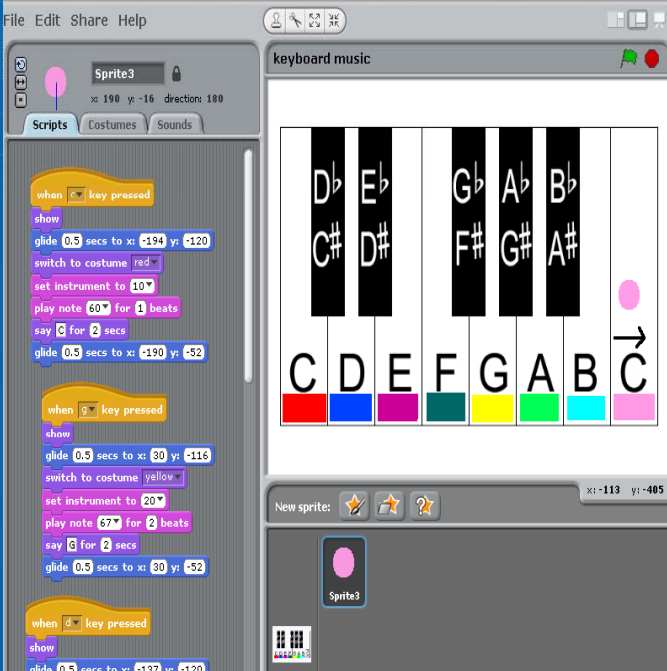
The image shows the Scratch IDE interface. On the left, the 'Scripts' tab is active for 'Sprite1'. The script starts with 'when green flag clicked', followed by 'clear'. A 'forever' loop contains the following blocks: 'switch to costume bee1', 'set instrument to pick random 10 to 60', 'play note pick random 60 to 72 for pi', 'pen down', 'set pen color to pick random 1 to 50', 'set pen size to pick random 1 to 10', 'switch to costume dance1', 'move pick random 30 to 60 steps', 'turn pick random 1 to 30 degrees', and 'if on edge, bounce'. On the right, the 'recursion practice' stage shows a bee sprite with a red trail, moving across the screen. The bottom right corner features the University of Massachusetts Lowell logo.

43

Programming music notes in Scratch allows you to utilize the notes in a variety of ways. You are:

- Thinking about music
- Working with graphics
- Programming something to happen
- Using a coordinate grid
- And just having a lot of fun while engaging in some really great learning!

44



The image shows the Scratch IDE interface for a keyboard simulation. The stage is titled 'keyboard music' and displays a piano keyboard with keys labeled C, D, E, F, G, A, B, and C. The script for 'Sprite3' is as follows: 'when green flag clicked', 'show', 'glide 0.5 secs to x: -194 y: -120', 'switch to costume red', 'set instrument to 10', 'play note 60 for 1 beats', 'say C for 2 secs', 'glide 0.5 secs to x: -190 y: -52'. A second block is: 'when green flag clicked', 'show', 'glide 0.5 secs to x: 30 y: -116', 'switch to costume yellow', 'set instrument to 20', 'play note 67 for 2 beats', 'say G for 2 secs', 'glide 0.5 secs to x: 30 y: -52'. A third block is: 'when green flag clicked', 'show', 'glide 0.5 secs to x: -137 y: -120'. The bottom right corner features the University of Massachusetts Lowell logo.

The Future of Middle School Music & Computer Technology

- Explore more lessons that integrate computational/constructionist/creative thinking into interdisciplinary curriculum projects
- Showcase student work on a Fine Arts website in each school
- Involve as many subject areas as possible in projects involving technology and music integration
- Stimulate students to pursue the science of music and technology in their future

46



Performamatics: Future

- **Focus and build on Sound Thinking**
 - infuse computational thinking into music ed.
 - attract more CS majors to the course
- **Spread Scratch throughout the course**
 - from basic operations to generative music
 - attempt to create a repository of course activities that can be replicated by others
- **Integrate music and CS theory more closely**
 - create exercises and experiences where students can see the relationships more clearly

52



Performamatics: Acknowledgments

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53





PERFORMAMATICS

thank you

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<http://www.performamatics.org>

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