

## TEACHING A COMPUTER TO SING A Three-Hour Workshop

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### Title

Teaching a Computer to Sing: A Workshop on Combining Computing+Music

### Goal / Purpose of the Session

This workshop will give attendees direct experience in working with the techniques and tools we use to teach computing in the context of music and music in the context of computing. It will describe and demonstrate the work we have done over the last two years in a middle school, after-school program that combines singing with programming. It will also provide a forum for discussion of how this work can be adapted for participants' schools.

### Detailed Session Activity / Information Outline

The workshop will begin with a short presentation on what we are trying to accomplish (turning kids on to computing, just as many other programs) and a brief overview of our approach (how we use the 2½ hours that we're with the kids each Tuesday and Thursday after school). We'll entertain some initial questions from attendees, but we'll limit those so that we can get to hands-on work as quickly as possible.

Attendees will first work with EasyABC, a stand-alone program that supports virtually all of the ABC notation standard and translates that notation into a standard music score. This program is freely downloadable for PCs and Macs, but if attendees are unable to install it we will have them work with WebMusicScore or ABCTool, web-based programs that render ABC notation but are considerably less user-friendly than EasyABC.

Attendees will then move their creations to PencilCode, a Scratch-like drag-and-drop programming environment that *partially* supports ABC notation. They will, for example, translate repeats (|: ... :|) into for loops and 1st and 2nd endings into if statements, work with string concatenation and some simple arithmetic algorithms, and begin to understand the issues involved in generating music from a web page.

Along the way attendees will be exposed to music fundamentals such as note pitch and duration, rests, key signatures, accidentals (sharps and flats), and chords. The session will end with a discussion of how our work can be adapted for use in other schools and perhaps we'll even get people to sing with us!

## Expected Attendee Experience / Background

To get the most out of this workshop, attendees should have a basic familiarity with music notation and programming fundamentals. Attendees who can read music and/or who are familiar with programming environments such as Scratch and PencilCode are especially encouraged to attend. Attendees should bring their own computers so that they can download software and access the relevant program environments on the web.

## Expected Learning from / Benefit of This Presentation

Attendees will be exposed to samples of the multi-part music scores that our students sing and program, ABC Notation and the EasyABC program designed for transcribing music in that notation, and the PencilCode programming environment and the CoffeeScript language that it uses. They will learn how to use these tools to teach music and computing simultaneously.

## Description of Any Handouts / Takeaways

Attendees will receive samples of all materials discussed, including the “cheat sheets” we have developed to help students learn how to read music and how to code music in ABC Notation. Handouts will also include references to the various websites where additional information can be found.

## Presenter Background / Experience

**Jesse Heines** is a Professor Emeritus of Computer Science whose knowledge of music comes from playing trumpet in school bands and orchestras throughout his schooling and singing in barbershop quartets and choruses to this day.

**Rachel Crawford** is a music educator who teaches K-8 General Music and serves as the middle school Choir Director. She has worked with students of all ages in studio teaching and after-school programs, but mostly she loves to sing and make up songs with her two young daughters.

**Firas AL-Rekabi** is a 7th grade math teacher. He holds a Ph.D. in CIS and taught undergraduate CS courses as an assistant professor in Jordan for over 15 years. Firas helps students in our program with coding and basic computer concepts, and his son is one of those students.

Our current work has grown out of earlier work in *Performamatics*, a college-level, interdisciplinary program combining computing and music that has been funded by the National Science Foundation since 2007.

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