USING SYSTEMS TOOLS IN MUSIC CLASS

by Andrew Frankhouse, with Alan Ticotsky

At Innovation Academy Charter School (IACS) in Tyngsborough, MA, music teacher Andrew Frankhouse uses systems tools in creative and perhaps unexpected ways. Behavior-over-time graphs (BOTGs) help students analyze and appreciate different pieces of music, and visualize graphically how aspects of compositions develop. Andrew also uses feedback loops to help students understand the business of music.

VISUALIZING MUSIC

Because most of his students lack the formal training in the theory and notation systems necessary to study music structure in depth, Andrew uses a combination of simple analytical processes and software to aid students in analysis.

Andrew provides examples of many genres of music for students to study. In addition to working with selections of popular music, his students analyze and compare works from Baroque, Classical, and Romantic Period composers like Bach, Mozart, Beethoven, Berlioz, and Schubert. Every semester, students tell Andrew that they find themselves listening to their favorite popular music with an ear tuned to form and texture. Many students remark about how similar most popular music is, both within and between genres.

Andrew has been guided in his own studies by a broad variety of scholarly work, and he credits his studies with musicologist Dr. Peter J. Evans as a major influence. He acknowledges that care is needed so as not to overdo the emphasis on structure at the expense of other musical elements. Students who are very data driven in their thinking may reach logical but erroneous conclusions about paths of influence in music history, based solely upon similarities in music revealed by graphs. Overall, however, Andrew considers that the benefits of using software to visualize music far outweigh the drawbacks. Most students extend their attention spans and interest in diverse pieces, and increase their aesthetic sensitivity.

Students are provided with a template for the first activity, which Andrew calls “Sound Energy Analysis.” As they listen to a piece of music, they assign it a “score” based on different attributes, using a template like the one below. (Figure 1) “Higher energy” attributes (fast, loud, etc.) are given a positive score, while “lower energy” attributes get a negative score. This process can be used to score a whole work or each individual section of it.

Using this template, create Sound Energy scores for listening examples						
+	**2**	**1**	**0**	**-1**	**-2**	**-**
Fast						Slow
Loud						Soft
Bright						Dark
Oblique						Level
Complex						Simple
Angular						Smooth
Wide						Narrow
Dissonant						Consonant

Figure 1 Sound Energy Analysis

They compare their ratings and analyze them as a class. When they become comfortable with the process, Andrew has them score several pieces of music, spanning a broad spectrum of genres. Students put their data on a single histogram so they can compare the music in a graphical context. The resulting diagrams are visually striking and add insight to students' grasp of how composers and performers use a variety of attributes to create unique compositions.

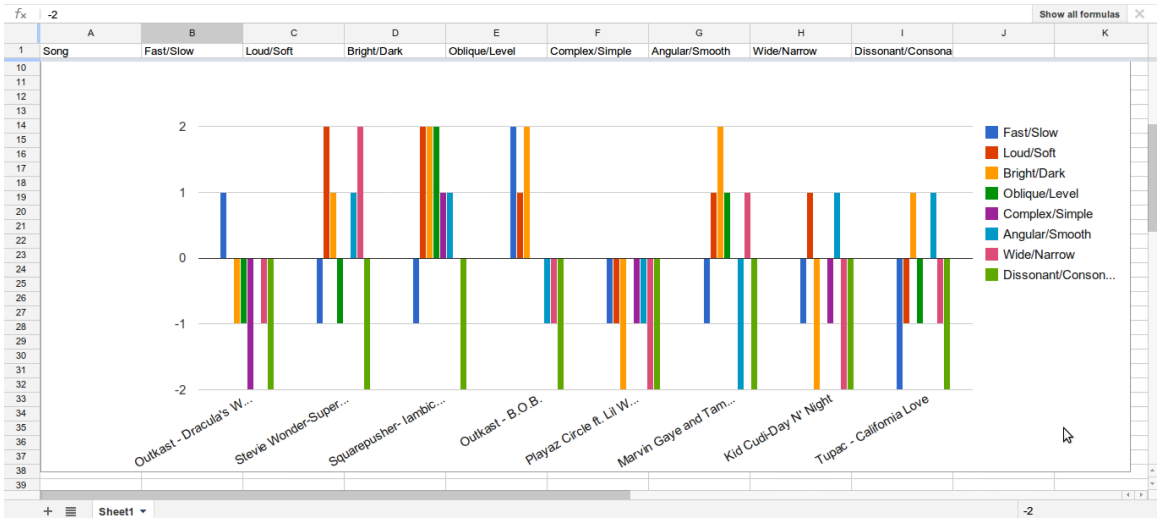

Figure 2 Student graph comparing Sound Energy attributes for eight popular songs.

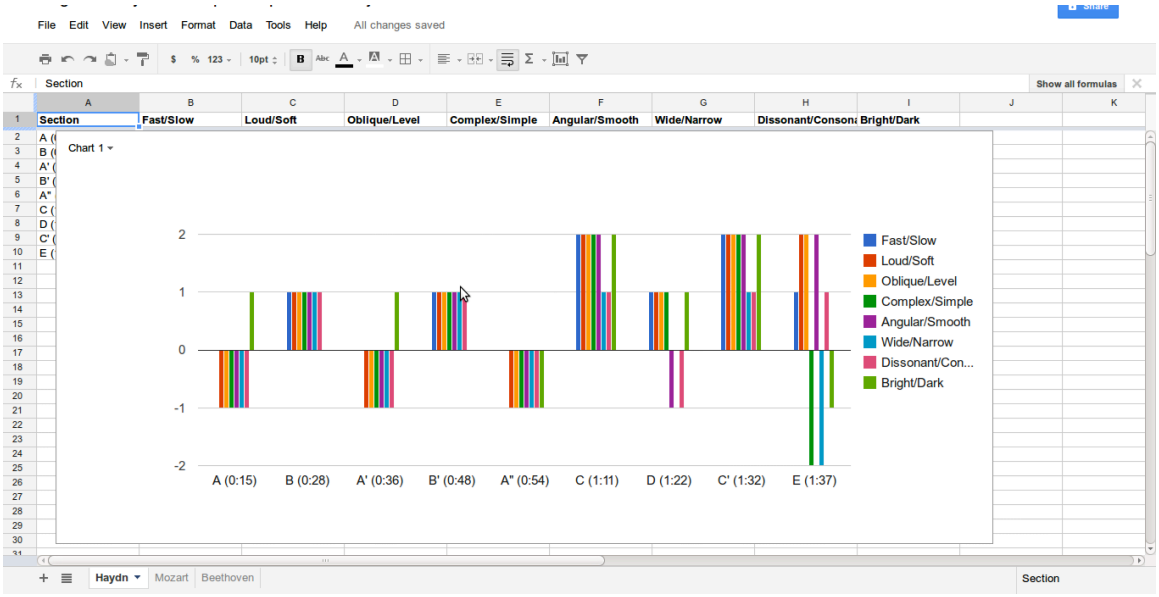

Figure 3 Student graph of the Haydn symphony movement pictured above.

When Andrew has students listen to longer selections, he uses behavior-over-time graphing to track the changes and development within a single piece. He uses software called, "Sonic Visualiser," which he describes as easy to use and is free to download (www.sonicvisualiser.org). The graphs he uses with students clearly show changes in the music throughout the pieces and make precise, objective comparisons possible. Students study spectrograms like the example in Figure 4 that show divisions and changing forms within a piece of music, clearly contrasting the structure among different parts. Note the contrast in volume level and texture between sections.

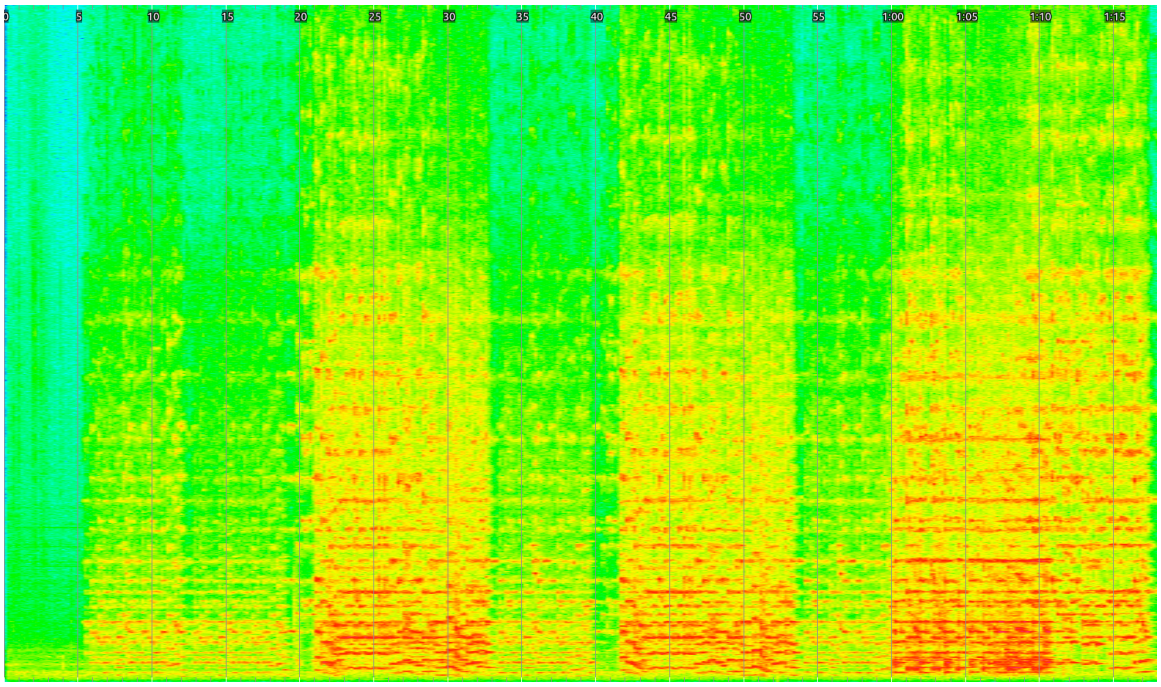

Figure 4 Excerpt of spectrogram for Haydn's Symphony #88 – VI.

Andrew has used graphing software to demonstrate how compressed music files "look" compared to larger formats. With so many people, especially younger listeners, hearing music through small earphones and on speakers built into computers, it's important to know what compromises in sound quality are being made. An important connection is made for students between music class and physics class, and between art and science.

USING BOTGS WITH THE CHORUS

One day Andrew was listening to a recording of a recent rehearsal with the school chorus. The recording software happened to display the pitch and volume of the sound graphically as it played over time. Inspiration struck. Andrew realized that the singers could get valuable feedback by not only listening to the recording but also from watching the spectrogram.

"See here?" he said, pointing to an area on the screen where the colorful line widened. "They really weren't too together there."

At another point, he saw the line of sound thinning as it extended into an area of quiet: "Some of them held on longer at the end."

Not only would the chorus hear how they sounded before beginning the next practice, but they would see exactly where they needed to improve their coordination.

THE BUSINESS AND HISTORY OF MUSIC

As a professional musician himself, Andrew is familiar with the challenges facing artists trying to make a living from their music. The electronic distribution of music has made piracy an enormous problem, and Andrew explored its detrimental effects with his class. During a class discussion, students brainstormed ideas about this complex issue using a systems tool called a connection circle (Figure 5).

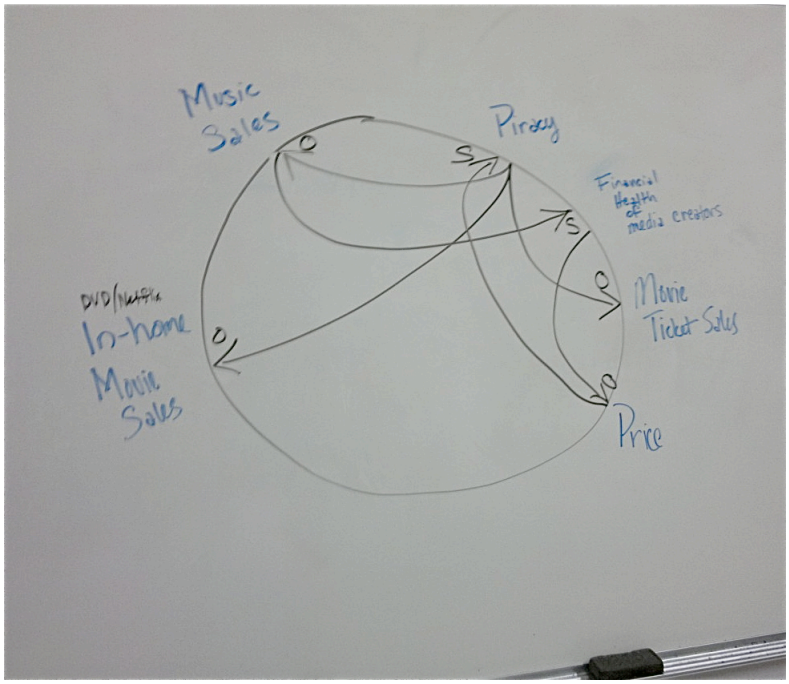

Figure 5 Connection circle about music sales and piracy

The students traced the causal connections and found a reinforcing feedback loop. Not only was the illegal copying of music unfair to the artists and producers, but students theorized that prices were driven up also. Follow the loop around to understand their logic (Figure 6).

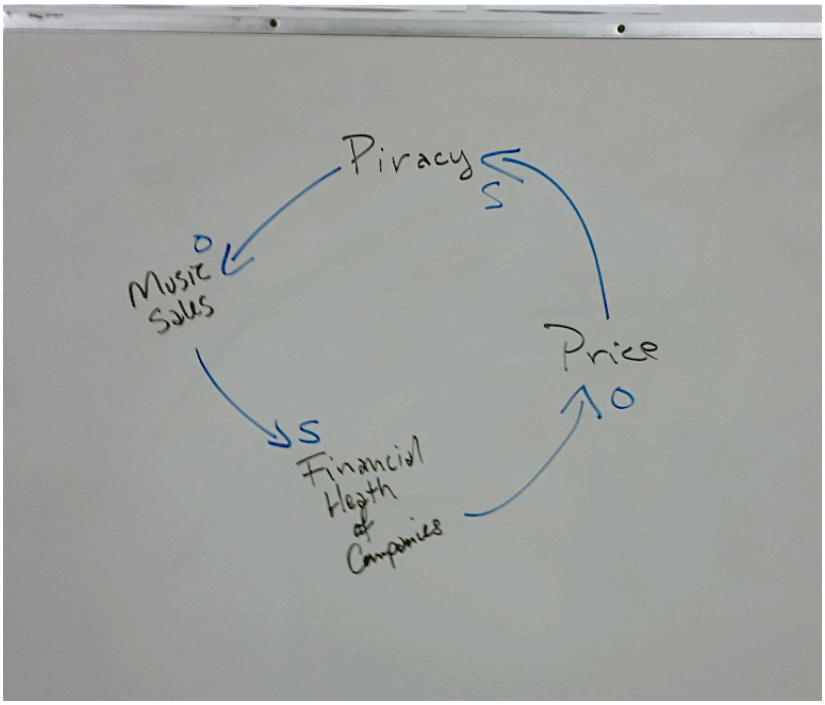

Figure 6 Reinforcing feedback loop

Piracy decreases music sales, and that weakens the financial strength of the companies. They are forced to raise prices on music they can sell, which tends to increase the incentive for illegal downloading. This reinforcing loop drives down music sales and raises prices while theft increases. For those of us who might not think we're hurting anyone if we copy music to give to a friend, this feedback loop helps us see that there are victims to our crime.

NEW USES FOR SYSTEMS TOOLS

Andrew is a systemic thinker who is always on the lookout for ways to use new methods to teach about music. He teaches a popular elective course on African-American music. In addition to learning about the aesthetic roots of the music, students trace the struggles for recognition and financial compensation the artists have faced. Students recently completed a study of blues, where they compared original recordings of Delta blues singers with contemporary interpretations of their songs by artists like Eric Clapton, The White Stripes, and others. Comparing and contrasting musical interpretations results in rich conversations in class and follow-up searches by students working independently.

Currently, Andrew is working on ways to graph the history of African-American music with his class. Once again, interdisciplinary connections are made relevant for students as they study music in context with American history and economics. The confluence of cultural influences, technological advances, economics, and history provides a rich and complex background for high school students to enjoy and learn about one of the greatest musical traditions in the world.

Using systems tools in classrooms has many advantages. Watching Andrew Frankhouse teach music provides a wonderful example of true interdisciplinary learning. It might seem difficult and unlikely for high school teachers to extend their curriculum outside the highly specialized skills they need to teach. But given a teacher with a systemic viewpoint and broad intellectual curiosity, students can use tools like BOTGs and feedback loops to help them understand complex ideas.