

Tool Kit VII

Science and Technology in Society

Objective

Explore how technological innovation and musical taste often go hand in hand. Explore the technological innovations and musical tastes of previous generations and cultures. Consider the technological innovations and musical tastes of the present day. Project what technological innovations might occur in the future.

Materials

- Large whiteboard or butcher paper
- Post-its (or similar pieces of paper)
- Computer with Internet access and speakers

Background Information for Educators

The Chicken-and-Egg Problem: Technological Innovation and Musical Taste

Every instrument in MIM's galleries represents a one-time innovation in music technology that suited the resources and musical tastes of the adopting culture. For example, the early predecessor of the guitar known as the 'ud, a type of plucked lute, is thought to have been invented in the Middle East (Mesopotamia) from where it traveled throughout the world, changing according to the tastes and resources of the adopting culture. And yet, from the Middle East to Asia, Europe, Africa, and the Americas, the 'ud has been transformed into musical instruments as disparate as the Chinese pipa and the American banjo. Even the electric guitar can trace its beginnings to the 'ud. At times, it is possible to examine the impetus for, and social impact of, such innovations in musical technology.

Activity 1: The Technologies of Music Participation

Investigate

Present students with a stack of Post-it notes and request that they respond to the following questions on separate Post-it notes:



Plucked lutes exist throughout the world in forms that have been adapted to suit local tastes.

- A. **What innovations in music technology have affected the way that I listen to or enjoy music? For example, what programs or interfaces did I use to listen to music when I was in elementary school? How do I listen to music now?** Answers here may vary. Some may have listened to music on technologies such as iPods as children and now use music services such as Spotify. Others may have begun with CDs and now use iPods or Internet radio or any number of other things.
- B. **What innovations in music technology have affected the way adults I know listen to or enjoy music?** Again, answers may vary from phonographs and 8-track tapes to cassette tapes, laser discs, compact discs, minidisks, and others.

Create

On a wall or piece of butcher paper, organize the Post-it notes on a spectrum or timeline according to any criteria you choose. For example, you might choose the criterion of “portable music,” which includes everything from radios and 8-tracks to CD players and iPhones. Another criterion might be “popular taste,” which, depending on the point in history, would provide a different grouping.

- C. **What has technology changed in the ways people enjoy music? What has not changed?** For example, do people still attend live concerts? Are phonographs still sold? Does anyone know of persons still with cassette players in their car?
- D. **Do I know someone who enjoys music in a completely different way, using a different technology than I do?** For example, does everyone stream music? Does everyone go to live concerts?
- E. **How have technological innovations affected the way people enjoy music in other places?** For example, use a music service like Spotify to discover the music that is trending in a foreign country. With Spotify, you can type the name of a country into the search bar and often come up with a “Top 50” music hit list for that specific country. What is similar about the music in this Top 50 list from the music you listen to? What is different? (Have you ever heard Belgian hip-hop?)
- F. **Does everyone in the class use the same technologies to enjoy music?** For example, does

everyone stream music on Spotify? Are there other music services that people stream from? Are there other technologies that people use to listen to music? Does a Top 50 playlist on Spotify represent the taste of all people, or just the people who use Spotify?

Activity 2: The Technologies of Music Creation

Investigate

[Note: Depending on the students, this activity may need to be integrated with an investigation of the names of different musical instruments—keyboards, computers, violins, guitars, trombones, trumpets, drums, etc.]

Present students with a stack of Post-its or similar paper and request that they respond to the following on separate Post-it notes:

- A. **What musical instruments are present in the music that I listen to? Can I identify by name all the instruments that are used?** List each instrument on a separate Post-it. If applicable, be sure to include instruments such as microphones, guitar-effect pedals, amplifiers/speakers, computers, etc. Anything that produces “sound” for the purposes of recording or performing a song can count here.
- B. **What musical instruments are present in the music that the adults I know listen to?** List each instrument on a separate Post-it.
- C. **What instruments are present in the music from [pick a country from Activity 1]?**
- D. **What musical instruments are present in [pick any place and time in history that’s relevant to your class]?**

Create

Group the musical instruments by genre on the same timeline as was used for Activity 1. Draw lines between the groups of instruments and the technologies that people use to enjoy them. Some groups of instruments may be enjoyed via multiple technologies.

- E. **Are there any musical instruments that we have listed as both a musical instrument and a technology?**
- F. **Imagine/Compare: What would [X genre] sound like if we were to perform it using the musical instruments of [Y genre]?**

- G. What might this music sound like if specific technologies were not used? For instance, if people played all the parts being played by computers or machines? For example, a computer can produce “beats” that would otherwise require an entire drum circle to produce. [See Collection Connection “Marking Pianos” and “Hip-Hop” below.]
- H. What might this music sound like if microphones or amplification were not present? For example, to be able to create sound effects for guitar or vocal sounds, a microphone must be employed along with an amplifier and a speaker. [See Collection Connection “Amplified Guitars” below.]
- I. How have technological innovations affected the music that we listen to? Do we listen to the same music today as we listened to thirty years ago? Is that because of the technology or because of public taste? Or both?
- J. Chickens, eggs, technologies of creation, technologies of participation: Which came first?

Assessment

Formative

Students will demonstrate their understanding of the interaction between technology and music participation and creation in their own lives as well as those of people they know by their participation in class discussions and activities.

Summative

Students can analyze a specific music technology and its use or impact on the way people listen to or enjoy music. They can also analyze the impact of a technology on the way that music is created (e.g., making beats in a drum circle versus on an iPad).

Activity on your visit to MIM: How do we preserve music for later use? How do we use prerecorded music?

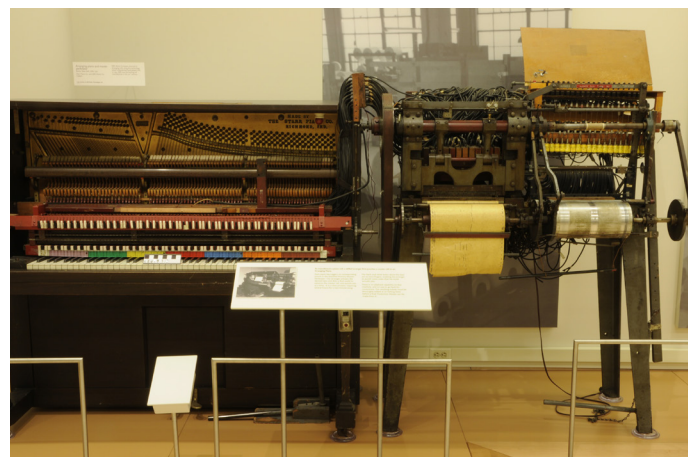
Collection Connection: Arranging Pianos and the Mechanical Music Gallery

The Arranging Piano was invented to preserve “samples” by well-known musicians playing popular music. A player sat down at the piano and played a tune, while an apparatus attached to the piano marked a paper roll with the key strokes of the player. Afterward,



Recording technology has had an enormous impact on how people participate in listening to music.

a technician put perforations on the paper roll wherever a mark appeared. These technicians could also correct any mistakes that the performer may have originally made. Copies of the roll were endlessly reproduced and sold. Anyone with a player piano could simply insert the roll into their piano, and the self-playing mechanisms would faithfully re-create the tune according to whatever was marked on the piano roll. This is an early example of capturing and reproducing an interpretation of music. If you could not afford to hire a pianist every time you wanted to listen to music, you could invest in a “player piano” and purchase as many piano rolls as you needed. In the same way, if you cannot afford to hire Beyoncé for your next party today, you can still get some of her songs to listen to on your electronic device of choice.



Arranging Pianos copied the mechanics of a musician’s piano performance onto a paper scroll for later reproduction in specially designed player pianos.



Electric guitar technologies significantly impacted the development of rock and roll.

The entire Mechanical Music Gallery represents, in certain respects, a desire to create music on demand, whether or not skilled musicians were available to create that music.

Collection Connection: Recording and Hip-Hop

Hip-hop was born in 1973 at a house party in the South Bronx in New York. DJ Kool Herc and Coke La Rock performed break-beat DJing and improvised rap lyrics. Break-beat DJing is just what it sounds like: a DJ plays and repeats small segments of music from vinyl recordings or “records” to create a new piece of music we call a “sample.” Turntables, such as the Technics SL-1200MK2, allowed DJs to cut and sample beats from vinyl records. This style of turntable was the most popular model for hip-hop DJs because it had a “direct drive” mechanism that gave DJs more control and the instrument was durable enough to withstand the wear and tear of scratching and beat-cutting.

With the advent of the MP3 file format, computers became the central piece of equipment for creating beats from samples. While turntables are still in wide use, to achieve the scratching sound that is so characteristic of hip-hop, DJs also use drum machines or pads, mixers, controllers, and an array of other implements. The setup of DJs is highly personal and can change throughout their careers, as they seek out new sounds and techniques or as new technologies are invented.

Activity 3: Why do we amplify music with electronics?

Amplifying a guitar does far more than simply enable us to make it louder or softer. It also enables us to alter the sound in an infinite number of ways. MIM’s

Experience Gallery is full of acoustic instruments, including guitars and various kinds of drums. Investigate how these acoustic instruments sound similarly or differently from the music you listen to on your electronic device (cell phone, iPod, etc.). Are the sounds simply of an amplified acoustic instrument? Or has the sound been processed in some way? Try to create a huge beat with one of MIM’s drums. Compare the beat you can make with your friends to the beats you hear in your favorite music. Is there a difference in technology that prevents your beat from sounding like the beats you hear on recordings?

Collection Connection: Amplified Guitars

Beginning in the late 1800s, as tastes in popular music changed and performance spaces became larger, both the musicians and the public sought louder music. Just as vocalists wanted to be heard above the increasingly large and loud dance bands, guitarists wanted instruments that could project a clear sound into huge dance halls, over radio broadcasts and onto phonograph recordings. The public wanted music (and musicians) that they could hear even as they were infatuated with the booming sounds and driving rhythms of certain styles of popular music.

Who invented the electric guitar?

The earliest electric guitars were developed in the 1930s and were intended for Hawaiian music. In



1937, a Texan named George Beauchamp patented the first successful electric guitar design. Around the same time, Les Paul, a musician and inventor, began his own experiments with electric pickups mounted directly onto a solid piece of lumber. Later, in the 1950s, companies such as Fender and Gibson started manufacturing electric guitars on a large scale and making them more accessible and affordable, and in the process inspired a new era of music. As demand continued to grow, innovations occurred in body design, and musicians could express themselves not only through the sound of their guitar but through musical style as well. Not confined to rock-and-roll music, electric guitars have also become standard instruments in blues, surf, punk, heavy metal, country, and more.

Additional Resources

DJ B-Stee Making Music with Turntables and Electronics

Getting Started as a DJ: Mixing, Mashups, and Digital Turntables – Cole Plante

Hip-Hop Turns Forty, *The Atlantic*

The Basics of Organology from the Virtual Museum of Canada

Arizona State University's Consortium for Innovation and Transformation in Music Education (CITME) Curates Numerous STEM/STEAM Music Education Resources