Advancements in Technology: Impact on Music Teaching and Learning

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FOUR TECHNOLOGY TRENDS

SESSION I

Four Trends

- Performance tools expand in public ways
- Digital audio gets intelligence and legs
- Classrooms go interactive, virtual, as tools shrink
- Working and making music in the "clouds"

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Performance tools expand in public ways

Harbingers of the Future

- Laptop Music Ensembles
- Wii Controllers ("Wii Music" and Writing Software for the Wii)
- Cell Phone Performance
- Continued Development of Real-time Internet performances
- Jumbotrons at Concerts
- Internet Sites Featuring Sound Performances

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Digital audio gets intelligence and more portable

Music Representation

"We need a way of getting music read automatically for machine use rather than first translating into an input language…. It seems to be perfectly within the possibilities of today's techniques…. Such an optical reader would read the whole process…. You could have an entire repertoire stored in the memory of the machine."

Arthur Mendel at the first symposium on Musicology and the Computer (1965)

Optical Music Recognition (OMR)

- Photoscore
- Smartscore
- Sharpeye

Audio Music Recognition (AMR)

- Pitch extraction (anyone remember the TAP Pitch Master and Martin Prevel's Melocaptor?)
- Several monophonic pitch to MIDI/notation converters included those built into Finale (MicNotator) and Sibelius (Audioscore)
- Monophonic is easy; polyphonic is a challenge

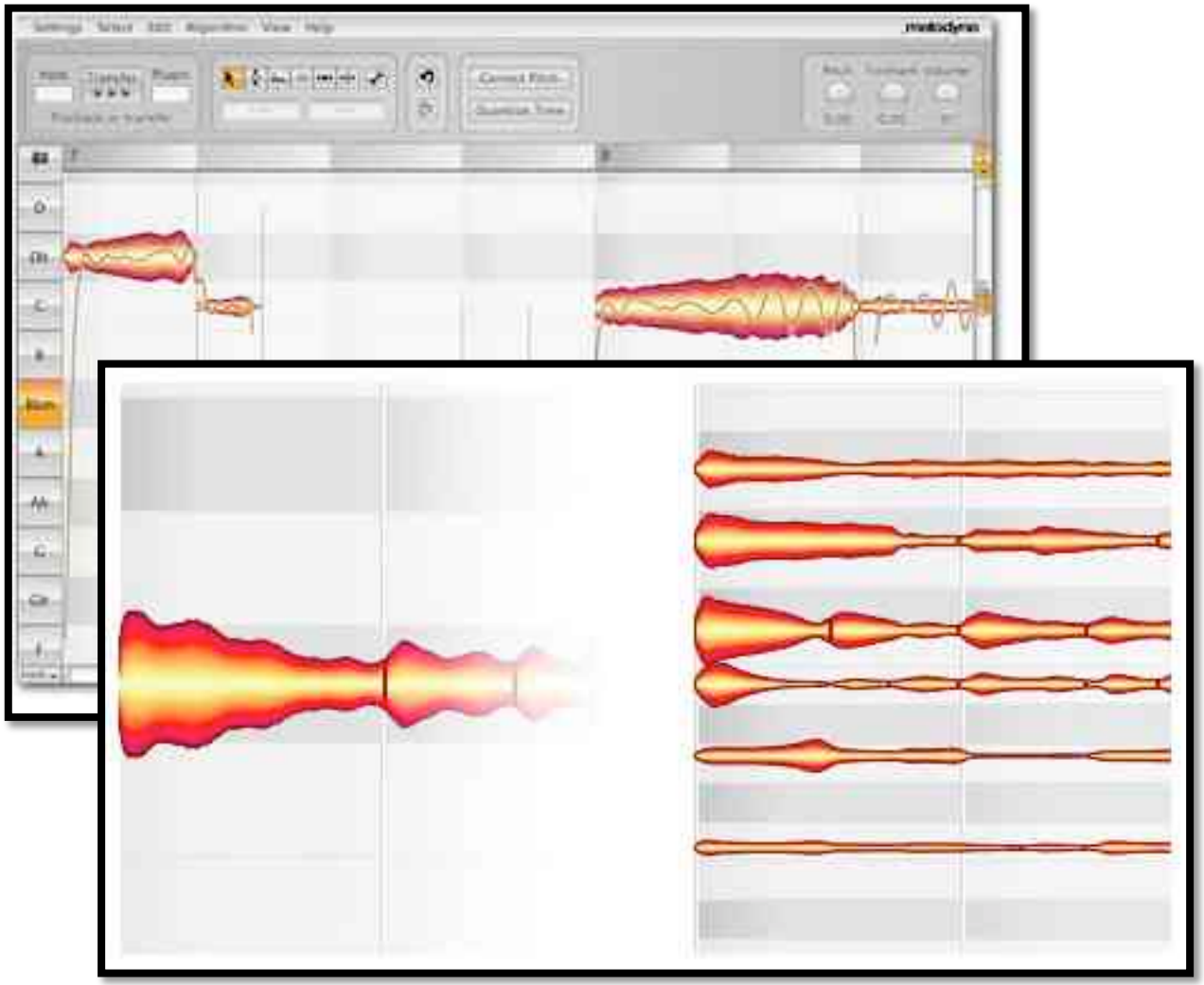
Shazam: Audio Fingerprinting

- started in 2002 as cell phone recognition
- recognize over 1.7 million songs in locations such as bars, automobiles, restaurants -- anywhere that has mobile reception
- database of over 8 million tracks (which extends back to the '50s) to find an exact fingerprint match.
- accuracy between 70 percent (e.g. mobile recognition) and 99.9-plus percent (broadcast monitoring).
- Very fast recognition

Others

- Gracenote (Sony Corp) known for CDDB compact disc recognition but also audio fingerprinting technology
- OMRAS (Online Music Recognition and Searching) academic project
- Orpheus Music Research (Greg Wilder)
- Products like WidiSoft or WAV, MP3, AIF to MIDI translation
- Celemony's Melodyne

Melodyne and Direct Note Access



Peter Neubäcker
Melodyne's inventor and
Founder of Celemony Software
GmbH

Recording devices shrink further

Mickey from Blue Mountain Microphones

Sonoma Wire Works Four Track iPhone App

Zoom H4N

New iPod Nano

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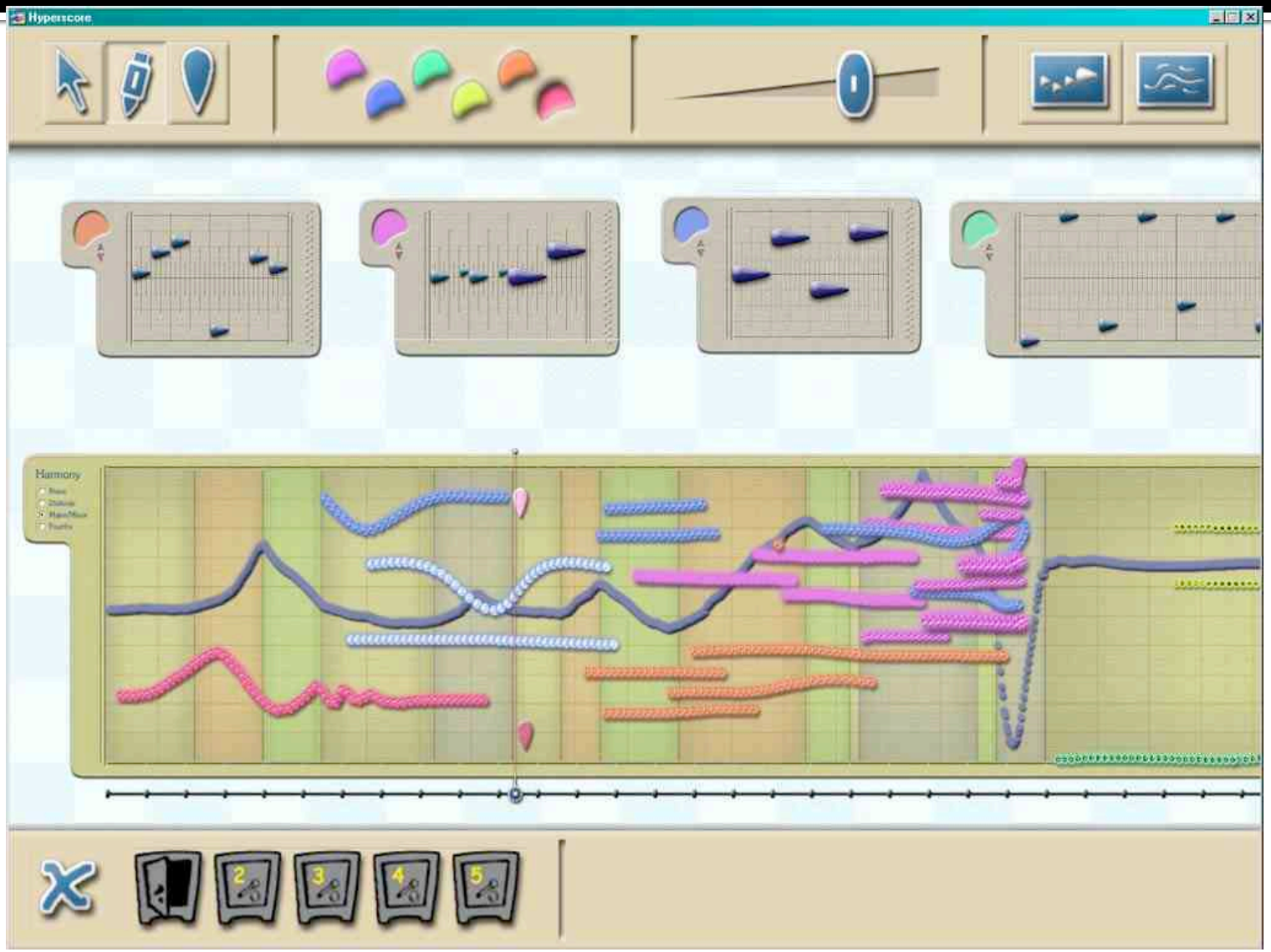
Classrooms go interactive, virtual, as tools shrink

Classrooms Go Interactive!

- Interactive Music Toys
- Cell Phones as Clickers and More
- Smartboards: Potential Unrealized
- eBooks

Some Sizzle with a Zizzle

Machover's work



"Siftables" Blocks with a Twist

Siftables aims to enable people to interact with information and media in physical, natural ways that approach interactions with physical objects in our everyday lives. As an interaction platform, Siftables applies technology and methodology from wireless sensor networks to tangible user interfaces. Siftables are independent, compact devices with sensing, graphical display, and wireless communication capabilities.

Cell Phone Functions

- Clickers
- GPS/Mapping
- Calculators
- Conversion Apps
- Browsers
- Readers (eBooks)
- Cameras
- Music Devices

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Working and making music in the clouds

In the Internet "cloud"

Shared & Public Data

Private Data

Appli-cations

Social Networking Tools

Clouds: Productivity apps

- Google
- Zoho
- Obama (apps.gov)
- AuthorStream

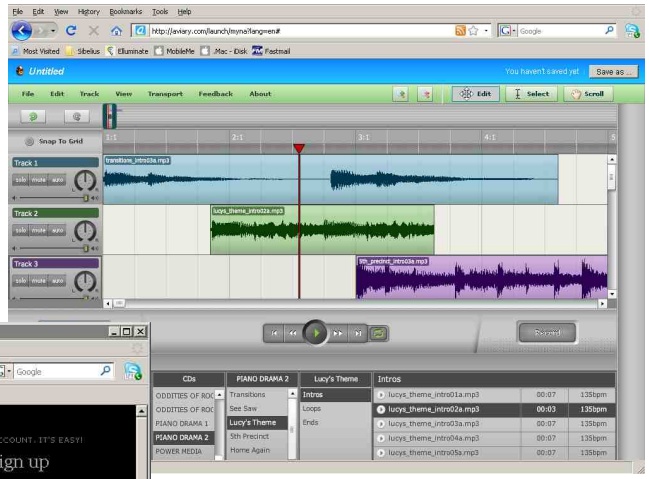
Clouds: Music delivery

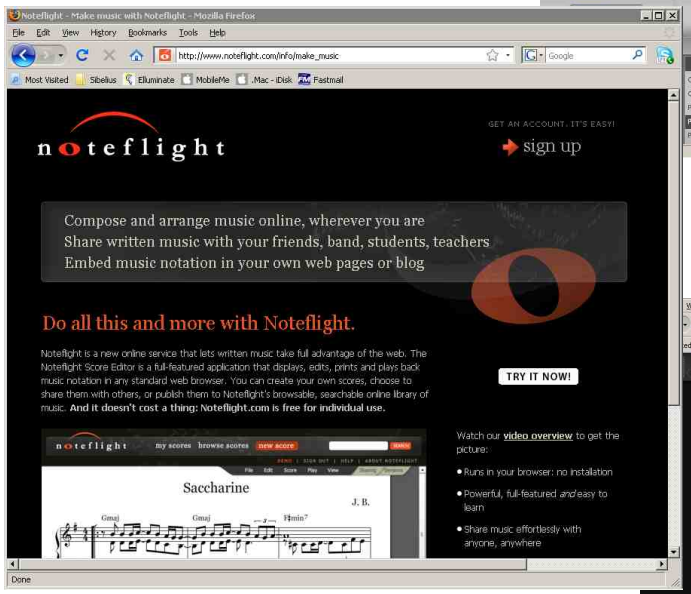
- Pandora "predictive radio"
- Spotify "on demand listening"
- iTunes "online music and video superstore"
- Mp3tunes "your personal music files anywhere"

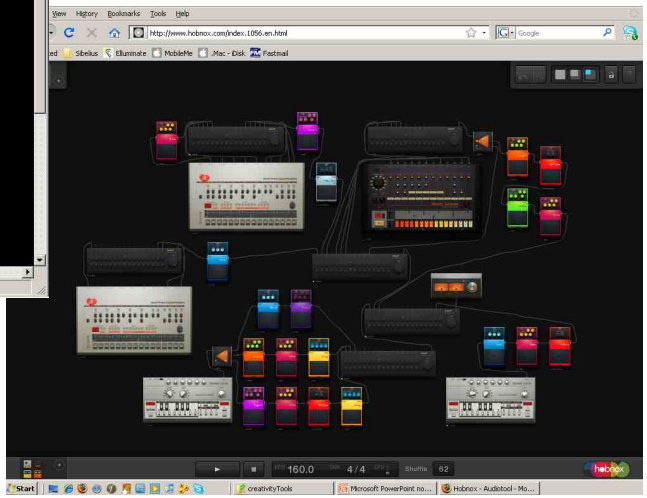
Mp3tunes and Airband

Clouds: Music creativity

- Aviary.com myna
- Noteflight
- Hobnox.com audiotunes
- Sheepbeats
- Noisegames
- and more







Clouds: Curriculum

- SCORM
  (Shareable Content Object Reference Model)
- Sharing lessons content between Learning Management Systems (Blackboard, Moodle, D2L, etc.)
- Open source music
  curriculum sharing?

END OF SESSION I

IMPACT ON MUSIC TEACHING (WITH AUDIENCE PARTICIPATION): SESSION II

Four Trends

- Performance tools expand in public ways
- Digital audio gets intelligence and legs
- Classrooms go interactive, virtual, as tools shrink
- Working and making music in the “clouds”

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Performance tools expand in public ways

INPUT: Performance tools expand in public ways

Public "art" concerts will change dramatically in the next 10 years with increased technology and a wider range of "styles."

48%	1.	Strongly agree
43%	2.	Agree
9%	3.	Undecided
0%	4.	Disagree
0%	5.	Strongly disagree

INPUT: Performance tools expand in public ways

"Alternative" ensembles (like laptop/cell phone groups) become not "alternative" but mainstream in the next 20 years

13%	1. Strongly agree
39%	2. Agree
22%	3. Undecided
26%	4. Disagree
0%	5. Strongly disagree

FUTURE: Performance tools expand in public ways

- **Students Take Charge:** Alternative groups form without out involvement
- **Performance Software**: More examples of real-time performance programs like "Live"
- **Internet-based performance grow in popularity**: Quality of "beaming in" a friend to jam becomes quite high and affordable
- **Concerts Change Dramatically**: Public concerts include enhanced technology

CLASSROOM: Performance tools expand in public ways

- Changes will occur in how we prepare performance majors, ranging from very minor at some schools to major new directions in others
- Computer programming moves to working on smaller platforms for music apps
- Video grows in importance and great care will be taken in providing access of those with physical disabilities
- Interactive real-time performance over Internet boardband connections improves steadily in quality and in impact on music learning – challenging models of employment for music performances professors
- "Soundscapes" for geographical regions merges with Google map-like Internet sites

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Digital audio gets intelligence and more portable

INPUT: Digital audio gets intelligence and legs

Will tools like Shazam become a detriment to the development of student listening skills?

8%	1. Strongly agree
13%	2. Agree
29%	3. Undecided
38%	4. Disagree
13%	5. Strongly disagree

INPUT: Digital audio gets intelligence and legs

How long before software instantly translates an orchestral recording into a printed score?

14% 1. Next year

32% 2. Within a few years

45% 3. Five or more years

9% 4. Not in my lifetime

FUTURE: Digital audio gets intelligence and legs

- **Flexibility**: hear any music event, capture it, sonically analyze it, score it, edit and manipulate it acoustically or symbolically
- **AMR Smarts**: Tools like Shazam become pervasive for all musics, not just pop music
- **One Exchange Format**: MusicXML and MIDI merge as one standard, open source format
- **Hear It and Click It**: Recording devices become increasingly miniaturized with very high resolution (like digital cameras)

CLASSROOM: Digital audio gets intelligence and legs

- Impromptu digital student recordings for classroom analysis and study from anywhere
- Manipulate music recorded events for error detection training
- Sophisticated sonic analysis of music performance nuances and translation to symbolic representations for study
- Interchangeable timbres, pitch changes, and more for exploring what-if music scenarios (Legos music blocks)
- Intelligent music-minus-one flexibility for performance simulation of music genres and ensembles, past and present

ISSUES: Digital audio gets intelligence and legs

- Complexity of the task: it's a lot harder than it looks to go from sonic to symbolic (Mendel 1965!)
- Commercial/pop music tools will outpace and out fund tools needed for music instruction
- Copyright, DRM, and artist compensation remain major hurdles to audio file sharing
- Network bandwidth (especially in U.S.) will inhibit development of interactive, web-based audio recording
- Quality mics and speakers defy miniaturization

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Classrooms go interactive, virtual, as tools shrink

INPUT: Classrooms go interactive, virtual, as tools shrink

Public school administrators/parents will remain quite divided about their endorsement of cell phone usage in the schools for the next 5 years.

48%	1.	Strongly agree
30%	2.	Agree
11%	3.	Undecided
11%	4.	Disagree
0%	5.	Strongly disagree

INPUT: Classrooms go interactive, virtual, as tools shrink

Within two years, all music textbooks will be in electronic form only?

8%	1. Strongly agree
0%	2. Agree
27%	3. Undecided
42%	4. Disagree
23%	Strongly disagree

FUTURE: Classrooms go interactive, virtual, as tools shrink

- **Collaborative Teaching:** Students/faculty take advantage of consortiums like Big Ten, or Southwest Regional, of state systems for classes to be offered as distance learning experiences taking advantages of expert professors
- **Video Gaming**: More examples of video-based technology develop for more "academic" settings
- **"Super" Cell Phones and Tablets**: Become the devices most used in school classrooms
- **SmartBoards**: Become the standard but with rear projection and much like you see on TV crime shows and NBC News
- **eBooks:** Become standard but running on larger touch-sensitive screens and texts are sold as "owned" and not rental. Libraries embrace this technology and become digital repositories

CLASSROOM: Classrooms go interactive, virtual, as tools shrink

- Project-based work prevails but we need to continue to teach skills and knowledge in the context of projects
- Cell phones and tablet computers will be more useful as we portable devices but will still need larger displays as we work with in-class presentations
- We will expect a greater exchange of ideas form students as we work on more sophisticated musical problems with technology support (gather around screens and expect student communication with the screen via hand-held devices
- Rarely request that students buy "hard copy" materials since much of the required work will be in the form of electronic material, videos, projected holography

ISSUES: Classrooms go interactive, virtual, as tools shrink

- What kind of hardware device
- DRM for authors/royalties
- Respectability in the academy
- Interactive capability
- Media capability
- Cost

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Working and making music in the clouds

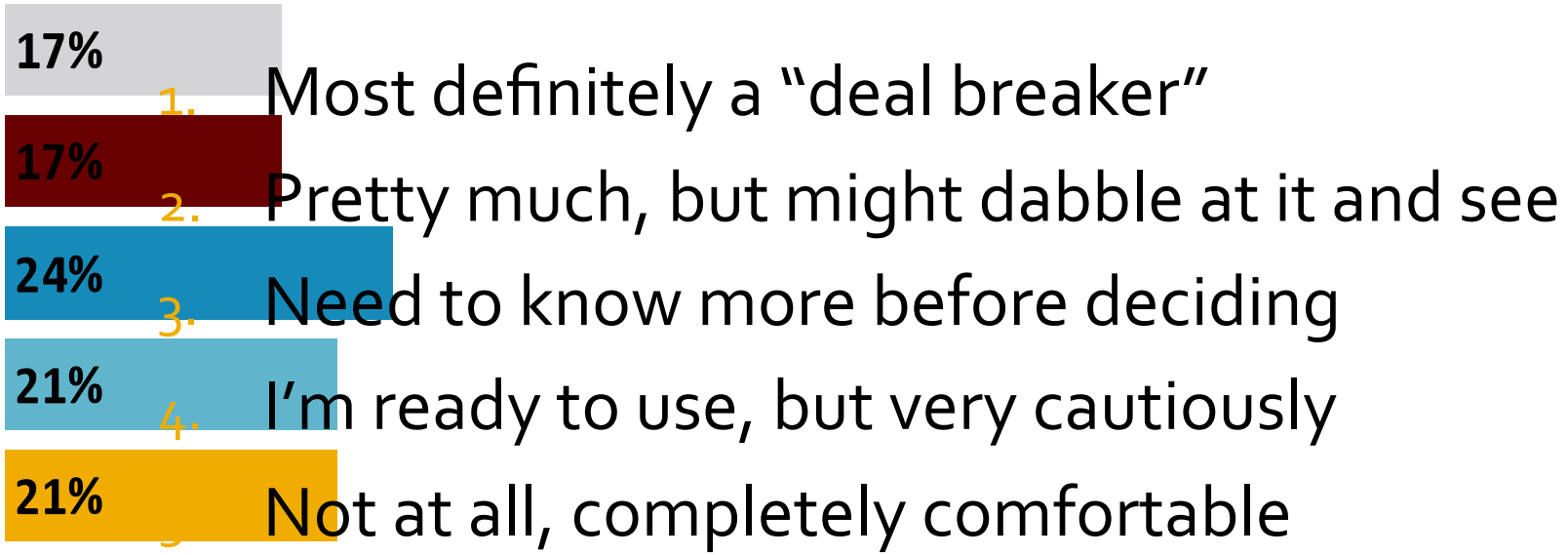
INPUT: Working and making music in the clouds

How likely is it that all of your music classroom activity, students and yours, will soon rely on software tools and storage in the Internet "cloud"?

25%	1.	All of it will be online
67%	2.	Some of it will be online
8%	3.	Undecided
0%	4.	Very little of it will be online
0%	5.	None of it

INPUT: Working and making music in the clouds

Are issues of security and privacy a "deal breaker" for you when it comes to using "cloud" applications and storing personal and scholarly materials?



FUTURE: Working and making music in the clouds

- **Lifetime ePortfolios**: Access to personal resources, scholarly work, and media anywhere, irrespective of hardware
- **Universal Tools**: Expanding set of application tools that are not hardware or personal machine specific
- **World Library**: Virtual access to the mature library of scholarly resources, print and non-print
- **Global Tutors**: Online world repository of curriculum modules, interactive, individualized teaching tutorials
- **Cost Reduction**: Software costs, upgrades, and support greatly reduced (subscriptions replace purchase)

CLASSROOM: Working and making music in the clouds

- Online portfolios will grow in one's personal "cloud" from student musician to retired professional
- Common set of web-based tools for music, research, and admin use through campus or off-campus services
- Attend or participate in performances virtually anywhere, synchronously or asynchronously
- Student and faculty personal lives intertwine as social network trails meet with contacts, photos, life stories, and more.
- Scholarly "authority" will be accessible to anyone, anytime through online wikis, blogs, e-publications, and more

ISSUES: Working and making music in the clouds

- Security and privacy?
- Tethered to the Internet?
  What happens when no connection?
- Cost recovery model? Free ad-based vs. paid subscriptions

ISSUES: Working and making music in the clouds, continued…

- Will advanced music apps work in a cloud-based environment?
- Verifying authority? Need to transfer research skills to Internet resources.
- Changing role of the "professor" as the primary expert or content authority in the classroom. Authorities abound in the "cloud."