"Quick Twenty" lists: a fast, fun, easy way to introduce instructors and administrators to STEM songs for teaching

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- Part of the VOICES "Digital Library" project
- Goals of the Digital Library:
 - Support instructors, administrators, professional songwriters, students, and scholars in creating, finding, and using materials relating to songs for STEM education
 - Develop and encourage best practices for use of songs in STEM classes

Proposed content for the digital library:

Enhanced, curated database

SING ABOUT SCIENCE & MATH

songs for teaching, learning & fu

OME FIND/ADD SONGS LESSON PLANS QUIZZES BLOG OTHER STUFF

Welcome to the "Wikipedia of science songs," covering the expanding universe of educational music since 2004! Whether you're looking for a new YouTube rap video about genomics or a decades-old song about the periodic table, you've come to the right page!

For help with song searches, check out our video tutorial and/or the search tips below. Educators may also wish to read our blog post on incorporating the SAS8M database into your courses and/or our article in *Biochemistry and Molecular Biology Education* (now freely available to all!).

IMPORTANT SEARCH TIPS

You may search one or more fields at a time. If you enter text in multiple boxes, you will get results
that match ALL conditions. Example: if you type tree in the Song Title field and Bill in the
Performer/Songwriter field, only songs whose title includes tree AND whose performer or songwriter
includes Bill will be shown.

 Spelling counts! That is, searches will only match exact sequences of characters. Example: a search for the performer Bungee Jumping Cows yields no matches because the official group name is Bungee Jumpin' Cows. However, searches are not case-sensitive.

 Single words, or even parts of words, often work better in searches than multi-word phrases. (For example, entering mitochondri will match mitochondnal, mitochondria, and mitochondrion.)

 Keywords/phrases may be found either in a song's title or in its lyrics, provided that the lyrics are stored in our database.

When searching for short keywords, consider adding a space before and/or after them. For
example, a keyword search for pi will return hundreds of songs, since this string matches apical,
epinephrine, pine, etc. A search for [space]pil[space] will reduce the number of hits considerably.

Additional tips are posted on our database F.A.Q. page.

SEARCH OUR DATABASE OF 7000+ SONGS (last update: Oct. 20, 2016)

Keyword/Phrase:			Go!	
Keyword/Phrase:			Go!	
Performer/Songwrit	ter:			Gol
Song Title:	100	Gol		2
Song Template:			Gol	
(I.e., the song upo	on which	a parody	is bas	ed)
Album Title:		G0!		
Website URL:		Go!		
(e.g., youtube.con	n [omit h	ttp://ww	w.])	
	Song Suggested By:		1.000	100
			G	iol

Additional (optional) search restrictions:

Only include songs intended for students between ages and 99. (Songs for "all ages" or adults will not be included if the range is narrowed to less than 0-99.)

Only include songs known to be parodies.

Only include songs with online lyrics.

Only include songs with online tytes.
 Only include songs with full-length online audio.

Only include songs with full-length online videos.

Only include songs with lesson plans.

Only include songs with online scores (sheet music).

Don't include songs that may contain adult language.

Proposed content for the digital library:

- Enhanced, curated database
- Flashcard summaries of the best scholarly articles about STEM songs closed questions was administered during class time. The Equilibrium Song design of the questionnaire began with a data analysis plan A system at equilibrium is dynamic, such as every question had a purpose and should produce

the best possible data for the purpose of this action research. The questions had to be very clear such that there was no misinterpretation and to make it easy for students to provide valid, accurate, and reliable answers. In addition, the questions designed had to fulfil content validity to ensure that the sample questions was measuring what was intended to be measured [9].

Students were given approximately 5-10 minutes to complete the questionnaire and to add in any additional Chorus comments. They were not requested to write down their names in the forms, hence there was a level of anonymity and they were able to write down their opinions without fear. A frequency count was done for each question and figures were used to present the findings. The results of the questionnaire were analyzed and categorized

Additional studies could be done to include a more

- The concentration of products and reactants, They'll always and forever be a constant, Rate of forward, reverse reactions will be same
- Kc calculations are popularly tested, Ke tells us how far a reaction occurs. If Kc is much smaller than the value of 1 This means there is very little product formed.

3. Results

Le Chatelier's Principle is so important, When Temperature of the system increases, The equilibrium, it will shift to endothermic.

40 Strongly Agree 30 Agree Neutral 20 Disagree Strongly disagree - Teagura as and tool s stepsteducing Valey Deschool o'n real of mateos? Ale sorts antipatie WR POLIDE BORD BORD

Figure 1. Analysis of questionnaire results based on action research conducted on ninety five Monash University Foundation Year (Science) students. A questionnaire, consisting of six closed questions was administered: 1) Are songs helpful as a study tool? 2) Do you find songs stress-reducing? 3) Do

Proposed content for the digital library:

- Enhanced, curated database
- Flashcard summaries of the best scholarly articles about STEM songs
- Templates for learning guides

Needed for full implementation:

- substantial investment of time and money
- grant support

A start: The Quick Twenty Project

- 20 pretty good songs from each STEM field, showing the power of STEM songs for teaching, and the range of approaches to using them
- Relatively easy to assemble
- Approachable: quick, fun

Expectations for each song:

- Usefulness for teaching
- Lyrics & recording freely available online
- Ideas for use in a course, specific to the song

Example from a semi-professional STEM songs person: I'm a Virus, by Glenn Wolkenfeld



https://youtu.be/kYf_Sl8W3qY

I'm a Virus (Lyrics)

Virus Interactive Lyrics

Mode: Learn

Q #1/8; Correctly labeled 0 out of 4 items

Move each item to its correct place

cell
 infectious
 metabolism
 reproduce

I'm a virus, an _____ particle,

a nano-thug, a pirate, the genuine article

Ebola, chickenpox, west Nile, influenza,

Yellow fever, AIDS, herpes, SARS, I'm comin' right at ya

I'm not a _____, not an independent organism,

I don't even have my own

I only myself by taking over cells,

Then I bust 'em apart, no wonder you don't feel well!

I'm a Virus (Lyrics)

Virus Interactive Lyrics

Mode: Learn	8 questions, 1 response, 1 correct, 0 incorrect, 7 to g
Move each item to its con • cell • infection	rrect place us • metabolism • reproduce
l'm a virus, an infect i	ous particle,
a nano-thug, a pirate,	the genuine article
Ebola, chickenpox, we	est Nile, influenza,
Yellow fever, AIDS, he	rpes, SARS, I'm comin' right at ya
I'm not a cell , not a	in independent organism,
I don't even have my o	own metabolism,
I only reproduce my	yself by taking over cells,
Then I bust 'em apart,	no wonder you don't feel well!
Good!	
You placed all of the it	ems correctly on the first try!
Next question	

Example from a professor: Poiseuille's Law, by Greg Crowther



https://youtu.be/9lnznkgQ-NQ

Lesson Plan

Songs like this one can be used during class meetings and/or in homework assignments. Either way, the song will be most impactful if students DO something with it, as opposed to just listening.

An initial, simple follow-up activity could be to answer the study questions below. A more extensive interaction with the song might entail (A) learning to sing it, using an audio file and/or sheet music as a guide, and/or (B) designing kinesthetic movements ("dance moves") to embody it. The latter activity could begin with students identifying the most important or most challenging content of the song, and deciding how to illustrate that particular content.

Study Questions

(1) What is Poiseuille's Law used for? That is, what does it calculate? In what units should be answer be reported?

(2) What does the "r" in the song stand for?

(3) The song states, "The blood flows around and around and around." Is this true?

(4) How does vessel radius relate to resistance to blood flow?

(5) What is delta P here? Is this the same delta P that is in Fick's Law of Diffusion?

(6) Of all the terms included in the equation, which one has the strongest influence on blood flow?

(7) Your classmate claims that blood flow is dependent on vessel DIAMETER raised to the fourth power. Is this true? Poiseuille's Law of Laminar Flow (1) Poiseuille's Law calculates the rate of blood flow through a single blood vessel of the circulatory system. Units should be volume of blood per unit time, e.g., milliliters per second.

(2) "r" stands for radius -- the radius of the blood vessel.

(3) Blood does flow in a circuit: from the left heart to the various tissues of the body, back to the right heart, to the lungs, to the left heart, out to the various tissues again, and so on.

(4) Resistance to flow (often abbreviated with a capital R) is inversely proportional to radius to the 4th power (r⁴). As radius increases, resistance decreases.

(5) Here delta P refers to a difference in hydrostatic pressure over the length of the vessel. It is not the same as the delta P in Fick's Law of Diffusion. That delta P refers to a concentration difference of dissolved gases (whose concentrations are reported as partial pressures).

Expectations for the list:

- Examples from each educational level
- Reasonable gender balance of song authors and performers
- Each song labelled with its general area (e.g. "electricity") and topic (e.g. "Ohm's Law")
- The list should include at least 3 general areas.

High priorities for the list:

- Some songs set to well-known tunes written in the last 10 years.
- Some songs set to original tunes.
- Variety of song genres (e.g. folk, rap, rock, country).
- Songs by professional songwriters and by nonprofessionals.
- Some songs with polished recordings/videos, and some with rather unpolished recordings. (Setting the bar too high may discourage some.)

- Have subject coordinators for physics, biology, and statistics.
- You to develop a Quick Twenty list for another STEM field?
- astronomy, chemistry, computer science, engineering, geology, math, psychology, ...
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