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Rapping to review: A novel strategy to engage students and summarize course material

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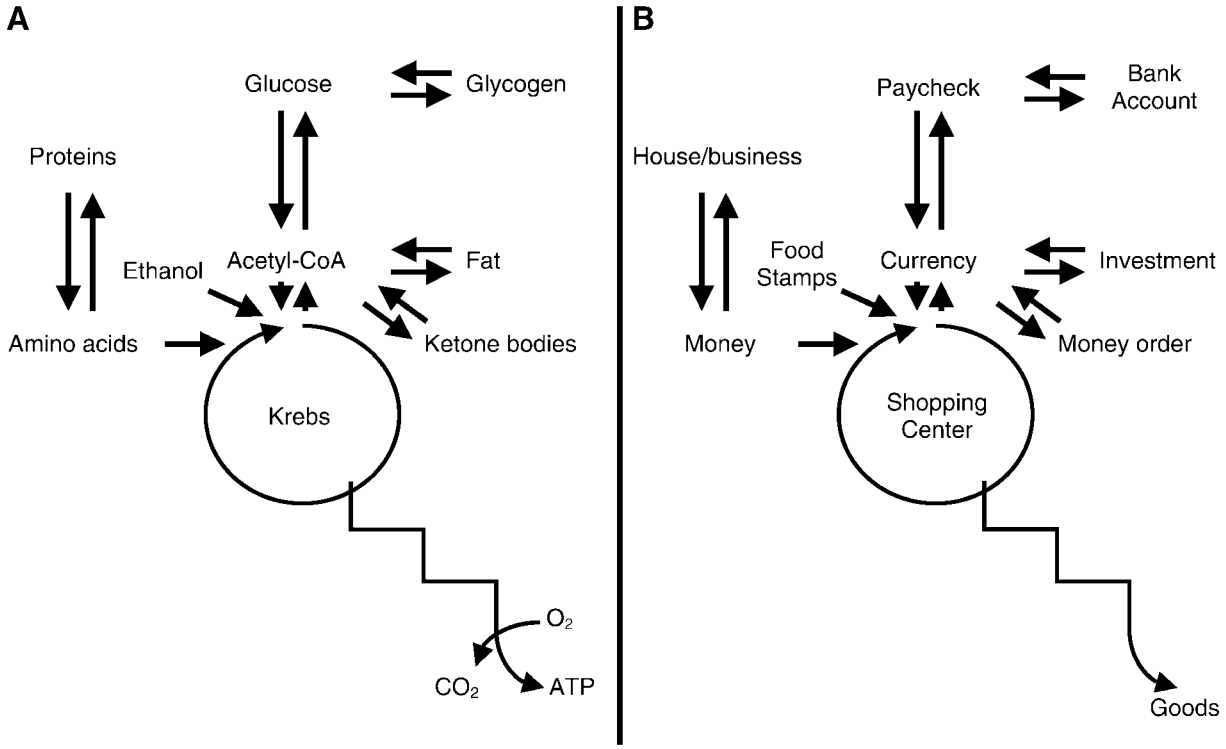

FIG. 1.
***A*: intermediate metabolism. *B*: analogy.**

larly, we can purchase money orders to send currency to friends and family. Ethanol is another source of energy. During the metabolism of ethanol, NADH is accumulated and used to produce ATP. For every ethanol molecule that is metabolized, one glucose molecule is no longer necessary and thus will be stored. In the analogy, ethanol represents food stamps that are good only to purchase food. Sometimes, in addition to a paycheck, people receive food stamps. Although food stamps cannot be converted to currency, every time a stamp is used to buy food there is currency that is not spent and thus will be stored.

Finally, if it is necessary, proteins can be degraded to amino acid residues that are converted to acetyl-CoA, which in turn can be used to produce energy or glucose (gluconeogenesis). This is, however, not a good idea for the body (catabolism). In the analogy, proteins represent a house or business, the most solid way to store money for a long time. If some day your income is seriously reduced, selling your home or business will produce the money that is needed for living. As with proteins, however, on the long-term basis this is not a good idea.

Students enjoy this analogy, which produces a clear picture of intermediate metabolism. I found this analogy also useful for the general public to assist them in understanding the mechanisms by which people gain or lose weight and how different diets work.

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RAPPING TO REVIEW: A NOVEL STRATEGY TO ENGAGE STUDENTS AND SUMMARIZE COURSE MATERIAL

Recent studies indicate that hip-hop can successfully be used as a tool in the K-6 classroom to improve literacy skills (1, 7). Although hip-hop is in its infancy, some educators are

using it as a mnemonic device to help students with math and history facts (8). The use of music as a way to stimulate and teach new material is based on the work of Howard Gardner, an educational psychologist best known for his theory of multiple intelligences (2). Gardner stresses the use of nontraditional teaching techniques to account for different learning styles (3). In fact, some science educators have used music to teach traditional lessons, such as biological classification (6). This semester, I used this novel teaching technique to review the semester's material in my undergraduate, nonmajors' Anatomy and Physiology 2 course and used the popular Carlos Santana song "Since Supernatural" (4) as my template.

Few science educators incorporate music in their lessons. I was inspired by Professor Helen Davies, a University of Pennsylvania microbiology professor, who uses song to teach about infectious disease (5). Although she uses popular tunes such as Simon and Garfunkel's "Sound of Silence" and the Beatles' "Yesterday," her tuneful teaching style has won her many awards, including the National Golden Apple for Teaching Excellence.

Below are revised lyrics to Carlos Santana's "Since Supernatural," called "Phys is Supernatural." Students really enjoyed the review, and one commented that it was the most original thing that he had seen so far in their college experience. As a strategy to expand on this idea, teachers should consider having students write their own rap lyrics to actively engage them in the material. Furthermore, teachers may focus on a more specific area to provide greater depth and detail of the subject matter.

Phys Is Supernatural

TURN THIS UP A LITTLE LOUDER NOW
TURN THIS UP A LITTLE LOUDER NOW
TURN IT UP

LADIES AND GENTS YOU'RE TUNED TO THE SOUND OF A AND P 2

WHERE THE KIDNEYS AT?
WHERE THE LUNGS AT?

HERE IN PHYSIOLOGY NOTHING'S CHANGED
HOMEOSTASIS IS THE NAME OF THE GAME
FLUCTUATIONS THAT ARE OUT OF THE RANGE
ARE SENSED TO PREVENT DANGER
SITUATIONS THAT WOULD MAKE YOUR HEART STOP
WOULD MAKE ALL THE SYMPATHETIC NEURONS START
FIRING TO SYNAPSES ON EVERY PART
WHERE RECEPTORS ARE FOR
EPI, ACH, AND NE
PUPILS DILATE, HELPS YOUR SEEIN'
PRESSURE'S DROPPING, CO'S STOPPIN'
GOTTA GET THAT BLOOD FLOW HOPPIN'
BLOOD CELLS-WHITE, T CELLS FIGHT
WHAT HAPPENS DURING FIGHT OR FLIGHT?
THE SPLEEN IS SLY
AND RED CELLS DIE
AND LYSOZYMES COME OUT WHEN YOU CRY

OH, BP, BP, BP
NEGATIVE FEEDBACK
NO MATTER WHAT IT IS
BARORECEPTORS KEEP TRACK
WHEN IT'S GOING TOO HIGH
THE FIRING IS LOW
OH, DON'T WORRY ARTERY
NO ANEURYSM FOR YOU!
AND EACH MOMENT IN TIME
YOUR STOMACH KEEPS TRACK
OF THE LEVEL OF CHYME.
I AIN'T TOO MUCH OF A DORK TO SEE
THERE'S AMAZING STUFF TO LEARN IN PHYSIOLOGY.

WITH HOMEOSTASIS AIN'T NOTHING CHANGED
NEURONS KEEP FIRING UP TO YOUR BRAIN
KEEPING TABS ON YOUR PLEASURE AND PAIN
UNTIL THE SIGNALS START TO WANE
HYPOTHALAMUS SENDING SIGNALS
TO THE PITUITARY
CRH, TRH MAKIN' THYRO
THE ENDOCRINE SHOW WITH HORMONES—BUT THEY'RE SLOW!

POLYS STREAM IN, PHAGOCYTES CLEANIN'
WHITE CELLS COMING, YOU KEEP DREAMING
FEVER'S PASSING
FOOD'S MY PASSION
SINCE THOSE BAD BUGS GOT A BASHIN'
GORGE TONIGHT, TOO MUCH FAT, TOO MUCH CARBS, TOO MUCH RICE.
MY GUT NOW HAS HCL TOO HIGH
REVERSE PERISTALSIS, OUT IT FLIES!

VC, VC, VC
KEEP YOUR BREATHING ON TRACK
IF THE CO_2'S HIGH
CHEMORECEPTORS BRING IT BACK
IF THE PH IS UP
THEN THE BREATHING IS LOW
OH, DON'T WORRY KIDNEYS
WE DIDN'T FORGET YOU!
CAUSE IF THE PH'S NOT FINE,
ACIDS IN THE URINE
ARE GONNA LEAVE ME BEHIND.
I AIN'T TOO MUCH OF A NERD TO SAY
PHYSIOLOGY IS FUN IN LOTS OF WAYS

WHERE THE KIDNEYS AT?
WHERE THE LUNGS AT?

HEY, B CELLS
MAKE THE BACTERIA DIE

JUST KNOW IN THE BODY
HOMEOSTASIS WANTS TO PREVAIL

BRAIN, GUT, FRONT AND DORSAL SIDE
PHYSIOLOGY IS SYSTEM-WIDE
HEART, LUNGS, HEAD, AND VENTRAL SIDE
HOMEOSTASIS LETS YOU MAKE IT FOR THE LONG RIDE

CAPILLARIES WOULD YOU EXCHANGE
EXCHANGE SOME OXYGEN FOR ME

BRAIN, GUT, FRONT AND DORSAL SIDE
PHYSIOLOGY IS SYSTEM-WIDE
HEART, LUNGS, HEAD, AND VENTRAL SIDE

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References

1. **Anderson E.** Rap Music in the Classroom? *Teaching English in the Two-Year College* 20: 214–221, Oct 1993.
2. **Gardner H.** *Frames of Mind: The Theory of Multiple Intelligences.* New York: BasicBooks. 1983.
3. **Gardner H.** *The Unschooled Mind: How Children Think and How Schools Should Teach.* New York: BasicBooks. 1991.
4. **Jean W, Duplessis J, and Washington G.** Since Supernatural. On: *Shaman.* CD by Carlos Santana.
5. **Kadaba L.** A teacher's infectious tunes. *Philadelphia Inquirer*: May 2, 2001.
6. **Lykins KV.** The "musical" method of teaching classification. *Am Biol Teacher* 55: 182–183, 1993.
7. **Morrell E and Duncan-Andrade JMR.** Promoting academic literacy with urban youth through engaging hip-hop culture. *English J*: July 2002. [Abstract online] http://www.ncte.org/ej/abstracts/0916july02/promoting.shtml.
8. **Wellington E.** Reading, writing, rapping. *Philadelphia Inquirer*: May 7, 2003.

SIMPLIFIED INTERPRETATION OF THE PACEMAKER POTENTIAL AS A TOOL FOR TEACHING MEMBRANE POTENTIALS

Most courses of physiology start by teaching about membrane potentials in different cells. Many of our students find these ideas difficult to understand. Often they try to memorize facts rather than understand mechanisms. The most difficult task may be interpretation of the pacemaker potential generation in sinoatrial (SA) cells. This illumination attempts to improve students' understanding of membrane potentials by giving them a simplified interpretation of pacemaker potential generation before they have group discussions.

This simplified model interprets the pacemaker potential as a hyperpolarization wave that is not able to reach the hypothetical resting membrane potential (calculated to be about −14 mV), because the triggering potential of calcium/sodium channels (−40 mV) initiates the next cycle. The continuous cycle of electrical activity in SA cells would then consist of four stages: depolarization (opening of calcium/sodium channels), repolarization with hyperpolarization (opening of several types of potassium channels), hyperpolarization recovery (cessation of potassium permeability), and triggering of depolarization without ever reaching the resting membrane potential. Although this is an oversimplified interpretation of SA potential generation, students who can understand and discuss it are better able to interpret resting and action membrane potentials.

The following text is given to medical students as reading material for discussion that is usually scheduled for the following week. The students can use their textbooks (1, 3) or other references (2, 4). In **Simplified characteristics of SA cells** below, students are asked to calculate the hypothetical resting potential for the SA cells based on a Na/K permeability ratio of 0.58:1.00 and the following ion concentrations: extracellular Na^+ = 142 meq/l and K^+ = 4; intracellular Na^+ = 14 meq/l and K^+ = 142 meq/l (4).

Answer

$$\text{EMF} = -61 \log(140 + (0.58 \times 14)/[4 + (0.58 \times 142)] = -14.3 \text{ mV}$$

where EMF is electromotive force.

They are also expected to draw a graph similar to Fig. 1.

Text for Study by Students

A simplified interpretation of the SA potential generation. *Please refer to your textbooks and other sources.*

Simple facts about membrane potentials. *1*) More permeable membranes have better defined membrane potentials that are less variable than potentials of less permeable membranes. The high permeability seems to anchor the membrane potential near the Nernst potential of that ion. The cost of stabilization is the high ion flux that must be compensated by more work of ion pumps.

2) Hyperpolarization can be described as a more pronounced negativity of the membrane potential after repolarization. The occurrence, quantity, and duration of the hyperpolarization wave necessarily reflects momentary membrane permeability for certain ions. Hyperpolarization is caused by the temporary relative increase in potassium permeability compared with the resting phase. If this increase in potassium permeability is small, the hyperpolarization wave will also be small. For example, if a certain membrane is almost exclusively permeable to K^+ ions, it will have a membrane