"The Tectonic Drag"
by Merrie Koester, Ph.D.

I. Intended Grade Level: Middle and High School

II. Objective: To ask students to explore and model the dynamic Earth movements of plate tectonics through kinesthetics – preferably through a choreographed "line dance." After working through this cooperative group project, students then assess their understanding of plate tectonic concepts through peer teaching.

III. Key Concepts:

- Plate tectonics
- Sea floor spreading
- Mid-ocean rifts and ridges
- Ocean floor dating
- Convection currents as one possible mechanism for plate tectonics
- Types of plate boundaries
    1. **divergent**
    2. **convergen**t (both ocean / ocean and ocean / contintent)
    3. **sliding** (strike/slip)
- Earthquakes and volcanoes associated with plate boundaries
- Earthquake drill maneuvers
- Mountain building and tectonics

IV. Subjects and Discipline: Earth science

V. Time Needed: This can vary depending on whether teams of students practice during class time or on their own time. I usually allow up to 3 class periods for "rehearsals" if my schedule permits. Teams then perform their "drags" for their classmates and other invited guests like administrators, other science teachers, etc.

VI. Materials:

- Student copies of "The Tectonic Drag"
- Downloaded samples of beat, hip hop, or rap music

VII. Suggestions and Safety Precautions: This is a most enjoyable and safe activity. Of course, no horseplay should be allowed. The trickiest part is finding a suitable place on campus for students to practice. The gym, empty classrooms, or auditorium if available are all good suggestions. Be sure to obtain the principal's approval.

VIII.. Self-assessment through peer teaching : Have students, who should by now be "experts" of sorts on plate tectonics, design a lesson themselves in which they must use art and/or technology to teach a portion of the tectonic drag (with its parallel concepts) to their peers.

IX. Procedure:

- After students have learned the key concepts of plate tectonics (see above list), then introduce this assignment. It serves as excellent reinforcement of the material before testing.

- Beforehand, you will have either assigned the students to teams yourself or had them draw numbers from a hat to be randomly grouped together. You will also need to have yourself practiced performing the "Tectonic Drag" to the music of your choice to serve as an example.

- Expect some students to balk at the idea of dancing in front of their peers. Patiently explain that this activity, which will be counted as a quiz or testgrade, may make you step outside of yourself for awhile, but end up being quite fun!

- With great expression, you tell your students that they are going to be choreographing the movements of plate tectonics with a line dance of sorts and that you will give them the words to use. Then turn on your rap music and dramatically perform the "drag."

- Tell them you will allow 3 (or however many you are allowing) class periods to rehearse and that afterwards they will perform their dances, which you will be videotaping for posterity, reflection, and assessment purposes.

- Finally, go through the rap line by line to reinforce and identify all the plate tectonics concepts that are being covered in its verses.

- Be sure to keep track of the level of individual participation in each group. (See Assessment Rubric for Group Projects. I often have students assess themselves as well as the others in their group.) Beware of "freeloaders" who give very little input but expect full credit. These students will have to be graded separately from the rest.

X. Science Standards.

Earth Science: Earth Processes

Content Standard B – Structure of the Earth System

- Understandings of the lithosphere and asthenoshere
- Major geologic events such as earthquakes, volcanic eruptions, and mountain building, which result from lithospheric plate motions.

XI. Skills:

Cooperation with peers
Problem solving
Analysis
Application of subject matter content
Creative expression
Gross motor skills, coordination, and rhythm
Self-assessment through peer teaching

XIII. Vocabulary

crust
mantle
core
lithosphere
asthenosphere

oceanic crust
continental crust
divergent boundary
mid-ocean rift / ridge
subduction / convergence
deep ocean trench
volcanic mountains
hot spot
convergent boundary / mountain building
earthquakes
Rim of Fire
sliding boundary / strike-slip fault
San Andreas Fault

THE TECTONIC DRAG

On the floors of the sea are rifts and ridges
that circle the world like gigantic zippers.
From these giant cracks, the sea floor spreads –
pushing older rocks right out of their beds.

CHORUS:

Let your arms go up and out and down;
they're convection currents going round and round.
Convection currents are the driving force that
push the Earth's plates along their course.
The plates are doin' the TECTONIC DRAG –
spreading, crashing, diving – making buildings sag.

While some plates move apart from each other –
others run head on and collide together.
When crust of ocean meets crust of land,
the former gets buried beneath the sand.
When two land plates collide head on,
they rise in the middle to build a "mounton."

But when one land plate slides past another one,
great earthquakes happen, and they're NO FUN!
There's a rockin' and a rollin' all along the crack,
while people drop and cover, prayin' it won't come back!

CHORUS: Let your arms go up.....

ASSESSMENT RUBRIC FOR GROUP PROJECTS

CRITERIA	Exceeds expectations (20 points) *	Meets expectations (12 points)	Fails to meet expectations (0-4 points)
COMMUNICATION	Shares ideas with peers in a way that adds to the group effort.	Occasionally initiates new ideas or suggestions.	Provides little or no help to the group in the form of constructive ideas.
OPENNESS TO LEARN	Is very willing to try something new and work with other members of the group.	Reluctantly goes along with the group.	Rejects the whole idea of the assignment.
RESPECT	Listens to others; encourages others to contribute ideas; accepts alternative perspectives; is tolerant of the shortcomings of others; and helps others to succeed in class.	Is tolerant of others, but often dominates the group activity or discussion. Listens to the ideas others, but generally maintains personal views and ideas.	Dismisses the thoughts and ideas of others; possibly uses rude language to ridicule. Offers ideas that are limited to his or her personal opinions.

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Score: _____ / 60

* Point values will vary depending on the project.

NOTES / COMMENTS: