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Contextual Teaching Exchange

A publication for educators committed to helping all students excel through the use of contextual teaching strategies

Infusing Workplace Writing into the Study of Literature

Theresa Spangler, Brunswick High School, Glynn County, Ga.

Several years ago my high school seniors rushed into my classroom with their thank-you notes, graduation announcements, and memory books. As they looked at the treasures that symbolized the end of high school, one girl carefully examined her box of thank-you notes. "Mrs. Spangler," she shrieked, "I won't ever get five paragraphs on this little card!"

Although I laughed, the message was clear. In an attempt to prepare students for standardized writing tests and college freshman composition courses, we have afforded our students very few opportunities to learn the writing structures that the workplace demands. This incident was an epiphany for me, and thus, my campaign to teach "real-world" writing formats began.

Although most current textbooks now provide quality workplace writing assignments, I enjoy creating my own. As a language arts instructor many of my writing assignments are tied to literature.



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Physics – Why Bother? ... That's Why!

Ray Kaschalk, physics teacher, Watkins Glen High School, Ny.

Motivation? Or lack of motivation? –That is indeed the question for a high school physics teacher. Many physics teachers dread the coming of spring, for with it comes a peculiar malady, which can strike at the hearts of even their most ardent students. Some teachers refer to this strange affliction as senioritis, but I refer to it as "whybother-itis."

I feel that this name hits closer to the mark, because, for many of my students, it is the first time in their otherwise illustrious careers that they have deliberately taken time to stop what they've been doing and ask, "Why bother?"

I think the term "senioritis" is dangerous because it kind of implies an almost resigned acceptance – that a student, once infected, has almost no chance of recovery. I have been fighting the good fight with my seniors for years, and I realize now that this may actually be the most important "teachable moment" of their secondary education experience.

In my state, the high school curriculum is almost entirely driven by mandated testing. Our students are herded through at a break-neck

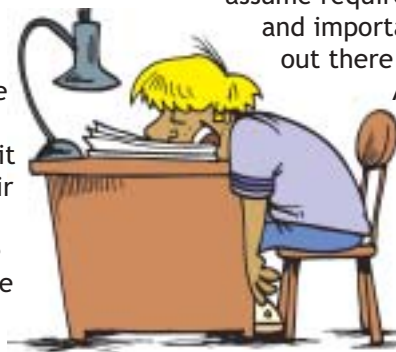
pace, and the high-achieving students obsess about doing as well as they can on these exams.

Sometimes we become so focused on "what is required" we don't take the extra time to really examine our surroundings and our communities to find out what is going on in the real world. We assume required content is relevant and important, but we don't get out there to see for ourselves.

As far as physics goes, why might a student that will be majoring in music in a few months need to know the difference between a quark and a hadron?

The trouble with teaching a senior elective course is, at some point, students realize the horse race is over. It may be when they finally get the college acceptance or scholarship that they've worked so hard for. It may be when they find out what their final class ranking will be. Or it may just be when they realize that they are going to graduate and nothing short of disaster will prevent that from happening. Whatever the case, it is at that one point, that critical moment, when a student stops, takes a deep breath, and wonders, "Why bother?"

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Terminal Velocity Lab

Name: _____

Jim Evans, Broken Arrow Senior High School, Broken Arrow, Okla.
An activity for physics and Principles of Technology classes.

Purpose: To observe terminal velocity and its effects on an object.

Theory: Terminal velocity occurs when the

$$\text{Drag Force} = \text{Falling Force}$$

$$F_{\text{drag}} = F_{\text{gravity}}$$

Materials:

6 coffee filters
meter stick

stopwatch
electronic balance

Procedure:

1. Weigh all 6 coffee filters. Calculate the mass of 1 filter by dividing the total weight by 6. Be sure to record the mass in kilograms.
2. Measure the diameter of a filter without flattening it. Calculate the area of the filter: $A = \frac{1}{4}\pi(\text{diameter})^2$. Be sure to record the area in meters squared.
3. Measure the height for the drop. (Should be at least two meters.)
4. Drop a single coffee filter (bottom down).
5. Observe that the filter keeps a rather uniform speed. Why?
6. Drop it again, but also drop a crumpled filter beside it. What is the difference?
7. Drop the uncrumpled filter again, recording the falling time in the table.
8. Repeat step 7 with two filters stacked together, then with three, four, and five filters.

Data:

Mass of filter: _____ kg

Area of filter: _____ m²

Height of fall: _____ meters

No. of Filters	Time (sec)	Average Velocity (m/s)	Drag Coefficient
crumpled	_____	_____	_____
1	_____	_____	_____
2	_____	_____	_____
3	_____	_____	_____
4	_____	_____	_____
5	_____	_____	_____

Graph:

Using your data, graph Time vs. Filters. Place a line on the graph representing the fall of the crumpled filter. This should be a limiting value – for maximum or minimal drag.

Calculations:

$$F_{\text{drag}} = \frac{1}{2}C_d A \rho v^2$$

C_d = coefficient of drag

A = area of surface

ρ = density of fluid air

v = velocity

When constant velocity is reached, the net force on the filters will be = 0, or $F_{\text{drag}} = F_{\text{gravity}}$

$$\frac{1}{2}C_d A \rho v^2 = mg$$

For each row in the table, calculate: Average Velocity = Height of Fall/Time of Fall

Use acceleration of gravity $g = 9.80 \text{ m/s}^2$ and density of air $\rho = 1.29 \text{ kg/m}^3$. For each row in the table, calculate the coefficient of drag for a filter.

$$C_d = (2mg) / (A\rho v^2)$$

What are the units on the drag coefficient? _____

Teacher's Notes for Velocity Lab

The velocity lab came from a reading on the Internet. Modern physics began some 500 years ago when Galileo dropped metal balls of different masses from a height (supposedly the 'leaning tower' of Pisa). They hit the ground at the same time, though most expected the heavier ball to hit the ground first. This only occurs consistently by neglecting air resistance.

By contrast, when an empty coffee filter is dropped, air resistance is **not negligible**. Drop a filter from heights of one and two meters and measure how long it takes to hit the ground. Since doubling the distance doubles the time, the data indicate that the coffee filter reaches the terminal velocity very quickly.

One filter at varied distances	
Distance	Time(sec)
1 meter	1.15
2 meters	2.30

If you stack the filters and drop them at a fixed distance of 2 meters:

No. of filters	Time(sec)
1	2.30
2	1.60
3	1.30
4	1.15

The data imply that the force of air resistance appears to be a quadratic function of the velocity. I later found the formula

Force of Drag = $\frac{1}{2}$ (density of fluid)(velocity²)(Coefficient of drag)(area of the object)
as used in the "Calculations."

For your information, the following is a list of terminal velocities for several common objects:

Object	Mass (lb)	Diameter (in)	Terminal Velocity (mi/hr)
16 lb shot	16	4.72	325
football	0.91	11.1 x 6.8	100
baseball	0.32	2.9	95
golfball	0.1	1.68	90
softball	0.4	3.82	80
handball	0.14	1.88	75
tennis ball	0.13	2.56	70
squash ball	0.07	1.77	55
soccer ball	0.94	8.75	55
basketball	1.31	9.47	45
volleyball	0.59	8.43	35
ping-pong ball	0.006	1.47	20

Color Your World

Jerald Duncan

Earth is the fifth largest planet in our solar system. There are nine planets in all. The accepted diameter of Earth is 7922 miles. If you pretend that Earth is a sphere, then the surface area of the planet can be calculated using the formula for surface area of a sphere. Don't remember the formula? Think of the surface area as equal to the area of four circles with the same radius. That's $4\pi r^2$. And, in the case of Earth, it would be millions of square miles.



When you look at a globe or map of Earth, there are certain colors that designate various physical features such as blue for water, brown for land, green for forests and vegetation, and white for ice.

Use your math skills to calculate the total surface area of Earth and to determine how much of Earth's surface is covered with each color.

What is the total surface area of Earth?

Blue

The most common color is blue. That's because almost three-fourths of Earth's surface is covered with water. Actually, the figure is more like 71%. Of that total, only 3% is fresh water. Two percent of that is frozen, leaving only 1% in lakes, rivers, and underground water sources.

If Earth's surface is three-fourths water, how much is that in acres?

If you say three-fourths instead of 71% (which is more accurate), how far off, in acres, is your approximation?



If the surface area for water is 71%, how much is salt water and how much is in rivers, lakes, and underground water sources?

Brown

Brown symbolizes dirt or land. That's where the earth gets its name. The other planets were names for ancient gods or mythological characters. Earth is also called "*terra firma*," which is Latin for "dirt." The land portion of Earth is about 29% of the total surface area. Of the land area, one-fifth is mountains and one-eighth is desert. People (approximately 5.8 billion) share the land with other creatures and vegetation.



How many square miles of dirt are there on the planet?

If there are 640 acres in a square mile, how many acres of land are there on the earth?

How many acres of mountains and how many acres of deserts are there on Earth? What is the total for both?

How many acres are left for people, animals, and other stuff?

If you subtract 10 billion acres for the trees and divide the rest evenly among the world's 5.8 billion people, how much land, in acres, per capita (per person) would each receive?

Green

If there are currently 11 billion acres of trees, what percentage of the land is covered in forests?

In 1990, botanists and the Food and Agriculture Organization of the U.N. changed the definition of a tree. The previous definition came from the Dictionary of Forestry and was "a woody perennial plant, typically large and with a well-defined stem or stems carrying a more or less definite crown." The new definition defines a tree as a plant with solid mass of a tissue called secondary wood with a minimum height of 5-7 meters. Due to the change in definition, the net forest area has changed from 3,963 million *hectares* to 4,484 million *hectares*.



How many more acres of forest did the new definition add?

By what percentage did the new definition make the forest area increase?

White



Remember, 71% of Earth's surface is water. Ninety-seven percent is saltwater, and the rest is fresh water. Two percent of the freshwater is frozen.

How many acres of ice and snow are there in the world?

Creating a Board Game

Theresa Spangler, Brunswick High School, Glen County, Ga.

"Creating a Board Game" is a fun activity that teaches both content-specific and SCANS skills objectives. It is appropriate for grades 6-12. Writing the instructions for play is an excellent technical writing assignment.

SCANS Skills: *The student will:*

- work well in teams
- teach others
- acquire and evaluate data
- interpret and communicate information
- design systems
- apply technology to specific tasks
- possess good writing skills
- think creatively
- make decisions
- solve problems

Student Instructions

Activity: In a group of three or four, design a board game for high school students that teaches a literature selection (or the periodic table, vocabulary words, a math concept, etc.). Write the instructions which should include:

- a definition of the game (Include the number of players, the age of the players, and the objective or what the game teaches about the literature selection.)
- an equipment list
- the object of the game (how to win)
- board set-up
- instructions for play

Suggested Materials for Game Board:

- magazine pictures
- small objects for pawns (buttons, pennies, rocks)
- dice
- poster board
- markers
- construction paper
- computer clip art

Assessment:

Games will be assessed on the educational value of the game, the instructions for play, entertainment value, the appearance of the game board, creativity, and originality.



Infusing the workplace, cont.

Writing Suggestions The Tragedy of Macbeth

- Make a **T-CHART** analyzing Macbeth's decision to kill King Duncan.
- Write a **MEMO** to Lady Macbeth informing her of the prophecy and his recent promotion.
- Write a **DISMISSAL NOTICE** from King Duncan to the Thane of Cawdor. Cite reasons for his dismissal.
- Write an official letter from King Duncan to Macbeth informing Macbeth of his promotion to Thane of Cawdor. Include your **CONGRATULATIONS**. Mention Macbeth's past accomplishments and service record.
- Write a **LETTER OF INVITATION** from Lady Macbeth to King Duncan inviting him to visit.
- Write a **NEWSPAPER ARTICLE** about the untimely death of King Duncan or about Laby Macbeth's death.
- Write an official **PRESS RELEASE** from the castle informing the Scottish citizens of King Duncan's death.
- Write Malcom's **INAUGURATION SPEECH**.
- Detail the murder plot, step-by-step. Use a **FLOW CHART** showing chronological order.
- Write the witches' potion in the form of a **RECIPE**.
- Write a **PHYSICIAN'S REPORT** on Lady Macbeth.
- After the death of Lady Macbeth, Macbeth is disillusioned. He believes that his life "signifies nothing." Write an excerpt from Macbeth's **MEMOIRS** detailing his regrets.
- Create **WANTED POSTERS** for Malcom and Donalbain.
- Write a **LETTER OF CONDOLENCE** to Macduff expressing your sorrow at the loss of his family.



Physics— Why Bother?, cont.

I choose to use the term “whybother-itis” because this term addresses the true nature of the phenomenon, and implies, instead, that a question is being asked which begs for a decent response. I recognize that this is the point at which I can finally do what I have spent my life learning to do - answer that question! But this is not an easy task. The answer does not come overnight and the cure, once it’s applied, does not work instantly. The problem with this condition is that it does not affect students at the same time (some develop a case before ninth grade) or in the same degree. The key to proper treatment, then, is difficult - it requires answering “the question” each and every day you step into your classroom. “Why bother learning physics?” I strive to make physics interesting and relevant every day, but some days are easier than others. The easy days usually happen as a result of combining my previous experiences and knowledge with new experiences and tons of effort. I’d like to share an experience that came as the result of my experiences with CORD, which turned me on to contextual teaching and learning, and a summer internship devoted to the ideal of making physics mean something.

In my efforts to “contextualize” my curriculum this summer, I interned at a high power/voltage test facility for a local industry. The company I worked for is an international leader in the production of vacuum interrupters (industrial circuit breaker contacts). The experience was extraordinary. Every aspect of production as well as every facet of testing was based on applications of physical science. It was a veritable treasure trove of applied (contextual) physics.

I spent 407 hours over ten weeks working in the test lab, learning as much as I could about the operation of the facility. I kept

a daily journal religiously. In the journal, I noted specific things that I had learned each day and ideas about how I might apply them in my practice. I also tried to identify which state standards would be met by implementation of my ideas. The result was pure professional development. At the end of the summer, when I looked through my journal, I counted 32 ideas to improve existing lessons, 9 ideas for completely new lessons, several ideas to share with colleagues, and 11 ideas for field experiences.

The major areas of my curriculum that were strengthened by this experience were electricity and magnetism, electromagnetic applications, modern physics, and kinetic theory. I developed several new lesson plans that have enhanced student learning experiences, including one of the field experiences.

The field experience provided a relevant and important context by blending classroom experiences with practical problem solving and exploration. Students first visited the facility to tour the plant site and establish a base of knowledge about their product’s development and manufacture. They visited the High Power Test Lab, where they met the lab technicians and the lab manager.

While at the test lab, students were given a brief description of the different types of tests conducted, with a focus on how they are able to acquire data safely during testing. Later on, students were asked to help the lab out by designing a voltage divider sensor circuit that would be capable of sampling voltages as high as 10 kV. Students were given a vignette explaining the problem and establishing the engineer’s circuit requirements. Students are currently developing their designs, and the lab manager will select the best one. Students will visit the lab again to see the divider built and tested to design specifications. Participation is at an all time high.

I anticipate that I will be able to develop many more lesson plans and

coordinate more field experiences in the future based on this experience and the collaborative relationships I have established with this local business. My students for years to come will only benefit from learning more about physics in this interesting and meaningful context.

I encourage every physics teacher who has difficulty dealing with student motivation to make the effort to find ways to develop contextual themes within their courses. It is worth it and you will become a better teacher, but, most importantly, you just might answer that terribly important question that is on the mind of so many of your students.☺

Reading Comprehension Can be Strengthened Contextually

Dr. Sandra Harwell, Director, Contextual Teaching Network

Reading is a skill that many teachers feel should have been taught and students should have mastered by the time they enter secondary education. Most education systems support this false belief by not including formal reading instruction in curriculum frameworks after the elementary level. What is being revealed by the high stakes testing movement is that students may be adequately “decoding” words by the time they leave elementary, but they may not be reading for comprehension. How can secondary teachers help students learn to read for comprehension when they have their own curriculum to cover in a short time frame?

Strategies for reading across the content areas have been identified by Richardson and Morgan (1997). They describe the model as the **PAR Reading Model**. Whether students are reading literary selections or informational material, the strategies apply.

First, students must PREPARE for the reading. The classroom teacher can lead this process by having students anticipate or predict what they will learn from the reading. The process for helping students connect this to personal experience can vary with the subject or student population. For instance in a science class, the teacher may want to assign a chapter for student reading. Before assigning the

...continued on p. 8

Reading Comprehension, cont.

reading, the teacher could place a list of vocabulary words from the chapter on the board. Students in groups would be assigned several of the words and asked to define them based on personal knowledge and experience. In an open discussion, the words and definitions are shared among the entire class. Student groups must defend their definitions using prior knowledge and experience. The students then must predict what the objectives of the unit or chapter might be based on the student-generated definitions by explaining the importance of these vocabulary words in a specific area of science. This process also helps students make connections between new information and personal experience and knowledge.

ASSISTING COMPREHENSION is the second phase of the reading process. Students could be asked to compare and contrast, analyze, or explain the cause and effect of something in the text. The student task could also be a writing assignment that would involve either persuasive or expository writing. Whatever the assignment, it should be more than having students identify or pull exact statements from the text material to answer low-level questions. The goal is to have students deliberately read for understanding. The assignment must challenge the student by expecting an analysis or synthesis of the information in the text.

REFLECTION is the third phase of the reading process. Teachers can guide this process through whole group discussion posing a problem that could be generated by something in the reading. For example, in science class, if the unit happens to be on diseases including the history of the bubonic plague, the song, "Are You Going to Scarborough Fair?" could be played. The students would be asked to explain what the song has to do with the bubonic plague. A childhood song that can be referred to is "Ring Around the Rosies," which is another example of a song they have heard before but never connected to a disease. This process helps students actually form brain pathways for recall at a later time. The three-step PAR (preparing, assisting comprehension, reflecting) process is a quick way for all teachers to make sure that they are encouraging students to read for understanding. Helping students connect new information to prior experience and prior learning as well as their interests is contextual teaching at the highest level. ☺

Reference: Richardson, J. and Morgan, R. (1997). *Reading to learn in the content areas*. Belmont, CA: Wadsworth Publishing.

Mark Your Calendars for...

Teaching with Meaning: Improving Student Performance October 2, 2002 • Cincinnati, Ohio

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- *Promising Practices for Contextual Learning*, Dr. Bill Blank, Univ. of South Florida, Dr. Sandi Harwell, CORD
- *Problem-based Learning Activities*, Dr. Vincent Walencik, Montclair State Univ.
- *21st Century Teaching Practices*, Dr. Wally Bouchillon, Univ. of West Florida
- *Online Contextual Teaching*, Dr. Robert Berns, Patricia Erickson, Bowling Green University
- *Teaching Contextual Academics with Technology*, Dr. Michael Crawford, CORD
- *Supersize Learning: Contextual Teaching Strategies for the Classroom*, Ms. Theresa Spangler, Brunswick High School, Glynn County, Georgia
- *Reinventing Mathematics Instruction*, Ms. Betsy Urschel, CORD

The CTN conference will precede the National Tech Prep Network's 2002 Annual Conference, October 3–5. For more information: www.ntpn.info

Call for September/October Issue Articles

If you have a contextual lesson to share or a classroom experience to communicate, please write to us. The September/October issue of *Contextual Teaching Exchange* is just around the corner, and we would like to feature articles contributed by members of the Contextual Teaching Network. Please submit your article in a Word for Windows file and e-mail it to hcotner@cord.org. Deadline for submission of content is July 31.



Helping all
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Committed to improving student achievement by stimulating and encouraging contextual teaching

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