

CRITICAL THINKING

# Science and Technology

LESSON PLANS



TOM DURWOOD

How many of us actually require our students to analyze material in an in-depth way? How many of us require them to draw inferences, make connections, reach and defend conclusions?

Our liberal-arts courses are the ideal places to teach those cognitive skills that students need to be successful in the workplace. In fact, teaching that kind of deep thinking should be the hallmark of every liberal-arts course. That's what liberal-arts courses do best.

-- Rob Jenkins, *The Chronicle of Higher Education* (July 6, 2011)

# Tom's Note

Dear Fellow Teachers –

I had the pleasure of teaching English Composition at Valley Forge Military College. Like so many schools, we taught an impossibly wide range of students in our classrooms -- from remedial-level cadets with limited reading and writing skills to high-speed sophomores on their way to West Point.

Our cadets were always tired from their military duties. In these highly challenging, highly rewarding classrooms, we devised our own methods to teach our students.

**Here I have collected the lesson plans that worked.**

A resentful, low-attention-span class with such diverse skills is a challenge. It rewards a flexible plan of attack – a teacher armed with different ways to surprise and engage the students. You will find more of my lesson plans on my site [www.usefulsherpa.com](http://www.usefulsherpa.com) and on *Teachers Pay Teachers*.

## **WARNING: THIS IS ALTERNATIVE TEACHING**

My teaching style is not right for everyone. My approach is predicated on teaching that emphasizes real-world critical thinking and tons of practice writing. I was lucky to have a Dean who encouraged my outside-the-box approach to student writing and student engagement. In particular, if your department adheres closely to guidelines for Common Core or Composition and Rhetoric, these lesson plans will be difficult to fit into your syllabus.

Make your students think. Surprise them. Teach the real world and all the mechanics will follow.

Good luck in your classroom! I hope you will find this material helpful –

All best,

*Tom Durwood*

# The Teen Brain: It's Just Not Grown Up Yet

MARCH 01, 2010

RICHARD KNOX

NPR Morning Edition

When adolescence hit Frances Jensen's sons, she often found herself wondering, like all parents of teenagers, "*What were you thinking?*"

"It's a resounding mantra of parents and teachers," says Jensen, who's a pediatric neurologist at Children's Hospital in Boston.

Like when son number one, Andrew, turned 16, dyed his hair black with red stripes and went off to school wearing studded leather and platform shoes. And his grades went south.

"I watched my child morph into another being. Yet I knew deep down inside it was the same Andrew," Jensen says. Suddenly her own children seemed like an alien species.

Jensen is a Harvard expert on epilepsy, not adolescent brain development. As she coped with her boys' sour moods and their exasperating assumption that somebody else will pick up their dirty clothes, she decided to investigate what neuroscientists are discovering about teenagers' brains that makes them behave that way.

## Teenage Brains Are Different

She learned that that it's not so much *what* teens are thinking — it's *how*. Jensen says scientists used to think human brain development was pretty complete by age 10. Or as she puts it, that "a teenage brain is just an adult brain with fewer miles on it."

But it's not. To begin with, she says, a crucial part of the brain — the frontal lobes — are not fully connected. Really.

"It's the part of the brain that says: 'Is this a good idea? What is the consequence of this action?'" Jensen says. "It's not that they don't have a frontal lobe. And they can use it. But they're going to access it more slowly."

That's because the nerve cells that connect teenagers' frontal lobes with the rest of

their brains are sluggish. Teenagers don't have as much of the fatty coating called myelin, or "white matter," that adults have in this area.

Think of it as insulation on an electrical wire. Nerves need myelin for nerve signals to flow freely. Spotty or thin myelin leads to inefficient communication between one part of the brain and another.

## A Partially Connected Frontal Lobe

Jensen thinks this explains what was going on inside the brain of her younger son, Will, when he turned 16. Like Andrew, he'd been a good student, a straight arrow, with good grades and high SAT scores. But one morning on the way to school, he turned left in front of an oncoming vehicle. He and the other driver were OK, but there was serious damage to the car.

"It was, uh, totaled," Will says. "Down and out. And it was about 10 minutes before morning assembly. So most of the school passed by my wrecked car with me standing next to it."

"And lo and behold," his mother adds, "who was the other driver? It was a 21-year-old — also probably not with a completely connected frontal lobe." Recent studies show that neural insulation isn't complete until the mid-20s.

This also may explain why teenagers often seem so maddeningly self-centered. "You think of them as these surly, rude, selfish people," Jensen says. "Well, actually, that's the developmental stage they're at. They aren't yet at that place where they're thinking about — or capable, necessarily, of thinking about the effects of their behavior on other people. That requires insight."

And insight requires — that's right — a fully connected frontal lobe.

## More Vulnerable To Addiction

But that's not the only big difference in teenagers' brains. Nature made the brains of children and adolescents excitable. Their brain chemistry is tuned to be responsive to everything in their environment. After all, that's what makes kids learn so easily.

But this can work in ways that are not so good. Take alcohol, for example. Or nicotine, cannabis, cocaine, ecstasy ...

"Addiction has been shown to be essentially a form of 'learning,' " Jensen says. After all, if the brain is wired to form new connections in response to the environment, and potent psychoactive drugs suddenly enter that environment, those substances are "tapping into a much more robust habit-forming ability that adolescents have, compared to adults."

So studies have shown that a teenager who smokes pot will still show cognitive deficits days later. An adult who smokes the same dose will return to cognitive baseline much faster.

This bit of knowledge came in handy in Jensen's own household.

"Most parents, they'll say, 'Don't drink, don't do drugs,'" says Will, son number two. "And I'm the type of kid who'd say 'why?' "

When Will asked why, his mom could give him chapter and verse on drugs and teen brains. So they would know, she says, "that if I smoke pot tonight and I have an exam in two days' time, I'm going to do worse. It's a fact."

There were other advantages to having a neuroscientist mom, Will says. Like when he was tempted to pull an all-nighter.

"She would say, 'read it tonight and then go to sleep,'" he says. "And what she explained to me is that it will take [what you've been reading] from your short-term memory and while you sleep you will consolidate it. And actually you will know it better in the morning than right before you went to sleep."

It worked every time, he says.

It also worked for Andrew, the former Goth. He's now a senior at Wesleyan University, majoring in physics.

"I think she's great! I would not be where I am without her in my life!" Andrew says of his mom.

For any parent who has survived teenagers, there are no sweeter words.

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## HYDROLOGY: THE UNINTENDED CONSEQUENCES OF A DAM

# China's Three Gorges Dam and That Turkey Sandwich You're Eating

TOM DURWOOD

A really big dam has risen half a world away. Its shadow is falling on your kitchen table, warns Evan D.G. Fraser.

Seven thousand feet in length and 610 feet tall, the colossal hydroelectric Three Gorge Dam across the Yangtze River in Province dam looms like a sentinel from another age. It signals that things are about to change, and that includes you.

*“The Three Gorges Dam will shape the way we eat for the next generation.”* Evan D.G. Fraser, Associate Professor of Geography at the University of Guelph in Ontario, Canada and co-author with Andrew Rimas of the brilliant book *Empires of Food*, is not exaggerating when he points to this single civil work as the marker of a new (and troublesome) era of food production. “Three Gorges represents the last gap of a vast market-driven system of food production,” he writes. “They are what urban societies create to feed themselves. In their simplest formation, they’re webs of farms and trails, rivers and vegetation, all of which function to deliver food from a piece of tilled land to a cluster of interested eaters.” And the entire web is already wobbling. The ingredients of that turkey sandwich you’re having for lunch may no longer be available, or affordable.



*The Three Gorges Dam across the Yangtze River is the largest in the world.*

For one thing, the weather is changing. For a second thing, cheap oil is gone. “We have made our food system dependent on cheap oil and good weather,” says Fraser, “both of which are unlikely to continue into the future.” He continues:

There is a pretty strong scientific consensus that the 2050s, 60s and 70s won't have as good weather as the 1950s, 60s or 70s. This worries me because the way farming systems have evolved over the past 100 years depends on good weather. At the same time, we've created a permanent class of poor and economically marginalized people. When the weather turns bad, I think that major parts of the world will become significantly less productive and the economically marginal people will not have the buying power to obtain the food they need to survive.

The dam is so big that the city of Shanghai, sixty miles away, is sinking. The artificial lake it creates will be visible from space. The dam was initiated by Mao Zedong as a monument to the magnificence of Communism; he wrote a poem about his vision of the project, “Swimming,” in 1956. Engineers who pointed out its unintended consequences were jailed. Today it pumps out eleven times as much electricity as the Hoover Dam. So a new cog has joined the global food system of food and water supply. And it is a system that is

rotting, says Fraser. And, historically, wars sprout and empires fall when the food supply teeters.

The Chinese Academy of Sciences recently stated that, due to climate and population change, “cereal production . . . [will] fall significantly as the century progresses.” This is bad news for everyone, because the Chinese food empire, with its tangle of farms, warehouses, refrigeration cars, corn exchanges, cash registers, and frying pans, is hopelessly intertwined with the rest of the world.

The Three Gorges’ damming of the mighty Yangtze represents “a broken flow, leaving behind everything that’s ever gone before,” writes Fraser. “The Three Gorges Dam unveils a new world that stretches far beyond the cinder-block maze of Yichang.” You want to read *Empires of Food* to get the whole story.

Enjoy lunch.

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3. There has been some strange weather lately – fires in California, hurricanes in Florida, rain in New England. What do you think it means? What does Fraser think it means?

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4. Planet Earth has water problems. The entire city of Flint, Michigan does not have clean water, and others may follow. Changing weather patterns are drying up rivers we depend on. An international group of hydrologists, or water scientists, recently warned that dams do not actually help preserve water, but instead do great damage to the natural cycle.

<https://phys.org/news/2018-11-unintended-consequences-reservoirs.html>

What factors will affect your water supply in the next twenty years? What will help?

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