

# **“Gradually, then suddenly”**

*Accelerating Access, Achievement and Affordability in Education*

**Paul F. Corey**

**President,**

**Pearson Science, Business & Technology**

*World Academy Forum on the Future of Global Education*

**University of California at Berkeley – October 2-3, 2013**



**3100 B.C.**



**120 B.C.**



**100 A.D.**



**1452**

We next integrate both sides of Eq. 6.3. For convenience, we interchange the two sides of the equation and write

$$L \int_{i_0}^i dt = \int_{t_0}^t v dt. \quad (6.4)$$

Note that we use  $x$  and  $t$  as the variables of integration, whereas  $i$  and  $t$  become limits on the integrals. Then, from Eq. 6.4,

$$i(t) = \frac{1}{L} \int_{t_0}^t v dt + i(t_0), \quad (6.5)$$

The inductor  $i-v$  equation  $\rightarrow$

where  $i(t_0)$  is the current corresponding to  $t_0$ , and  $i(t_0)$  is the value of the inductor current when we initiate the integration, namely,  $i_0$ . In many practical applications,  $i_0$  is zero and Eq. 6.5 becomes

$$i(t) = \frac{1}{L} \int_{t_0}^t v dt + i(t_0). \quad (6.6)$$

Equations 6.1 and 6.5 both give the relationship between the voltage and current at the terminals of an inductor. Equation 6.1 expresses the voltage as a function of current, whereas Eq. 6.5 expresses the current as a function of voltage. In both equations the reference direction for the current is in the direction of the voltage drop across the terminals. Note that  $i(t_0)$  carries its own algebraic sign. If the initial current is in the same direction as the reference direction for  $i$ , it is a positive quantity. If the initial current is in the opposite direction, it is a negative quantity. Example 6.2 illustrates the application of Eq. 6.5.

### Example 6.2 Determining the Current, Given the Voltage, at the Terminals of an Inductor

The voltage pulse applied to the 100 mH inductor shown in Fig. 6.5 is 0 for  $t < 0$  and is given by the expression

$$v(t) = 20e^{-10t} \text{ V}$$

for  $t > 0$ . Also assume  $i = 0$  for  $t \leq 0$ .

- Sketch the voltage as a function of time.
- Find the inductor current as a function of time.
- Sketch the current as a function of time.

#### Solution

- The voltage as a function of time is shown in Fig. 6.6.

- The current in the inductor is 0 at  $t = 0$ . Therefore, the current for  $t > 0$  is

$$i = \frac{1}{0.1} \int_0^t 20e^{-10\tau} d\tau + 0$$

$$= \frac{20}{0.1} \left[ \frac{-e^{-10\tau}}{10} (10\tau + 1) \right]_0^t$$

$$= 2[1 - 10e^{-10t} - e^{-10t}] \text{ A}, \quad t > 0.$$

- Figure 6.7 shows the current as a function of time.

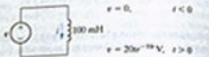


Figure 6.5 The circuit for Example 6.2.

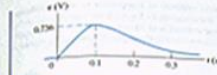


Figure 6.6 The voltage waveform for Example 6.2.

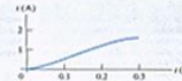


Figure 6.7 The current waveform for Example 6.2.

Note in Example 6.2 that  $i$  approaches a constant value of 2 A as  $t$  increases. We say more about this result after discussing the energy stored in an inductor.

### Power and Energy in the Inductor

The power and energy relationships for an inductor can be derived directly from the current and voltage relationships. If the current reference is in the direction of the voltage drop across the terminals of the inductor, the power is

$$p = vi. \quad (6.7)$$

Remember that power is in watts, voltage is in volts, and current is in amperes. If we express the inductor voltage as a function of the inductor current, Eq. 6.7 becomes

$$p = L i \frac{di}{dt}. \quad (6.8) \quad \leftarrow \text{Power in an Inductor}$$

We can also express the current in terms of the voltage:

$$p = v \left[ \frac{1}{L} \int_{t_0}^t v dt + i(t_0) \right]. \quad (6.9)$$

Equation 6.8 is useful in expressing the energy stored in the inductor. Power is the time rate of expending energy, so

$$p = \frac{dw}{dt} = L i \frac{di}{dt}. \quad (6.10)$$

Multiplying both sides of Eq. 6.10 by a differential time gives the differential relationship

$$dw = L i di. \quad (6.11)$$

Both sides of Eq. 6.11 are integrated with the understanding that the reference for zero energy corresponds to zero current in the inductor. Thus

$$\int_0^w ds = L \int_0^i y dy,$$

$$w = \frac{1}{2} L i^2. \quad (6.12) \quad \leftarrow \text{Energy in an Inductor}$$

Circa 2010: Progress?

> 2010





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## CHAPTER 8 THE NUCLEAR OPTION



**THE NUCLEAR OPTION**

Introduction

Background

Advantages

Disadvantages

Future



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Introduction

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Pearson Review



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Ninth Edition

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Trivia Module **Review**

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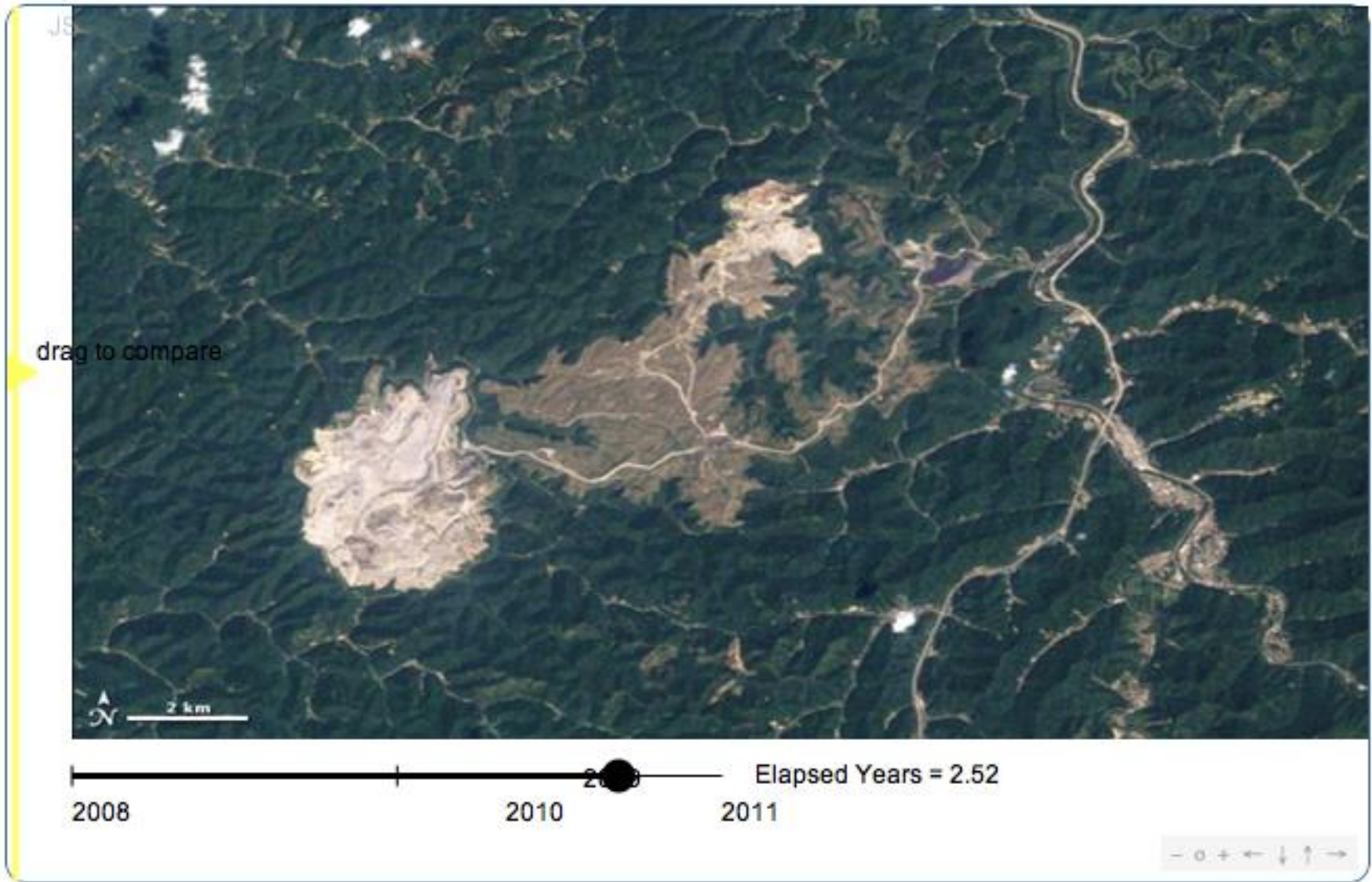
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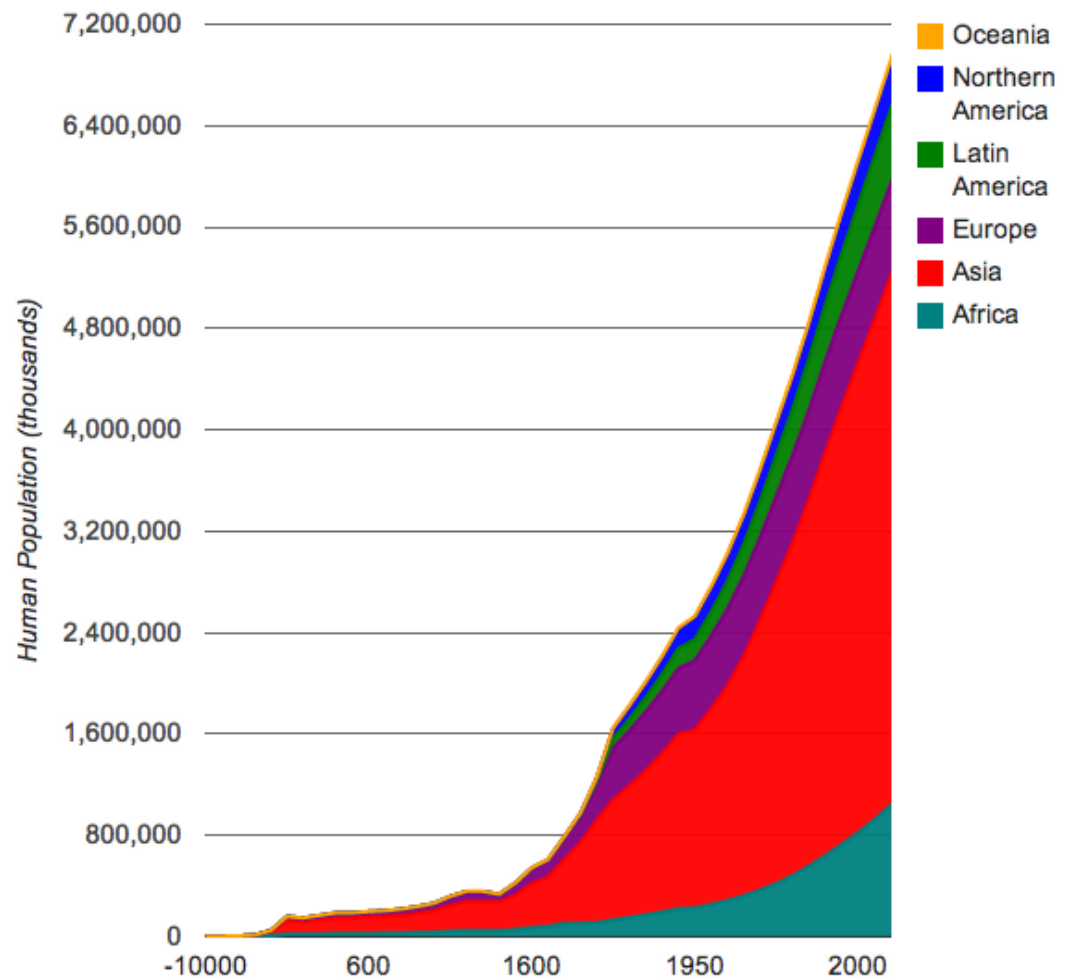
**Human Anatomy & Physiology**



Futures



Human Population Growth through time by region

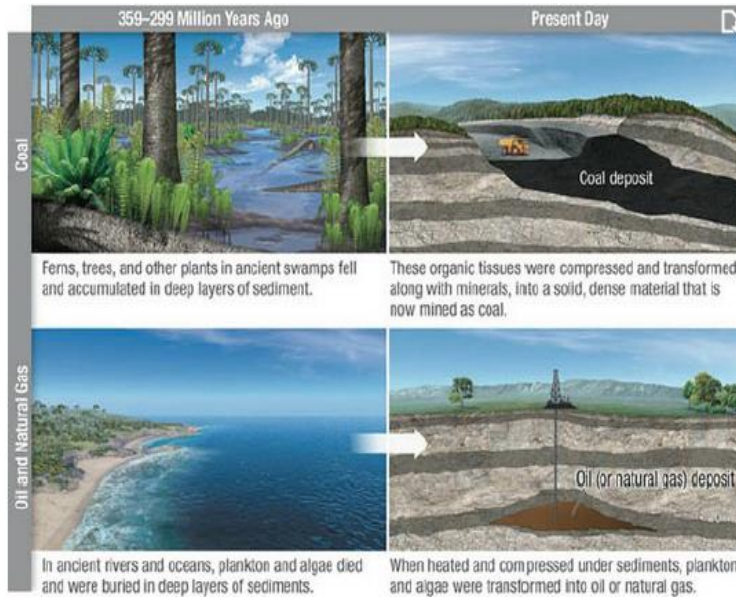




## 1 How are fossil fuels formed?

Discussion | 24 | 4 new

In periods over the past 500 million years, the planet was warm and covered with dense vegetation, large swamps, and extensive shallow seas. The warm and wet conditions were ideal for plants to grow on land and for algae and other small floating aquatic organisms called plankton to grow in swamps and oceans. During photosynthesis these organisms converted large amounts of carbon dioxide into organic tissues. After the plants and algae died, these carbon-rich tissues fell into sediments where conditions such as low oxygen availability prevented their breakdown.



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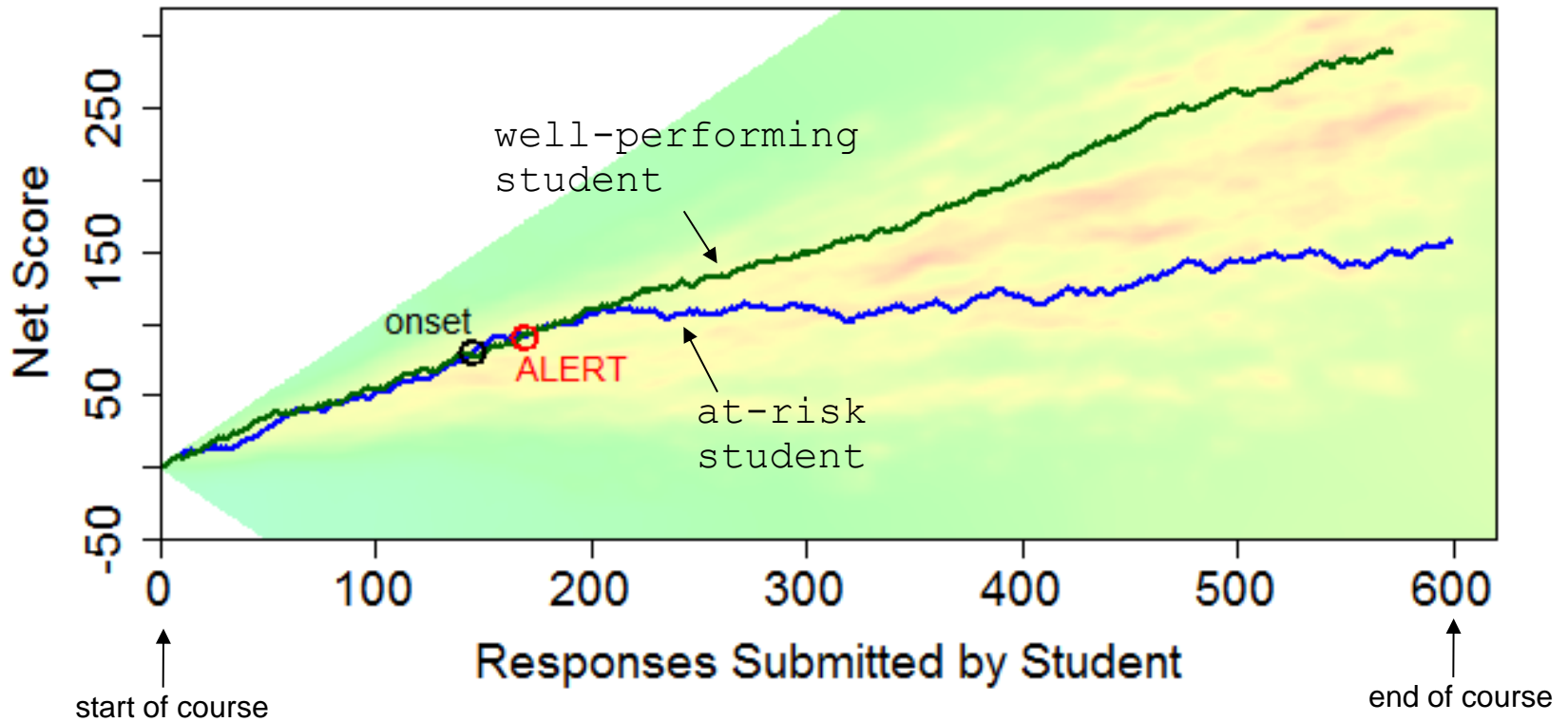
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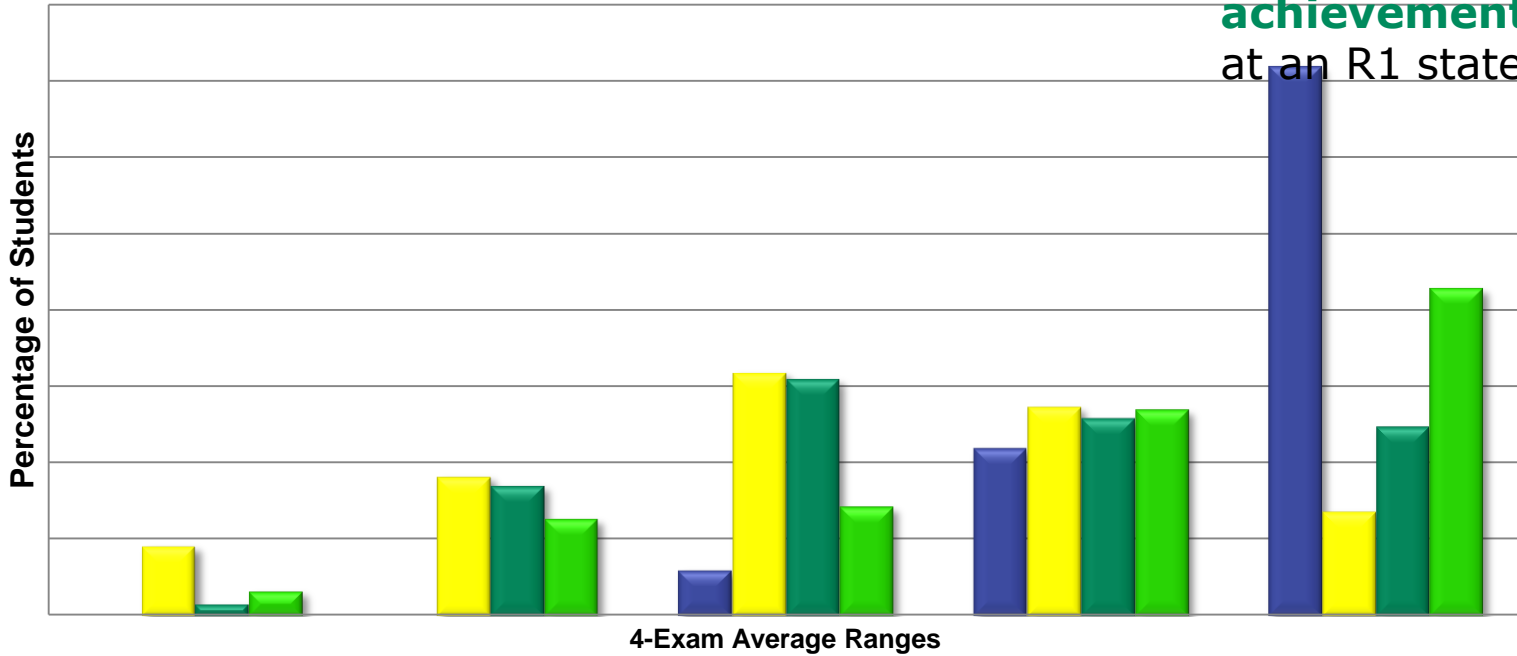
# Predictive Analytics



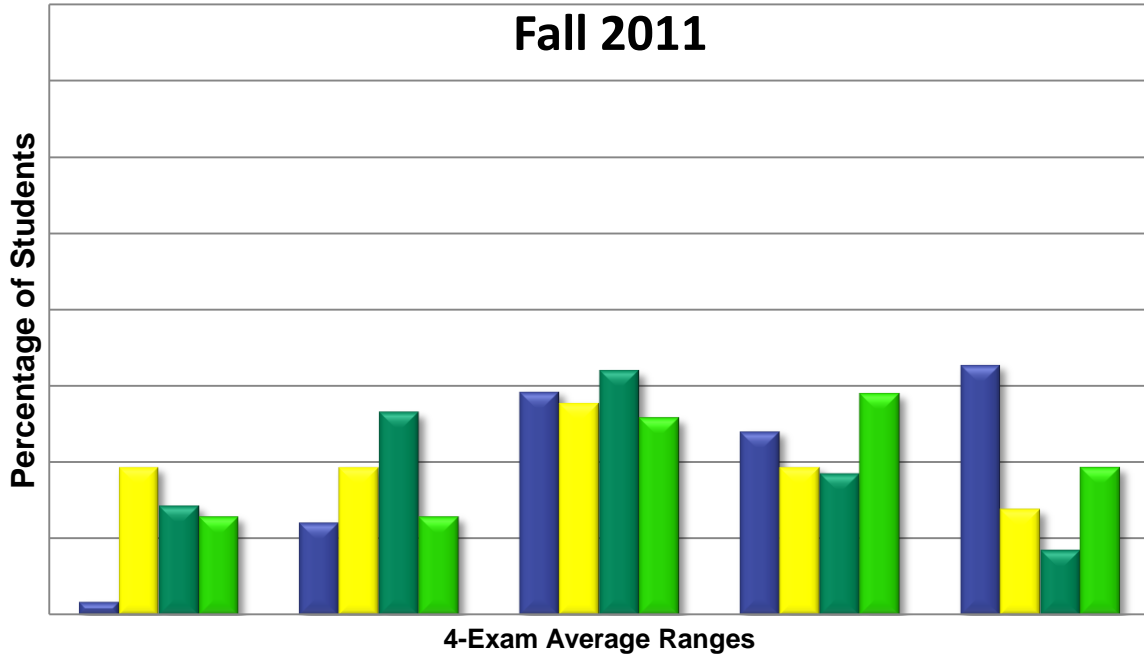
We raise an alert when the fractal dimension of the student's response pattern hits 2

# Fall 2009










Closing the **achievement gap** at an R1 state school



# Fall 2011



# Customizable

	Values and Environmental Economics		The Oceans		Renewable Energy
	Evolution and Biodiversity		The Climate		<a href="#">move to unassigned content</a>
	Communities and Populations		Water Availability and Pollution		Nonrenewable Energy



- **Peer instruction:** directed pair or small group discussion
- **Team-based assessment:** teams must work together

