

**Do you read a science book
like a novel?
A Meta Cognitive Reading Approach**

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Introduction



LOS ANGELES
MISSION COLLEGE

- Los Angeles Mission College is a comprehensive, public two-year accredited institution founded in 1975
- One of the 9 community colleges in the Los Angeles District

Student Characteristics:

- Fall 2014 enrollment: 10,616
- Minority students: 85% (74% Hispanic students)
- First generation college students: 75%
- Unprepared in English: 82%
- Unprepared in Mathematics: 91%

LAMC Office of Institutional Effectiveness (OIE)

Introduction

August 2012



Introduction - me!

Introduction to Biology

Non-science majors

Introduction to Human Anatomy

Introduction to Human Physiology

Pre-Health (pre-nursing, pre-med, pre-pharmacy)



Students don't perform well in the classes.



Students don't read their textbook correctly.

Reading Apprenticeship

by WestEd

Reading Apprenticeship
framework includes
the social,
the personal,
the cognitive and
the knowledge-building
dimensions.

SOCIAL DIMENSION

- » Creating safety
- » Investigating the relationship between literacy and power
- » Sharing text talk
- » Sharing reading processes, problems, and solutions
- » Noticing and appropriating others' ways of reading

COGNITIVE DIMENSION

- » Getting the big picture
- » Breaking it down
- » Monitoring comprehension
- » Using problem-solving strategies to assist and restore comprehension
- » Setting reading purposes and adjusting reading processes

PERSONAL DIMENSION

- » Developing reader identity
- » Developing metacognition
 - » Developing reader fluency and stamina
 - » Developing reader confidence and range

KNOWLEDGE-BUILDING DIMENSION

- » Surfacing, building, and refining schema
- » Building knowledge of content and the world
 - » Building knowledge of texts
 - » Building knowledge of language
 - » Building knowledge of disciplinary discourse and practices

**METACOGNITIVE
CONVERSATION**

Introduction to Biology Students

Spring 2014

deepen students' ability to analyze BIO texts through metacognitive conversation,

46 students

- 82% Hispanic
- 8%: Asian
- 2% African-American
- 2%: White
- 4% Others, 2%: no response

Female: 60% & Male: 40%

28%: Science majors, 54%: Non-science, 18%: Undecided



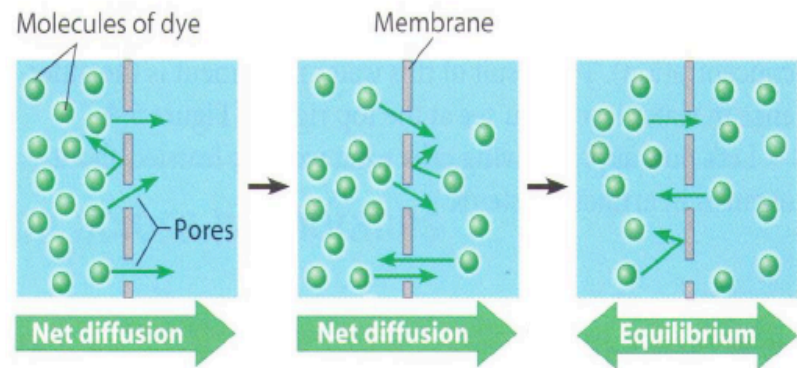
Key RA strategies: Think-Aloud and Reading Logs, with a focus on their relation to the four dimensions

Think-Aloud:

5.3 Passive transport is diffusion across a membrane with no energy investment

Molecules vibrate and move randomly as a result of a type of energy called thermal motion (heat). One result of this motion is **diffusion**, the tendency for particles of any kind to spread out evenly in an available space. How might diffusion affect the movement of substances into or out of a cell?

The figures to the right will help you to visualize diffusion across a membrane. **Figure 5.3A** shows a solution of green dye separated from pure water by a membrane. Assume that this membrane has microscopic pores through which dye molecules can move. Thus, we say it is permeable to the dye. Although each molecule moves randomly, there will be a net movement



▲ **Figure 5.3A** Passive transport of one type of molecule

[Video](#)

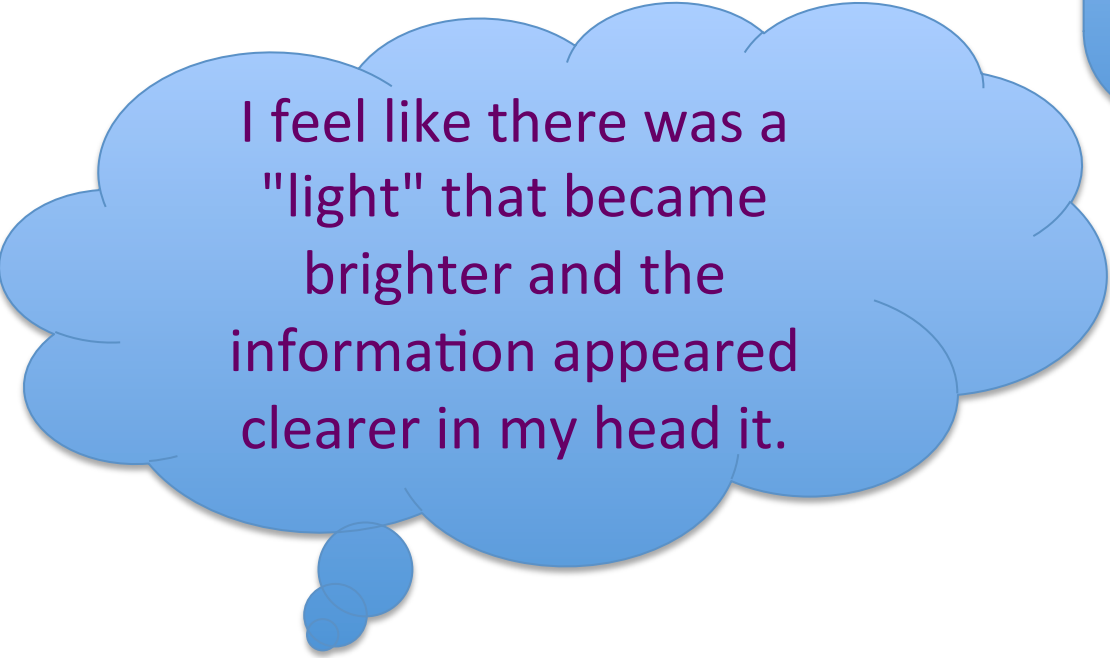
The students were asked to review a 5-minute video, which was recorded by the instructor who modeled the “Think Aloud” strategy. “Students were asked to practice the reading strategy for one week and leave feedback.

All comments were very positive and indicated that the method has helped them to read the text effectively.

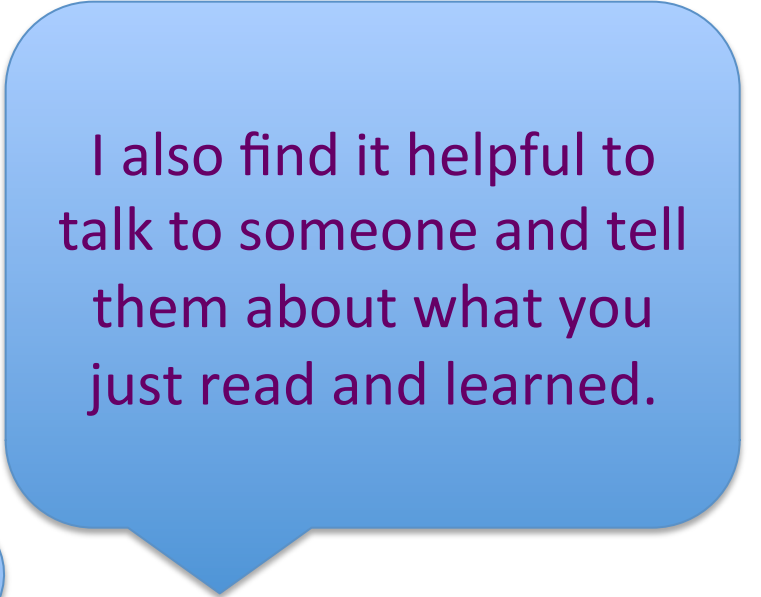
Selected comments from students:

“I usually just read words after words without actually grasping what I am reading. Most times I can't recall what I had just read. I have been a lot more patient with reading. I need to focus more and not be in a rush trying to get through a chapter. I have to slow down and concentrate on each word.”

“Before I would read my textbook like I'm reading a script and wouldn't stop. Now I stop at every sentence and make sure to understand what is being talked about.”



I feel like there was a "light" that became brighter and the information appeared clearer in my head it.



I also find it helpful to talk to someone and tell them about what you just read and learned.

Reading Log:

Name: Par Mohammadian	Chapter: 1
Write at least five main ideas from this chapter and include the page.	
Evidence I saw, I heard, I <u>read</u> in the text...	Interpretation I wondered, I made, I <u>thought</u> ...
Example: Ch 1: I <u>read</u> that one of the main ideas in this chapter is the seven properties and processes associated with life. Order is one of those properties. Page 4	Example: When I was reading through this section I <u>thought</u> about what order really means. The example helped me to understand but does it mean that everything that has an "order" is a property of life? If I were to think of an example, I would probably choose the number of ears. We have two ears. Does it count as an order? (Hint: This section describes my thoughts, feelings, and questions that I have while reading this particular section in the textbook – there is no correct or wrong answer – these are only your OWN thoughts. The idea is for you to take time to reflect and to connect while reading and then <i>ask questions</i> . This exercise will help you to make your thoughts visible while reading the text.). No definitions!!!

Name: 	Chapter: 23
Write at least five main ideas from this chapter and include the page.	
Evidence I saw, I heard, I read in the text...	Interpretation I wondered, I made, I thought...
It takes the blood in your body about 1 minute to travel through the circulatory system (Pg 498)	Wow, this is incredible. I can't believe that blood is pumping so quickly through my entire body. I wonder if blood pumps more quickly during physical activity to get more oxygen to the muscles? If you have heart disease does the blood move through slower? I also had a random thought and wondered how long it took a giraffe's huge 25 pound heart to pump blood through its entire body.

Ch.22: If you pay attention, you'll find that serving sizes are often surprising. Pg. 488	When I read this section it made me think. When was the last time I read the package of chips I eat every Wednesday night in English class? I am going to look and see if the 200 calories is one serving or two. I assumed that the serving was a single serving. The section warned us to read the labels carefully so we are informed about what were consuming.
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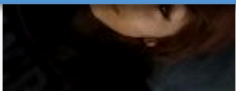
Hybrid BIO3 course:



Posts: 6

I read in the text that one of the main ideas in this chapter was the three domains of life. While reading through this section it was rather difficult for me to grasp what was being said. There were a lot of words that were new to me and everything just seemed to be in a different language. After rereading the section over a few times I wondered why the two domains Bacteria and Archaea differed from the domain Eukarya. I also wondered why the domain Eukarya had a subgroup of kingdoms, whereas Bacteria and Archaea do not. I thought that maybe the fact that Eukarya had the kingdoms Plantae, Fungi, and Animalia along with it held a significance in the reasoning of the differences. When reading through the specifications of each kingdom I thought of certain examples for each. For example an organism in the Plantae kingdom would be something like a cactus or a tree in my opinion, as these two do produce their own foods and sugars through photosynthesis. I feel an example for an organism that is in the Fungi kingdom would be yeast, although it is often debated if yeast is a fungus or a bacteria. Lastly, an example of an organism in the Animalia kingdom would be man, as the book states, as well as birds or fish. So with these kingdoms only being apart of the Eukarya domain, due to them sharing the similarity of having eukaryotic cells, does this mean that Bacteria and Archaea do not have various categories(kingdoms) of organisms that can be labeled in these domains?

Hello Breanne, i really enjoyed reading your post simply because i also had a hard time with all the new things i was reading about. Even though it was new, it was all rather interesting and i found ways of remembering the different domains and kingdoms. I also liked your example for the Plantae kingdom and it helps me understand it a bit more.



Posts: 14

While reading this chapter I felt that its main idea was chemistry and its correlation with biology and therefore our every day lives. Since all matter is made up of atoms and they of these chemical reactions and bonds. But what really stood out to me is the incredible use of water for all life. Beginning on page 29, it begins describing the cohesion of water and how just a simple hydrogen bond can make the molecules stick together enough for trees to take up to the leaves and release heat and oxygen thru photosynthesis. I think of how we drink water everyday, is the fact that water is that cohesive that it helps us actually be able to retain it? It is also amazing to me that our knowledge of what water is made of and our incredible advancement in technology and science that we can not create water.

Hi Paula, I also found that part very amazing. Isn't it amazing how we can't create water but we can create robots and very advanced technology on our phones and tvs and cars? But we cannot create water? I think that many people do not realize how important water is not only to us, but to everything on Earth.

Subjective vs Objective Assessments

- *Success rates*
- *Retention rates*
- *Student Learning Outcomes (SLOs)*



Future Plans

Train more STEM faculty

Train STEM Tutors

RA STEM Grant (WestEd)
STEM Grant (Dept. of
Education)

- ❖ Online courses
- ❖ On-campus workshop



Website:

<http://www.lamission.edu/lifesciences>
STEM RA



We are not experts and are still learning.

Every good conversation starts with good listening.

Practicing Think Aloud by Kristina Gonzalez

CHAPTER 5 THE WORKING CELL

Some Basic Energy Concepts

Energy makes the world go round—both the larger world outside and the cellular world. But what exactly is energy? Our first step in understanding the working cell is to learn a few basic concepts about energy.

Conservation of Energy

Energy is defined as the capacity to cause change. Some forms of energy are used to perform work, such as moving an object against an opposing force—for example, gravity. In other words, energy is the ability to rearrange a collection of matter.

For example, imagine a diver climbing to the top of a platform and diving off (**Figure 5.1**). To get to the top of the platform, the diver must perform work to overcome the opposing force of gravity. Specifically, chemical energy from food is converted to **kinetic energy**, the energy of motion. In this case, the kinetic energy takes the form of muscle movement.

What happens to the kinetic energy when the diver reaches the top of the platform? Has it disappeared?

The answer is no. You may be familiar with the principle of conservation of matter, which states that matter cannot be created or destroyed but can only be converted from one form to another. A similar principle, known as **conservation of energy**, states that it is not possible to destroy or create energy. Like matter, energy can only be converted from one form to another. A power plant, for example, does not make energy; it merely converts it from one form (such as energy stored in coal) to a more convenient form (such as electricity). That's what happens in the diver's climb up the steps. The kinetic energy of muscle movement is now stored in a form called potential energy. **Potential energy** is energy that an object has because of its location or structure, such as the energy contained by water behind a dam or by a compressed spring. In our example, the diver at the top of the platform has potential energy because of his elevated location. The act of diving off the platform into the water converts the potential energy back to kinetic energy. Life depends on countless similar conversions of energy from one form to another. ✓

✓ CHECKPOINT

How can an object at rest have energy?

Answer: It can have potential energy because of its location or structure.

What social, personal, knowledge building, and cognitive dimensions Kristina applied while reading the text?

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**METACOGNITIVE
CONVERSATION**

*Practicing Think Aloud **by you:***

(15 min)

- *Choose a partner*
- *Start reading a paragraph from the text using the Think-Aloud strategy (5 min)*
- *Your partner will observe you and take notes*
- *Then switch roles (5 min)*
- *Describe your observations to your partner (5 min)*

Any interesting observations?

Entropy

If energy cannot be destroyed, where has it gone when the diver hits the water? It has been converted to **heat**, a type of kinetic energy contained in the random motion of atoms and molecules. The friction between the body and its surroundings generated heat in the air and then in the water.

All energy conversions generate some heat. Although heat production does not destroy energy, it does make it less useful. Heat, of all energy forms, is the most difficult to “tame”—the most difficult to harness for useful work. Heat is energy in its most chaotic form, the energy of aimless molecular movement.

Entropy is a measure of the amount of disorder, or randomness, in a system. Every time energy is converted from one form to another, entropy increases. The energy conversions during the climb up the ladder and the dive from the platform increased entropy as the diver emitted heat to the surroundings. To climb up the steps again for another dive, the diver must use additional stored food energy. This conversion will also create heat and therefore increase entropy. ✓

Chemical Energy

How can molecules derived from the food we eat provide energy for our working cells? The molecules of food, gasoline, and other fuels have a special form of potential energy called **chemical energy**, which arises from the arrangement of atoms and can be released by a chemical reaction. Carbohydrates, fats, and gasoline have structures that make them especially rich in chemical energy.

Living cells and automobile engines use the same basic process to make the chemical energy stored in their fuels available for work (**Figure 5.2**). In both cases, this process breaks organic fuel into smaller waste molecules that have much less chemical energy than the fuel molecules did, thereby releasing energy that can be used to perform work.

For example, the engine of an automobile mixes oxygen with gasoline in an explosive chemical reaction that breaks down the fuel molecules and pushes the pistons that eventually move the wheels. The waste products emitted from the car’s exhaust pipe are mostly carbon dioxide and water. Only about 25% of the energy that an automobile engine extracts from its fuel is converted to

SO
ENERGY C

What do your cells have in common with a car’s engine?

✓ CHECKPOINT

Which form of energy is most randomized and most difficult to put to work?

Reading Log

(10 min)

Practice by using one main idea from the text (5 min) and then share with your partner (5 min)!

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