Slides presented at the
2015 NGSS Network Leadership Conference

High School Lesson Presentation

February 18, 2015

Presenter: Tricia Shelton

NEXT GENERATION SCIENCE STANDARDS
For States, By States

Session Layout

- What to look for…
- Lesson
  - Setup
  - Engage in the lesson as a student
  - Closure of the lesson
- What did you see?
- Other important things to look for and final thoughts

What to look for…

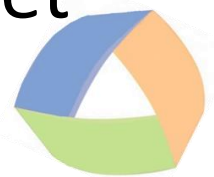
- Recognition of time limitation and that this is a snapshot of the classroom
- Recognition of where we are in implementation

What to look for…

- Used the EQuIP Rubric as a starting place
- Though it is designed to look at curriculum and not instruction, we thought it might provide a good basis to identify and modify questions for this session

A few big ideas from the EQuIP

- Practices, disciplinary core ideas, and crosscutting concepts work together to support students in making sense of phenomena and/or designing solutions to problems
- Provides opportunities for students to develop and use the three dimensions
- Lessons fit together coherently targeting a set of performance expectations



In Context: What to Look for in the Lesson

- Purpose of the lesson
  - How does the lesson help students make meaning of the phenomena while deepening their understanding of the three dimensions targeted by the lesson and building toward proficiency on the PEs?
  - What will this lesson expose students to that would contribute to the overall understanding and how is this made explicit for students?

In Context: What to Look for in the Lesson

- Three dimensions
  - How were the students engaged in three-dimensional learning?
    - Opportunities to use and construct each of the dimensions
    - Dimensions work together to help the students make sense of phenomena or design a solution to a problem
- Coherence
  - How did the lesson fit into a coherent picture that would support students in being able to demonstrate the understandings identified in the standards?

Evidence

I can see it, point to it in a lesson or unit, highlight it, or quote it directly from what is written.

Lesson

Place holder for if presenters want this for their setup, lesson, and/or lesson debrief

Tricia Shelton
Kentucky
ConnectThinkLearn.com

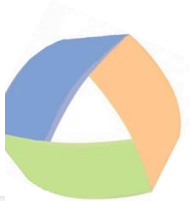
# of Students: 30 **Age/Grade Level:** 9 - 12 **Content Area:** Anatomy and Physiology
Unit Title: Introduction to Anatomy and Physiology: Systems, Subsystems, and Balance
Conceptualizing a Single System

Essential Questions:
How do the structures of organisms enable life's functions?
How do the inputs and outputs in a system affect its functioning?
Driving Question: If water is necessary for survival, how can such an essential substance kill us?

Performance Expectations:

HS-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS1-3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Science and Engineering Practices:	**Disciplinary Core Ideas:**	**Crosscutting Concepts:**
Models: Develop and Use a model based on evidence to illustrate the relationships between systems or between components of a system. Planning and Carrying Out Investigations: Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design, decide on types, how much, and accuracy of data needed to produce reliable measurements and consider	LS1-2 Multicellular organisms have a hierarchical structural organization in which any 1 system is made up of numerous parts and is itself a component of the next level. LS1-3: Feedback mechanisms maintain a living system's internal conditions with certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms	Systems and System Models: Models (Physical, mathematical, computer) can be used to simulate systems and interactions-including energy, matter, and information flows-within and between systems at different scales Stability and Change: Feedback (negative and positive) can stabilize or destabilize a system. .



Phenomenon and Driving Question

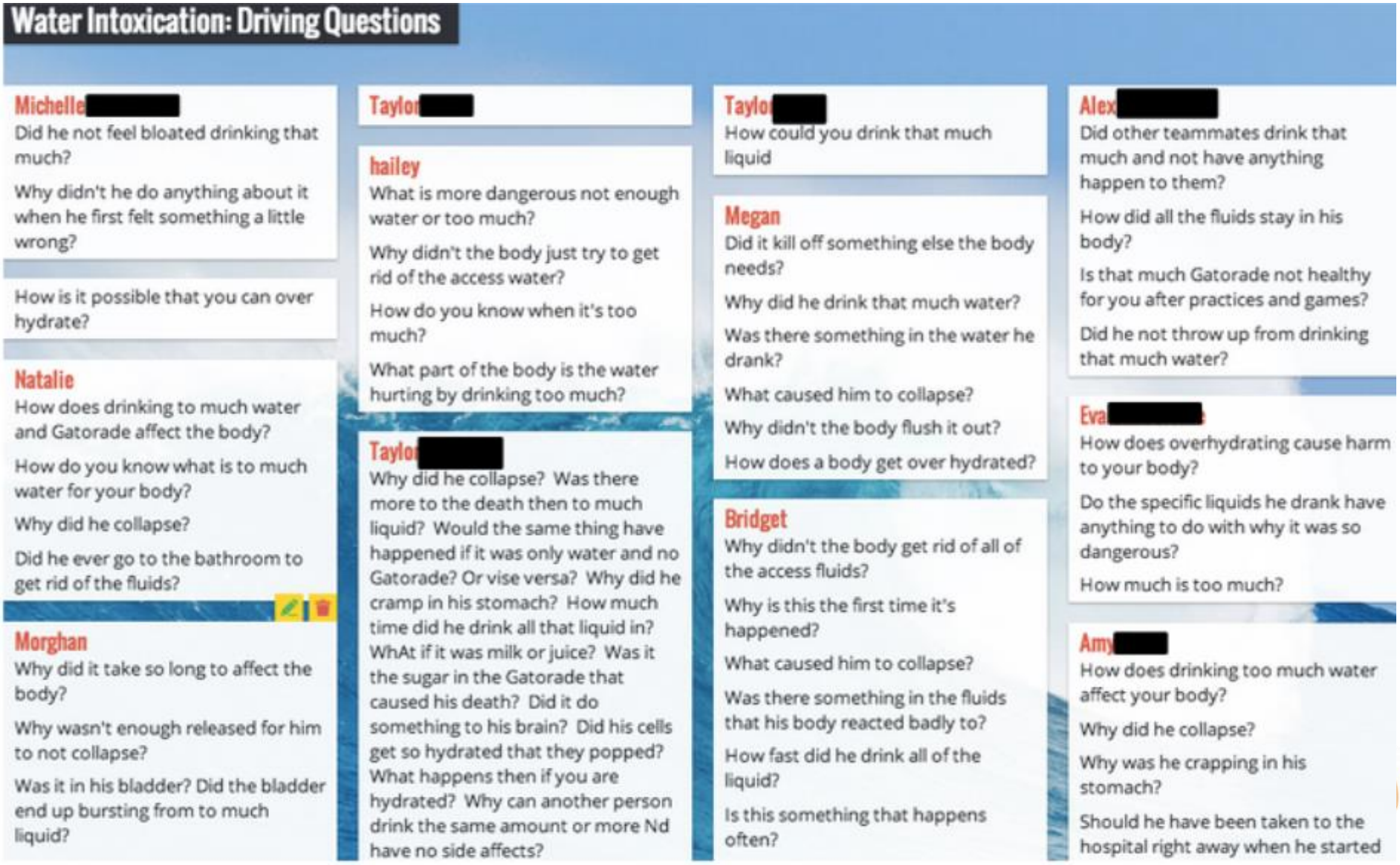
Phenomenon to Explain

"Football Player Dies from Drinking too Much Water/Gatorade" Associated Press, August 2014

http://bcove.me/jj61pmlz

Driving Question: If water is necessary for survival, how can such an essential substance kill us?

Student-Generated Questions



Storyline for Unit

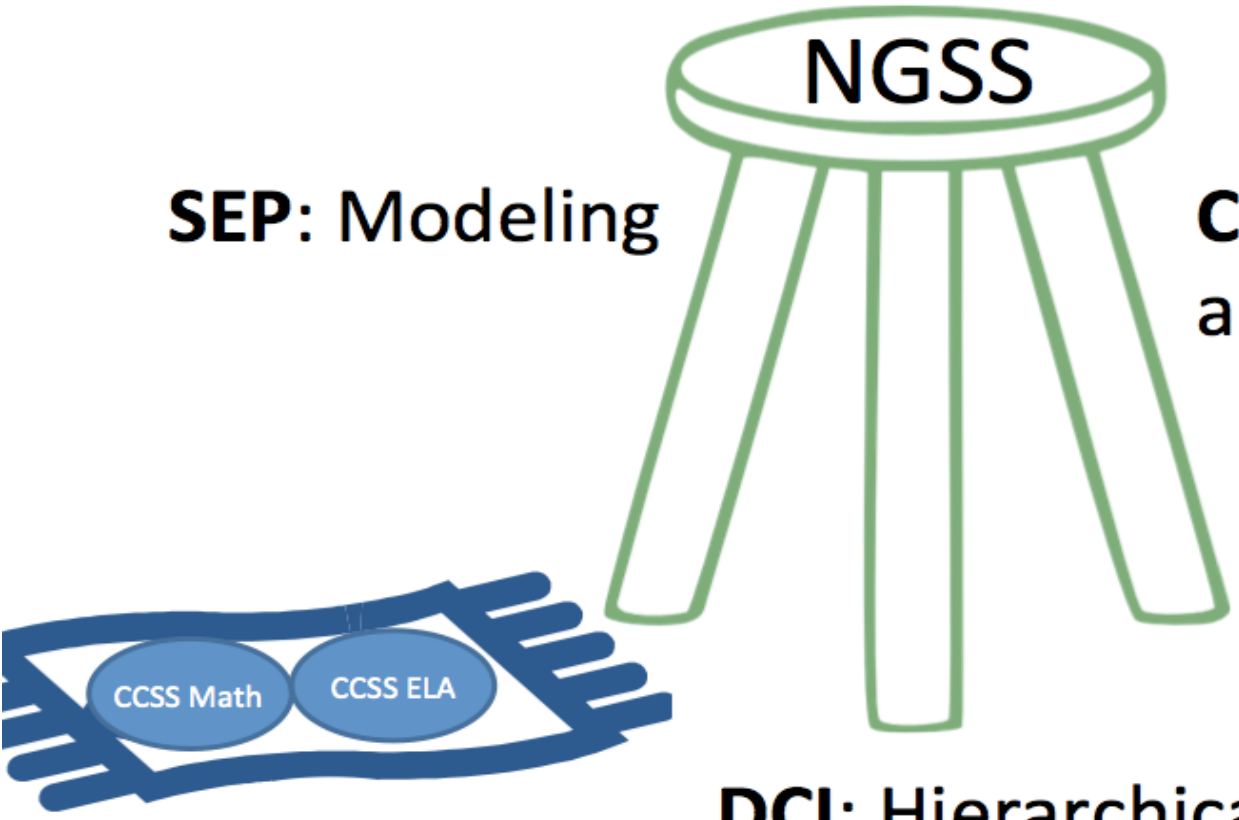
Graphic Organizer Template by Brian Reiser

Goal: Making sense of phenomena
Driving Question: If water is necessary for survival, how can such an essential substance kill us?

Death of HS football player by water intoxication

Phenomena-driven Questions	***Investigate and build knowledge through practices and CCCs***	***Incrementally Build Explanations, Models, or Designs***
What are the normal components of urine?	Models, explain [LS1.2, LS1.3] S&C, C&E	Initial explanation, model or design
How is urine made?	Using models [LS1.2] S&F, Systems	Add to/revise
How is the urinary system controlled/regulated?	Models, investigations [LS1.2, LS1.3] S&F, S&C	Add to/revise
How does the urinary system interact with other systems to keep an organism alive?	Explanations, Models [LS1.2,LS1.3] Systems, S&F, S&C	Final consensus explanation, model or design

Next Generation Science Standards



Transforming K-12 science from *"Learning About"* to *"Figuring Out"*

Learning about the science idea

- *Knowing the body systems and levels of organization (cells, tissues, organs, systems)*

Vs.

NGSS: Figuring out how and why it works

- ***Developing a model that explains how we get energy out of food***
  - *Being able to explain why we have cells*
  - *Being able to argue why a chemical reaction is needed to get energy from food, why it occurs in cells*
  - *Being able to trace matter and energy through the body*

Brian J. Reiser @reiserbrianj · Feb 6
@tdishelton @richbacolor NGSS = moving from "learning about" to "figuring out" - slogan originally fr Cindy Passmore

Crosscutting Concepts

How is the shape and stability of structures related to an object's function?

Structure and Function

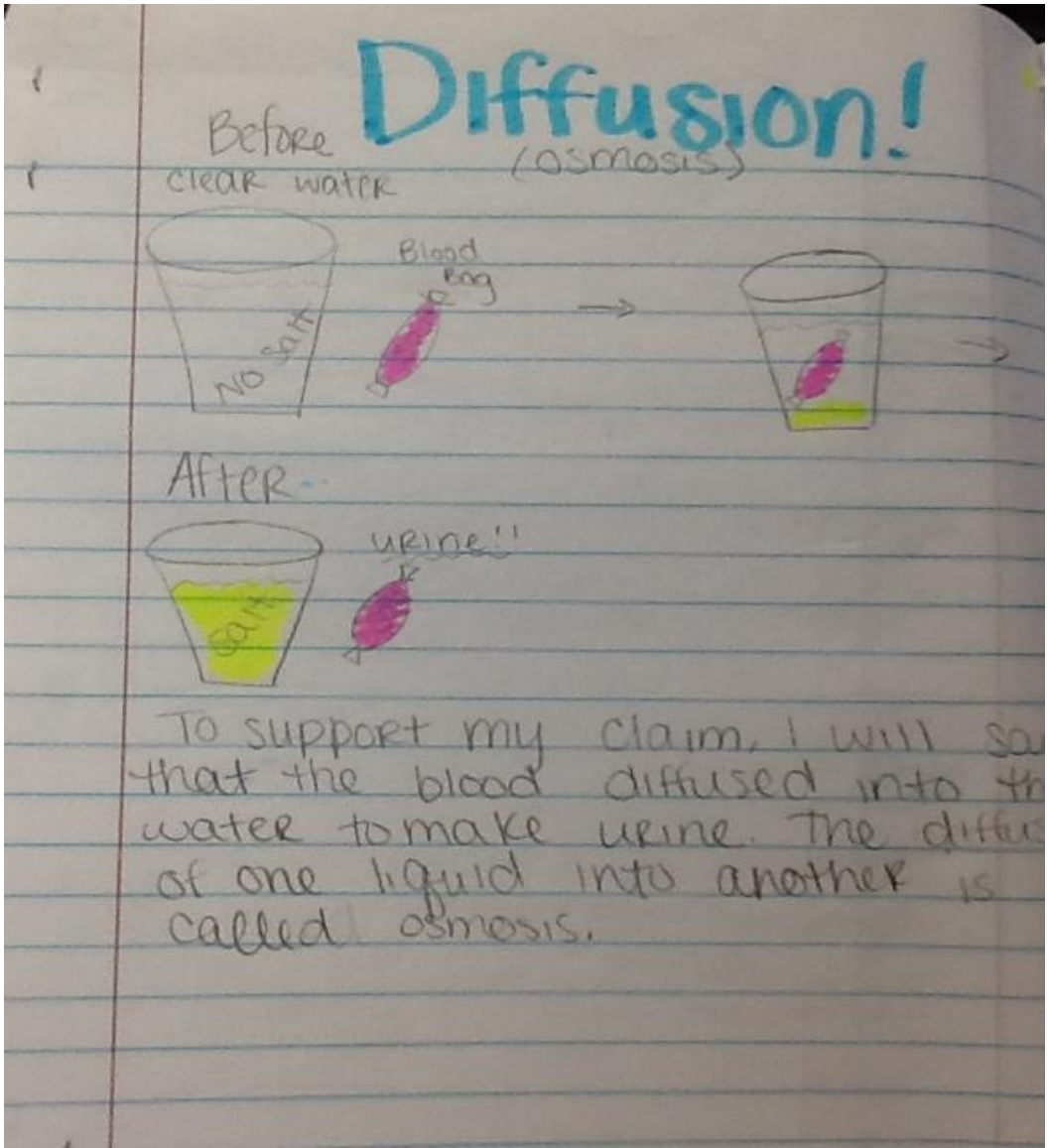
Modeling

Term	Description
Model	Objects, symbols, or relationships representing another system called the Target in a different medium.
Target	The system of phenomenon the model represents.
Fit	Accuracy with which a model represents its target.

Meaning Making

1. Make a DRAWING communicating the Phenomenon represent by the model.
2. What does the model show you? CONNECT to a Big Science Idea.
3. What EVIDENCE from the model support is the Big Idea in number 2?

Student Work



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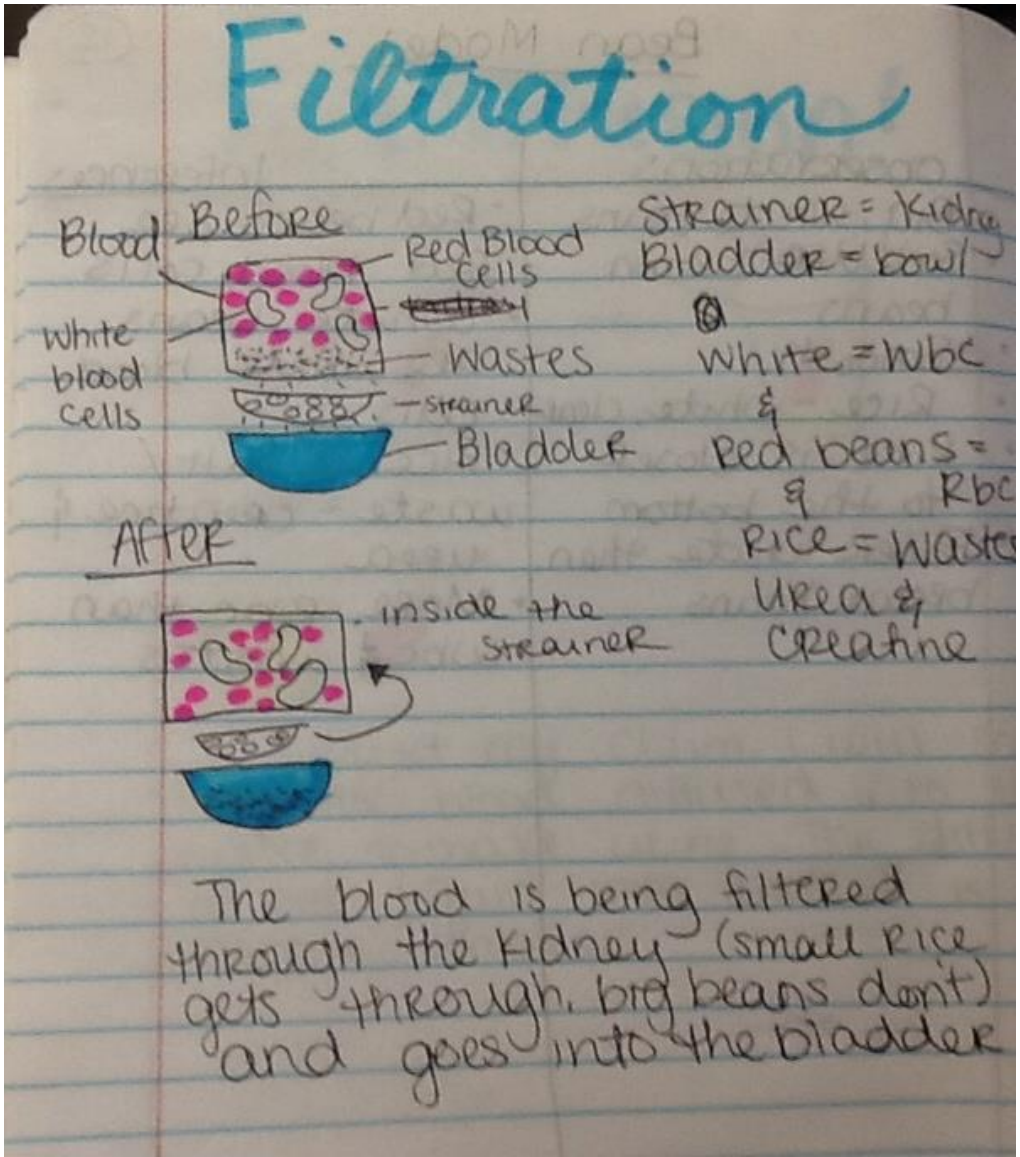

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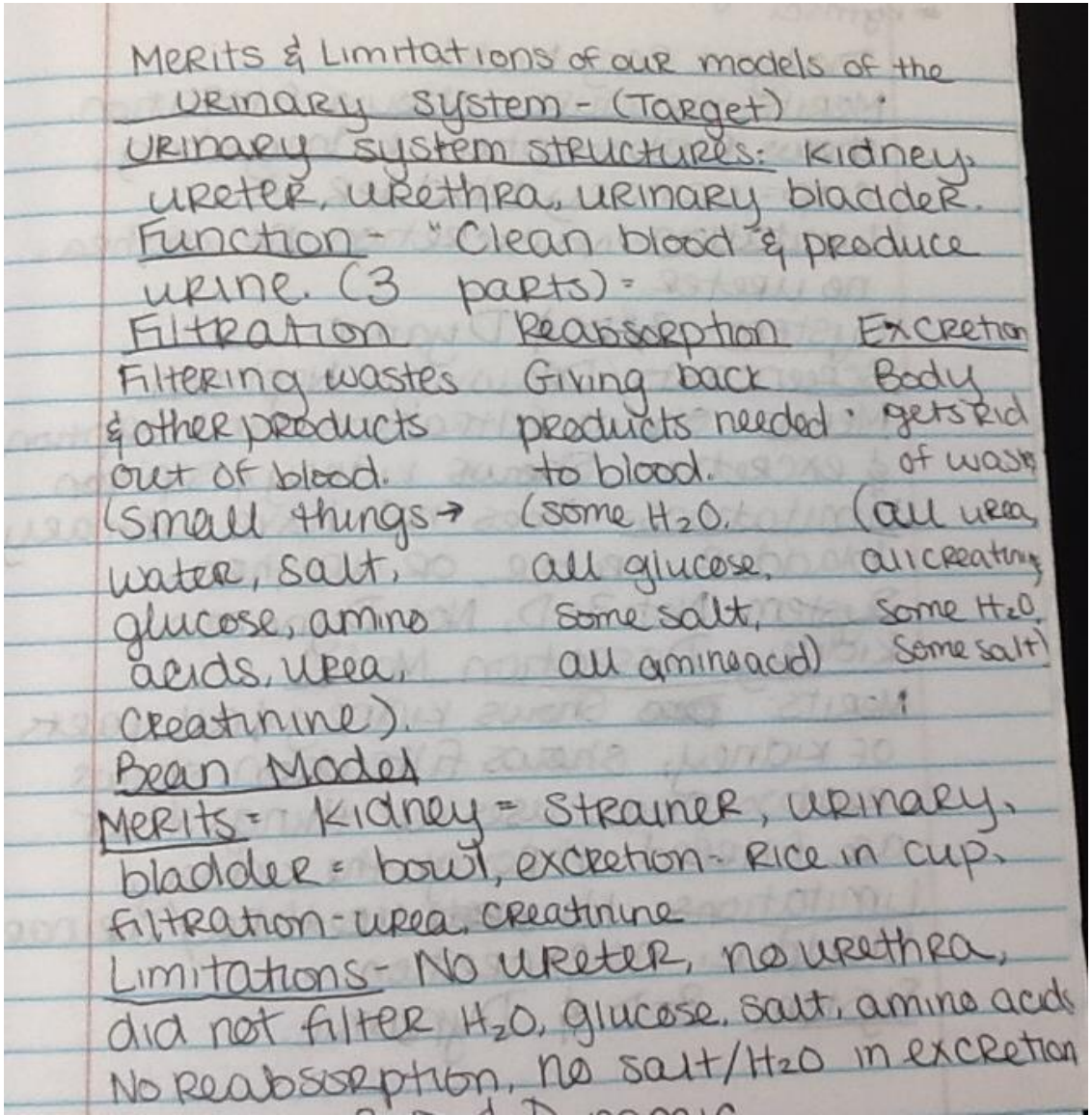

Merits & Limitations of our models of the Urinary System - (Target)

Urinary system structures: kidney, ureter, urethra, urinary bladder.

Function - "Clean blood & produce urine. (3 parts):

Filtration	Reabsorption	Excretion
Filtering wastes & other products out of blood. (Small things → water, salt, glucose, amino acids, urea, creatinine).	Giving back products needed to blood. (some H_2O, all glucose, some salt, all amino acid)	Body gets rid of waste (all urea, all creatinine, some H_2O, some salt)

Bean Model

Merits = kidney = strainer, urinary bladder = bowl, excretion - rice in cup, filtration - urea, creatinine

Limitations - No ureter, no urethra, did not filter H_2O, glucose, salt, amino acids No reabsorption, no salt/H_2O in excretion

Lesson

Full Learning Progression and Resources

http://www.ngsspln.com/classroom-support.html

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Other important things to look for?

What are some other things we would want to see in a high-quality lesson aligned to the NGSS?