Mini Case C: Analyzing Student Work

Email 7

RE: Cell division unit?

MrBrown@schooldistrict12.net
Sent: Thursday, February 11, 2016 7:58 AM
To: MrsDow@schooldistrict12.net

Caroline,

Thanks for giving me a chance to see the modeling activity yesterday. You mentioned that you saved some student work from last year that I could take a look at so I have some ideas about what I might expect from students. Can you share that with me? Also, do you have any advice for how you assessed students' models?

Bill

Email 8

RE: Cell division unit?

MrsDow@schooldistrict12.net
Sent: Thursday, February 11, 2016 12:38 PM
To: MrBrown@schooldistrict12.net

Bill,

I used the checklists to assess the models, but I think I am going to change it this year because of the Evidence Statements that have been released recently on the NGSS web site. I have attached the file with Evidence Statements here. Also, I will pull the folder of student work that I saved, and you can take a look after school today.

C

Unless otherwise specified, "descriptions" referenced in the evidence statements could include but are not limited to written, oral, pictorial, and kinesthetic descriptions.

HS-LS1-4

Students who demonstrate understanding can:

HS-LS1-4. **Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.** [*Assessment Boundary: Assessment does not include specific gene control mechanisms or rote memorization of the steps of mitosis.*]

The performance expectation above was developed using the following elements from *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models
Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

- Use a model based on evidence to illustrate the relationships between systems or between components of a system.

Disciplinary Core Ideas

LS1.B: Growth and Development of Organisms

- In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism.

Crosscutting Concepts

Systems and System Models

- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions — including energy, matter, and information flows — within and between systems at different scales.

Observable features of the student performance by the end of the course:

1	Components of the model		
	a	From the given model, students identify and describe* the components of the model relevant for illustrating the role of mitosis and differentiation in producing and maintaining complex organisms, including:	
		i.	Genetic material containing two variants of each chromosome pair, one from each parent;
		ii.	Parent and daughter cells (i.e., inputs and outputs of mitosis); and
		iii.	A multi-cellular organism as a collection of differentiated cells.
2	Relationships		
	a	Students identify and describe* the relationships between components of the given model, including:	
		i.	Daughter cells receive identical genetic information from a parent cell or a fertilized egg.
		ii.	Mitotic cell division produces two genetically identical daughter cells from one parent cell.
		iii.	Differences between different cell types within a multicellular organism are due to gene expression — not different genetic material within that organism.
3	Connections		
	a	Students use the given model to illustrate that mitotic cell division results in more cells that:	
		i.	Allow growth of the organism;
		ii.	Can then differentiate to create different cell types; and
		iii.	Can replace dead cells to maintain a complex organism.
	b	Students make a distinction between the accuracy of the model and the actual process of cellular division.	