SAMPLE LEARNING PLAN: CELL REPRODUCTION (Biology)

**Website:** [**http://mrsebiology.weebly.com/cell-repro.html**](http://mrsebiology.weebly.com/cell-repro.html)

**Learning Standards:**

I can learn how I learn the best, and use that information to help me in my classes.

I can accurately assess and monitor my own learning and work to fix anything I don’t know.

I can work collaboratively with other students in an online environment.

I can creatively demonstrate what I understand, and not just list facts I coped from a website.

I can make my own connections between concepts, and not just ones I found or a teacher made for me.

**Essential Questions:**

Why do cells divide?
What's a day in the life of a cell like?
Why are chromosomes important when a cell divides?
How are mitosis and meiosis similar, yet different?

**Content Standards:** (See next page)

**Standards-Based Scoring System**: (Used to assess understanding; can receive “halves”)

0 = No evidence

1 = Beginning

2 = Progressing

3 = Proficient

4 = Advanced

Cell Reproduction Unit Objectives

1. *Why Do Cells Divide?*

 A. I can explain why surface area-to-volume ratios are important to a dividing cell.

2. *The Cell Cycle*

 A. I can identify the phases of the cell cycle from diagrams.

 B. I can tell what happens in each phase of the cell cycle.

 C. I can show why one phase of the cell cycle follows another.

Vocabulary: chromatin, cell cycle, G1, S, G2, cytokinesis, mitosis, meiosis

3. *Chromosomes*

 A. I can identify the parts of a chromosome.

 B. I can explain the function of chromosomes.

 C. I can tell the difference between autosomes and sex chromosomes.

Vocabulary: chromosome, sister chromatid, centromere, autosome, sex chromosome

Illinois Assessment Frameworks: 12.11.13, , 12.11.17, 12.11.18

4. *Mitosis*

 A. I can identify the stages of mitosis from diagrams.

 B. I can put the stages of mitosis in the proper order.

 C. I can state what types of cells undergo mitosis, and why those cells undergo mitosis.

 D. I can list differences between how animal and plant cells divide.

Vocabulary: centrioles, spindle, cell plate, diploid, asexual reproduction, somatic cell, cell equator

Illinois Assessment Framework: 12.11.13

5. *Meiosis*

 A. I can identify the stages of meiosis from diagrams.

 B. I can put the stages of meiosis in order.

 C. I can explain when and how the number of chromosomes is reduced in meiosis.

 D. I can state what types of cells undergo meiosis, and why those cells undergo meiosis.

 E. I can explain how meiosis produces genetic variation in offspring and why genetic

 varation is necessary.

Vocabulary: homologous chromosomes, crossing over, haploid, sexual reproduction, gamete, zygote, tetrad, chiasmata, germ cell

Illinois Assessment Framework: 12.11.13, 12.11.15

6. *Summary*

A. I can list similarities and differences between mitosis and meiosis.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **I can statement** | **1 =Beginning** | **2 = Progressing** | **3 = Proficient** | **4 = Advanced** |
| ***Why Do Cells Divide?*** |  |  |  |  |
| 1a. I can explain why surface area-to-volume ratios are important to a dividing cell. |  |  |  |  |
| ***The Cell Cycle*** |  |  |  |  |
| 2a. I can identify the phases of the cell cycle from diagrams. |  |  |  |  |
| 2b. I can tell what happens in each phase of the cell cycle. |  |  |  |  |
| 2c.I can show why one phase of the cell cycle follows another. |  |  |  |  |
| ***Chromosomes*** |  |  |  |  |
| 3a. I can identify the parts of a chromosome. |  |  |  |  |
| 3b. I can explain the function of chromosomes. |  |  |  |  |
| 3c. I can tell the difference between autosomes and sex chromosomes. |  |  |  |  |
| ***Mitosis*** |  |  |  |  |
| 4a. I can identify the stages of mitosis from diagrams. |  |  |  |  |
| 4b. I can state what types of cells undergo mitosis, and why those cells undergo mitosis. |  |  |  |  |
| 4c. I can list differences between how animal and plant cells divide. |  |  |  |  |
| ***Meiosis*** |  |  |  |  |
| 5a. I can idenitfy the stages of meiosis from diagrams. |  |  |  |  |
| 5b. I can put the stages of meiosis in order. |  |  |  |  |
| 5c. I can explain when and how the number of chromosomes is reduced in meiosis. |  |  |  |  |
| 5d. I can state what types of cells undergo meiosis, and why those cells undergo meiosis. |  |  |  |  |
| ***Summary*** |  |  |  |  |
| 6a. I can list similarities and differences between mitosis and meiosis. |  |  |  |  |

1. Cell Reproduction Pre-Assessment

* Students are allowed to read selected pages in their text and answer questions aligned to each of the Objectives above.
* Questions are designed to see if students have mastered basic concepts, not in-depth concepts.
* Students mark their current understanding on their “How Am I Doing?” Sheet

2. Cell Reproduction I Can Note Summaries

* Students take “summary notes” over the pages in their textbook-the same pages they read for their pre-assessment.
* Students first pull out words and phrases that would be useful in answering I can statements
* Students then put these words together in an original sentence that summarizes the answer to the I can statement
* Students revise their understanding on their “How Am I Doing?” Sheet

3. Reciprocal Teaching Activity

* Students re-read the same pages they have read for the first two activities, only this time they will take on the roles specificed in reciprocal teaching (Summarizer, Clarifier, Questioner, & Analogizer).
* Science texts are difficult informational texts-students must learn that often you must re-read in order to reach full understanding
* Students correct and change what was in their I can note summaries from step #2.
* Students asked to revise their understanding on their “How Am I Doing?” Sheet
* If students score all “3s” on an objective (all I can statements), they can skip that station later on and move on to enrichment sooner, or they can work at the station if they so choose.

4. Cell Reproduction Learning Stations-students work towards a level 3 understanding

* Students work through the activities on each station for each objective on which they need work
* Activities are differentiated according to need, learning style, and multiple intelligence
* Students take a formative assessment at the end of each station using Google Forms, and then check their own answers
* Students revise their understanding after checking their answers (each question is aligned to an I can statement so students know which I can statement they don’t know)
* Students now know what Fix-It Station they need to do if they are not at 3s for each I can on an objective

5. Answering the I cans--Making Your Own Meaning

* Students answer the I can statements at a level 2 and a level 3 after completing each station
* This reinforces the difference between memorized, copied answers and answers making their own connections and in their own words

6. Fix-It Strategies/Enrichment

* Students do remediation activities to go back and review anything they still don’t understand
* If students still don’t get to a 3, they see me for further remediation
* If students get done early or didn’t have to do a station, they can move on to the enrichment activities

7. Review for Cell Reproduction Test (Level 3 Check)

* Students carry out team-directed review activities, using the rubrics for each objective to make sure they are at a 3

8. Cell Reproduction Test (Level 3 Check)

* Traditional Multiple Choice/Short Answer Test with leveled questions written for each I can statement

9. Level 4 Checks--Cell Reproduction

* See example on next page (based on Marzano’s work)
* Students work towards advanced mastery of the I can statements using a differentiated online project

Cell Reproduction Learning Rubrics

1. *Why Do Cells Divide?*

A. I can explain why surface area-to-volume ratios are important to a dividing cell.

|  |  |
| --- | --- |
| **SCORE** | **How to get the score:** |
| 4 | a) *The purpose of this choice is to have you make meaningful, Level 4 connections and understandings between the following concepts:**--Mitosis**--Cell Respiration**--Binary fission* The process by which prokaryotic cells divide is called **binary fission**, and it is different from mitosis in that prokaryotes do not have a nucleus to divide. Study the diagram below of the process of binary fission, noting similarities and differences between binary fission and mitosis:binary fission 2.gifClick on the link to the website below, and then click on “Investigating Bacterial Growth.” It will take you to a virtual lab. Listen/read the directions, and complete the lab activity. When you are finished, **WRITE UP THE LAB IN A LAB WRITE-UP FORM**. What will mostly determine if you are at a level 4 or not is your scientific explanation, showing how you can make connections between mitosis, binary fission, and cell respiration.http://www.classzone.com/cz/books/bio\_09/resources/htmls/virtual\_labs/virtualLabs.htmlb) *The purpose of this choice is to have you make meaningful, Level 4 connections and understandings between the following concepts:**--Mitosis**--Basic concepts of genetics**--Basic concepts of DNA* Read the website below, looking for connections between the topics listed above:<http://www.brown.edu/Courses/BI0032/gentherp/genIB2.html> Now click on the website below, and then click on “Breeding Mutations in Fruit Flies.” http://www.classzone.com/cz/books/bio\_09/resources/htmls/virtual\_labs/virtualLabs.htmlIt will take you to a virtual lab. Listen/read the directions, and complete the lab activity. When you are finished, **WRITE UP THE LAB IN A LAB WRITE-UP FORM**. What will mostly determine if you are at a level 4 or not is your scientific explanation, showing how you can make connections between mitosis, genetics, and DNA concepts.***No matter what choice you choose, in order to receive a Level 4 on the I cans, you MUST show solid, original LEVEL 4 connections between the concepts listed!*** |
| 3 | Given a scenario, infer or predict consequences of what would happen to a cell based on connections between its size and surface area-to-volume ratio |
| 2 | Recognize or state the simple relationship between surface area-to-volume ratios and why cells must split into two. (MC or SA) |
| 1 | With help, can do some of 2 or 3 |
| 0 | Even with help, cannot do any of 2 or 3. |

Sample Exit Ticket Questions: (Objective #1)

\* Required

Top of Form

1. Why do cells divide? (1a, 2) \*

* a. To make the cell have a surface area-to-volume ratio so it can diffuse substances into and out of the cell.
* b. To have the cell get a better surface area-to-volume ratio so it can help diffuse substances across the membrane.
* c. To make the cell larger so it has a larger surface area-to-volume ratio so it can move larger molecules across the membrane.
* d. To make the cell smaller so it has a larger surface area-to-volume ratio in to increase diffusion in and out of the cell.

2. Cell A has a surface area-to-volume ratio of 6:1, while Cell B has a surface area-to-volume ratio of 3:2. Which cell will probably divide soon? (1a, 3) \*

* a. Cell A
* b. Cell B
* c. Both cells will divide soon.

3. Cell A has a surface area-to-volume ratio of 24:8, while Cell B has a surface area-to-volume ratio of 3:1. Which cell will probably divide soon? (1a, 3) \*

* a. Cell A
* b. Cell B
* c. Both cells will divide soon.

Bottom of Form

Sample Differentiated Station: Blended Learning

**Station #2--Objective #2**

The Cell Cycle
                A. I can identify the phases of the cell cycle from diagrams.
                B. I can tell what happens in each phase of the cell cycle.
                C. I can show why one phase of the cell cycle follows another.

Vocabulary: chromatin, cell cycle, G1, S, G2, cytokinesis, mitosis, meiosis, interphase

A. Go to [this website](http://highered.mcgraw-hill.com/sites/0072495855/student_view0/chapter2/animation__how_the_cell_cycle_works.html) and view the animation.

B. Turn to the person next to you (whomever that may be) and summarize the steps of the cell cycle.  Say what each step is—IN ORDER—and what happens in each stage.

C. What stages did you not remember when telling them to your partner? Write them below, and then write what happens in each stage.  Replay the animation to help you.

D. Choose ONE of the following activities below:

--Write a story that matches ONE of the titles below.  Do this in Google Docs.  When you are finished, share it in Google Docs with another person of your choosing.  Make sure you include the phases of mitosis in your answer. Have them score your understanding of all the I can statements, and then give you feedback on how you can improve your understanding.

A Day in the Life of Sarah Skin Cell
A Day in the Life of Ned Neuron

HINT: You may have to do a little research about those types of cells before you write your story!

OR

--Go get some colored pencils and a blank copy of the cell cycle diagram.  Choosing one of the titles above, DRAW your story on the blank cell cycle diagram.  Illustrate each part of your story (which should line up with the stages of the cell cycle) as well as write what's happening to your main character.  Include the phases of mitosis in your story.  Have another student look at it, score it, and give you feedback on how to improve your understanding of the I can statements.

The story should show your understanding (not memorizing) of the answers to Objectives #2b & c.  **You will be assessed on how well you make connections between concepts, not how well you simply answer the I can statements.**

E. In your chart that you made suring Objective #1, write Level 2 and Level 3 answers to all of the I can statements for Objective #2.

F. Take the Exit Ticket (click on the link to the Google Form below).  Check your answers when you are finished.    On the How am I Doing Sheet, mark what level you are at on the I can statement for all of the Objective #2 I can statements.