

## 7<sup>th</sup> Grade STEM DESIGN CHALLENGE

### CORRESPONDING ENGINEERING DESIGN PROCESS STAGE IN RED

#### Unit 2: Structure and Function of a Cell

Topic: Design Mock Facebook Profiles of Organelles

Subject/ grade level: STEM/Grade 7

#### Materials:

- “The Cellular Network” project handout
- “ExampleFacebookPage” handout
- “ProjectScaffold” handout
- “FacebookPageTemplate” handout
- OrganelleWordBank” handout
- “PowerPoint1” slideshow
- “PowerPoint2” slideshow
- “Evaluation” handout
- “Facebook Analytics” math connection handout
- 21<sup>st</sup> Century Skill rubric to grade student project
- Websites
  - <http://www.classtools.net/FB/home-page>
  - <http://www.cellsalive.com/>
  - <http://www.ibiblio.org/virtualcell/tour/cell/cell.htm>
  - [http://www.wiley.com/legacy/college/boyer/0470003790/animations/cell\\_structure/cell\\_structure.swf](http://www.wiley.com/legacy/college/boyer/0470003790/animations/cell_structure/cell_structure.swf)
  - [http://www.eurekascience.com/ICanDoThat/plant\\_cells.htm](http://www.eurekascience.com/ICanDoThat/plant_cells.htm)
  - [http://www.eurekascience.com/ICanDoThat/animal\\_cells.htm](http://www.eurekascience.com/ICanDoThat/animal_cells.htm)
  - [http://www.biology4kids.com/files/cell\\_main.html](http://www.biology4kids.com/files/cell_main.html)
  - <http://www.wolframalpha.com/facebook/>

#### TEKS

##### Science

SCI.7.12C Recognize levels of organization in plants and animals including **cells**, tissues, organs, organ systems, and organisms.

\*©SCI.7.12D Differentiate between structure and function in plant and animal cell organelles including cell membrane, cell wall, nucleus, cytoplasm, mitochondrion, chloroplast, and vacuole.

##### Math

PS MATH.7.1A Apply mathematics to problems arising in everyday life, society, and the workplace.

PS MATH.7.1C Select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems.

##### ELPS

C1C Use strategic learning techniques such as concept mapping, drawing, memorizing, comparing, contrasting, and reviewing to acquire basic and grade-level vocabulary.

C3E Share information in cooperative learning interactions.

##### CCRS

##### Science

6A2A Describe or recognize major features that distinguish prokaryotic from eukaryotic cells.

6A3A Describe or recognize the appearance or structure of ribosomes, cytoplasmic membrane, chromosomes, cell wall,

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eukaryotic nucleus, nucleolus, lysosomes, vacuoles, cytoskeleton, centrioles, cilia, flagella, Golgi apparatus, chloroplasts, mitochondria, and endoplasmic reticulum, and describe important functions of each.

Math

6B2B Read and interpret graphical displays of data.

6C1B Draw conclusions from analyzing a set of data.

Cross-Disciplinary

1C3A Use general and specialized reference works and databases to locate sources.

2C6B Design a report using features such as headings and graphics appropriate to the writing task.

#### **Lesson objective(s):**

Students will review what they have learned about organelles, including their structure and function, by designing mock Facebook pages.

#### **Differentiation strategies to meet diverse learner needs:**

SPED/ELL:

Included: Abridged version of mock Facebook page design directions with sample graphics supplied.

Modification Suggestion: Simplify the language and/or shorten the computational knowledge handout, "Facebook Analytics."

### **IDENTIFY NEED**

This introduction is provided on "The Cellular Network" project handout:

*We are in the midst of studying the organelles that make up Eukaryotic cells. To approach this centuries- long studied material, you will utilize technology of the 21<sup>st</sup> century. Your role is that of the webmaster. You will need to arrange and create mock Facebook pages for each of the organelles. This job will require you to be creative and imaginative. The purpose of this activity is to assist you and others in learning the names, locations, and functions of all of the organelles in a Eukaryotic cell.*

Formative Assessment:

A rubric is included in this handout to help students understand the specific outcomes of the project and to assist the teacher in assessing the project.

Differentiation:

Use the strategy called, *Partner Speaks* to give students an opportunity to talk through an idea with their partner before sharing. During share out with the larger group, pairs speak from the perspective of their partner. This forces students to consider the ideas of others and encourages careful listening between pairs.

### **RESEARCH THE PROBLEM**

Students will conduct internet research to collect all of the information necessary to complete their mock Facebook profile pages for each of the organelles of focus. Show students the sample mock Facebook profile handout, "ExampleFacebkPage" or print out a copy for each team to serve as a guide.

Possible web resources for students to use (add others as needed, or allow students to find their own online resources):

- <http://www.cellsalive.com/>
- <http://www.ibiblio.org/virtualcell/tour/cell/cell.htm>
- [http://www.wiley.com/legacy/college/boyer/0470003790/animations/cell\\_structure/cell\\_structure.swf](http://www.wiley.com/legacy/college/boyer/0470003790/animations/cell_structure/cell_structure.swf)<http://www>

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- [w.eurekascience.com/ICanDoThat/plant\\_cells.htm](http://w.eurekascience.com/ICanDoThat/plant_cells.htm)
- [http://www.eurekascience.com/ICanDoThat/animal\\_cells.htm](http://www.eurekascience.com/ICanDoThat/animal_cells.htm)
- [http://www.biology4kids.com/files/cell\\_main.html](http://www.biology4kids.com/files/cell_main.html)

#### Differentiation:

For struggling learners, give them a copy of the “ProjectScaffold” handout to provide greater clarification of what each section on the profile page should represent for this project.

#### Formative Assessment:

Give each team 7 of the “FacebkPageTemplate” handouts. Have students use web resources and other sources to research each of the organelles by taking notes on the right side of each template only. These notes will be used to complete the next stage of the design process.

#### Extension:

Students can complete research on all of the organelles individually and then come together in the next stage to discuss their research, share ideas, and then work together to design the 7 pages.

### DEVELOP POSSIBLE SOLUTIONS

In design teams, students will use the “FacebkPageTemplate” to create the mock Facebook pages for each of the organelles.

#### Formative Assessment:

Working in their teams, students will complete the left side of this template with their notes taken previously. Students should use the rubric given to guide their creation process.

#### Differentiation:

For students who need extra support, provide a word bank of words to target the information that should be contained in the profiles, such as the “OrganelleWordBank” handout. Have students highlight or underline the words as they appear in the paper drafts.

#### Extension:

If you assigned all 7 pages to each student, in this stage students will now use their research to complete the left side of each template individually.

### SELECT THE MOST PROMISING SOLUTION

Once all assigned organelle pages are complete, the team will decide on their final versions to be depicted in each profile. Teams should select from their drafted versions and make changes or additions as needed. Pages should be either recreated or adjusted to fit the assignment requirements.

#### Formative Assessment:

Using the rubric given at the start of the project, teams should discuss and reach consensus on which of the profiles to use and make their final 7 selections. Final selections should be marked up with changes and notes that should be used to construct the final prototype of their website.

#### Differentiation:

Give students 7 copies of the rubric and have them staple one to each of their final selections with preliminary grading areas circled and notes on the bottom and back side of the rubric indicating modifications. Have students sign their

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names at the bottom indicating consensus.

#### CONSTRUCT A PROTOTYPE

Students will use the “PowerPoint1” template for the digitized version of their mockup of the profile pages. Students will create all hand-drawn illustrations for the PowerPoint by either scanning them in, or using a paint program (like Microsoft Paint) to create them. (**Teacher Note:** Make sure students rename their PowerPoint.)

Formative Assessment:

Give students “PowerPoint1” and have them work together to complete each profile for their presentation.

Differentiation:

Students who are very good at illustrating can digitally create and save each of the pictures to go with the 7 profiles and save them individually using a program like Microsoft Paint. Then, the team can insert and position the photos as needed within PowerPoint when ready.

Extension:

To hold each student accountable for the mockup and to equally divide the labor involved in the project, the teacher may assign each student an individual PowerPoint slide to complete. To do this, give each student the “PowerPoint2” template and then have students merge all of the completed “PowerPoint2” templates together into the one final PowerPoint slideshow.

#### TEST AND EVALUATE PROTOTYPE

Focus group format- Students will meet with another group to show them their profile pages and to get preliminary, external feedback.

Formative Assessment:

Teams will evaluate one other team’s presentation. Evaluating teams should use the rubric to guide the conversation and frame the feedback, while the presenting team takes notes on the changes and adjustments as they are suggested.

#### COMMUNICATE THEIR DESIGN

Students should create an introduction and closing slide to go with their mockup website pages. They can be creative with the two slides, but all contributing team member names should be indicated. After final adjustments have been made, students will showcase their presentations to the class to receive feedback on their final product.

Formative Assessment:

Using their copy of the project rubric, have teams record their feedback on the “Evaluation” handout. Teams will need enough copies to fill one out for each team presenting (except their own).

Differentiation:

The teacher may need to model how to correctly fill out the “Evaluation” handout for students prior to assigning the task. To do this together as a group, have the class evaluate the “ExampleFacebookPage” handout for modeling purposes.

#### REDESIGN

Provide presenting teams with the completed “Evaluation” handouts after you have assessed them for a grade. Based on comments and feedback provided by the focus group and the class, students will now make adjustments to their Facebook profile pages and use the “Fakebook” tool hosted by Classtools.net to post their final, live versions.

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Fakebook:

<http://www.classtools.net/FB/home-page>

Formative Assessment:

Students should compile their list of their project's corresponding live URLs hosted by the classtools.net website to pass in to the teacher for a final project grade.

Differentiation:

For teams that had difficulty with the digital format, or if access to group viewing equipment is a challenge, the teacher may give them the option of producing the redesigned project in paper and pencil form.

### MATH CONNECTION

*Analysis of Facebook Student Data*

Students will use tables and charts generated using Facebook to analyze data.

Formative Assessment:

Have students complete the "Facebook Analytics" handout to analyze, interpret, and draw conclusions from sample Facebook data.

Differentiation:

For students that struggle with graphical displays of data, the "Weekly Distribution" graph may be especially confusing. Pre-teach students how to read and interpret this graph by posing questions about the data not asked in the handout assignment.

Extension (At Home Connection):

Statistics are not a dry topic to middle school students if they are analyzing their **own** data and use it to formulate some questions or hypotheses. Students can create a free WolframAlpha analytics report of their own Facebook page using this link: <http://www.wolframalpha.com/facebook/>

Students will log on to Wolfram Alpha and select the "Get Your Report" link. Facebook will ask for permission to access their status updates. Students will need to give permission for this. It will also ask to access some information from their friends list that they can skip. Students should print out their reports for this activity to bring to school and/ or the teacher can assign one of the following topics below.

Possible research questions or activities to probe with this data:

- Analyze what time/day of the week do you post the most pictures. Why is this?
- Post the "Friends location" data. What is the furthest location? What percentage of your Facebook friends reside outside of the United States?
- Embed the "word cloud" report. Which words are the largest? What does this tell you about what is important to the author of these status updates?
- Use the "Gender" report to introduce pie charts
- Practice finding averages with post statistics
- Find out how many days have passed since the student's most commented post
- Have students blog about what surprised them about their data