

## MAKING THE CELL: TEACHER GUIDE

**Subject:** Life Science

**Grade Level:** Middle School

**Last Updated:** September 9, 2008

### **Case Summary**

Did you see “Making the Cell” last season? Well, a lot has changed since then. The group has finally made it to the beginning stages of the music business. Will they all be able to work together to complete a common goal? Read to find out the latest happenings with Bay-Boy’s newest venture.

### **Credits**

This case was written by William Harris (teacher, Ronald E. McNair, Sr. Middle School, Decatur, GA) and Sabrenia M. Parker (Ph.D. candidate, Clark Atlanta University, Atlanta, GA) fellows of the Emory University PRISM program (<http://www.prism.emory.edu>). Authors may be contacted at [wjh7869@fc.dekalb.k12.ga.us](mailto:wjh7869@fc.dekalb.k12.ga.us) and [sparke@learnlink.emory.edu](mailto:sparke@learnlink.emory.edu).

The idea for this case was inspired by *MTV*’s “Making The Band” series (<http://www.mtv.com/onair/makingtheband>).

### **Learning Objectives**

1. Explain how life is organized from a single cell.
2. Describe the difference between unicellular and multi-cellular organisms.
3. Explain the difference between prokaryotic and eukaryotic cells.
4. Explain the function of each part of a cell.
5. Describe how osmosis occurs.
6. Explain the process of diffusion.
7. Compare active transport and passive transport.
8. Explain how large particles get into and out of the cell.
9. Describe the process of mitosis.

### **Georgia Performance Standards**

- S7CS1*. Students will explore the importance of curiosity, honesty, openness, and skepticism in science and will exhibit these traits in their own efforts to understand how the world works. (NSES Content Standard A).
- S7CS6*. Students will communicate scientific ideas and activities clearly. (NSES Content Standard A)
- S7CS7*. Students will question scientific claims and arguments effectively. (NSES Content Standard A)

*S7CS10.* Students will enhance reading in all curriculum areas by reading a minimum of 25 books, conducting book discussions, building vocabulary knowledge and establishing context.

*S7L1.* Students will investigate the diversity of living organisms and how they can be compared scientifically. (NSES Content Standard C)

*S7L2.* Students will describe the structure and function of cells, tissues, organs, and organ systems. (NSES Content Standard C)

### Assessment

Students will work in groups to complete boxchart, after which an informal assessment is conducted through class discussion and brainstorming about the information that students wrote into the boxchart. Students will research learning issues for the case. To conduct the research, students will remain in groups as they reference the resources provided, i.e. textbook, internet, library, etc. A recorder from each group will document information found. Each team will work to create real products as per the assignment worksheets.

Overall grading for the case is based on their combined grades for their box charts and products. Grading will be based on a 5-point scale (5=excellent, 4=very good, 3=good, 2=fair, and 1=poor) that will be converted into a percentage and from there into total points depending on the weight of the assignment for each criterion:

- Accuracy and depth of product components; attention to grammar, word usage, and mechanics,
- Individual contribution and participation within the team,
- Individual research ability and effort, i.e. investigative questioning, online exploration, and etc...

Students critiqued on journal entries. They students will be assessed by rubrics and self/peer evaluations. There is a rubric for each product. The assignment worksheet categories are listed below. (Students are encouraged to be creative for each assignment).

#### *Make a board game*

After the identification and research of the learning issues in Scene 1, the students will be responsible for designing a board game based on the cell. The game will include functions of the different organelles and things that could possibly go wrong as a result of this organelle failing to work. For the board games, students will be guided to

<http://www.boardgames.com/index.html>, a board game website with a complete listing of games for every taste and gaming preference in many different game categories. Teachers may choose a specific game category for the students or allow them to choose their own.

**\*Note: there are hundreds of games listed.** A grading rubric is included with the ***Student Materials***.

#### *Create a song “16 bars”*

Once the students have completed Scene 2 and identified/researched the learning issues, they will use their newly acquired information on organelles to write an original rap song. Students will be accountable for including specific information on organelles and their functions in the songs. For the original 16 bar rap song, students will be guided to <http://davenoodlez.tripod.com/>, a website that provides keys to a successful song and pointers for writing 16 bar songs. A grading rubric is included in the *Student Materials*.

#### *Create a poster or brochure*

After Wally speaks in Scene 3, the students will create a poster advertising the new group or create a public awareness brochure on different cell organelles that may be either passed out or placed on walls throughout the school to announce the release date of their new CD. For the brochure, students will be guided to [www.mybrochuremaker.com](http://www.mybrochuremaker.com), a website that provides brochure templates and user-friendly instructions. A grading rubric for the poster and a grading rubric for the brochure are included in the *Student Materials*.

#### *Oral Review*

Once all the learning issues have been identified, the students will role-play going into a radio station and being interviewed by a local radio station personality (teacher or facilitator). The students will each play the part of a different character and the organelle that the character represents. They must also respond to the interview questions according to that organelle's function.

### **Implementation Strategy**

This case is designed for a class on block scheduling and as such is created to take place over approximately two weeks. Timeframe varies from day to day. Average span time is 1 hour and 20 minutes.

#### Implementation Schedule

*Organize students into small groups of 5*

##### **Day One**

Introduce new case (5 minutes)

Read Scene 1 silently and then assign parts to students (10 minutes)

Read Scene 1 through role play (10 minutes)

Brainstorm and construct box chart in small groups (25 minutes)

Identify/discuss learning issues as a class (15 minutes)

Assign learning issues to groups (5 minutes)

Complete peer/self evaluations (5 minutes)

Inform students of board game assignment (5 minutes)

*Homework:* Students will be encouraged to brainstorm about board game ideas.

##### **Day Two**

Return to groups and discuss board game ideas (5 minutes)  
Assign learning issues individual within small groups (10 minutes)  
Group and individual research using Resource Handout (45 minutes)  
Write in journals “What have I learned today?” (10 minutes)  
Complete peer/self evaluations (5 minutes)

### **Day Three**

Reconvene in small groups to share research from learning issues (25 minutes)  
Discuss hypotheses based on research (15 minutes)  
Return to large group and discuss learning issues from Scene 1 (20 minutes)  
Write in journals “What have I learned today?” (10 minutes)  
Complete peer/self evaluations (5 minutes)

### **Day Four**

Present 1<sup>st</sup> product for students to construct board game (5 minutes)  
Return to groups and construct board games (60 minutes)  
*\*\*Rough copy and sketch need to be completed by the end of class. Teacher provides materials such as crayons, markers, etc...*  
Complete peer/self evaluations (10 minutes)

### **Day Five**

Complete board games (40 minutes)  
*\*\*Final copy due at the end of class*  
Present board games to class (25 minutes)  
Complete peer/self evaluations (5 minutes)

### **Day Six**

Review Scene 1 (5 minutes)  
Read Scene 2 silently and then assign parts to students (10 minutes)  
Read Scene 2 through role play (10 minutes)  
Brainstorm and construct box chart in small groups (25 minutes)  
Identify/discuss learning issues as a class (15 minutes)  
Assign learning issues to groups (5 minutes)  
Complete peer/self evaluations (5 minutes)  
Inform students of rap song assignment (5 minutes)  
*Homework:* Students will research criteria for their “16 bar” songs.

### **Day Seven**

Return to groups and discuss song ideas (5 minutes)  
Assign learning issues individual within small groups (10 minutes)  
Group and individual research using Resource Handout (45 minutes)  
Write in journals “What have I learned today?” (10 minutes)  
Complete peer/self evaluations (5 minutes)

### **Day Eight**

Reconvene in small groups to share research from learning issues (25 minutes)

Discuss hypotheses based on research (15 minutes)  
Return to large group and discuss learning issues from Scene 2 (20 minutes)  
Write in journals “What have I learned today?” (10 minutes)  
Complete peer/self evaluations (5 minutes)

### **Day Nine**

Present 1<sup>st</sup> product for rap songs (5 minutes)  
Return to groups and write original rap songs (60 minutes)  
*\*\*Rough draft needs to be completed by the end of class.*  
Complete peer/self evaluations (10 minutes)

### **Day Ten**

Complete rap songs (40 minutes)  
*\*\*Final copy due at the end of class*  
Perform rap songs for the class (25 minutes)  
Complete peer/self evaluations (5 minutes)

### **Day Eleven**

Review Scene 2 (5 minutes)  
Read Scene 3 silently and then assign parts to students (10 minutes)  
Read Scene 3 through role play (10 minutes)  
Brainstorm and construct box chart in small groups (25 minutes)  
Identify/discuss learning issues as a class (15 minutes)  
Assign learning issues to groups (5 minutes)  
Complete peer/self evaluations (5 minutes)

### **Day Twelve**

Assign learning issues individual within small groups (10 minutes)  
Group and individual research using Resource Handout (45 minutes)  
Write in journals “What have I learned today?” (10 minutes)  
Complete peer/self evaluations (5 minutes)  
Inform students of brochure assignment (5 minutes)  
*Homework:* Students will be encouraged to brainstorm ideas for their brochures.

### **Day Thirteen**

Reconvene in small groups to share research from learning issues (25 minutes)  
Discuss hypotheses based on research (15 minutes)  
Return to large group and discuss learning issues from Scene 3 (20 minutes)  
Write in journals “What have I learned today?” (10 minutes)  
Complete peer/self evaluations (5 minutes)

### **Day Fourteen**

Present 1<sup>st</sup> product for brochures (5 minutes)  
Return to groups and work on brochures (60 minutes)  
*\*\*Rough draft needs to be completed by the end of class. Teacher provides materials such as poster paper, crayons, markers, etc...*

Complete peer/self evaluations (10 minutes)

### **Day Fifteen**

Complete brochures (40 minutes)

*\*\*Final copy due at the end of class*

Present brochures to class for review and class evaluation (20 minutes)

Complete peer/self evaluations (5 minutes)

### **Day Sixteen**

Read entire play from beginning to end (15 minutes)

*\*\*Give students the surprise ending of the oral interview.*

Write an essay on what the group members need to do to continue working as a functional organelle to prepare for interviews (10 minutes)

Radio interview (50 minutes)

### **Case Notes**

Each class is encouraged to modify this case as *MTV* or *BET* series are updated over time.

*Case Notes from high school biology implementation, February, 2008 by Candice Henry (teacher, Carver School of Health Sciences & Research, Atlanta, GA) a PBL Fellow of the Emory College Center for Science Education:*

I liked the case as an introduction to cell structures and functioning. It was a cute way to get the kids engaged, a lot of my struggling students were able to shine, they were very vocal about reading their parts in the case and they participated beyond my wildest expectations in the presentation of their rap. The brochure activity worked well, I attempted to differentiate the products by having the students gear their brochure either toward a middle school audience or a college audience. Because I did not want to spend a lot of time on the product, I think the quality of work is a representation of the limited time they got to “make it pretty”. While the content is there in the brochures the students still need to work on putting things in their own words. I downloaded about 32 beats from I-tunes and allowed the students to select their beat for their rap presentation and some classes/groups really got into the flow and content of their rap others I allowed to just create a poem. This was a great product, as I said before some students really got an opportunity to shine and they worked very hard to be the best in the class. I completed the skit with only my 1<sup>st</sup> period class and it went okay, I try not to impose my ideas on them, but I think that I might need to have a creativity list to help students get started on ideas and then let them flourish. All in all I thought that the case went well, until today when I went through a “Lets Fill in the Gaps” power point and the students were behaving as if they had not been discussing cell organelles this and last week which was a disappointment because I spent the time hoping they would get a deeper understanding of the concepts.

It would be interesting to update the case to the current Making the band season, because there are 2 groups of 5 on the show now and a solo artist (11 people) so that would include more organelles/band members in the scene and you could talk about mitochondria and endosymbiosis in terms of the solo artist. I added more organelles during discussions but it would have been great if they were embedded in the case.

I would definitely do the case again but I would:

1. update it to the current making the band season to be more content rich
2. as a focus each day give human characteristics to organelle functioning and have the kids act it out to continue relating the functioning with the organelles
3. do the brochure product
4. do the rap product, but lines have to be memorized

### **Facilitator Guide:**

*Facilitators are encouraged to keep these points in mind:*

- Living systems at all levels of organization demonstrate the complementary nature of structure and function. Important levels of organization for structure and function include cells, organs, tissues, organ systems, whole organisms, and ecosystems.
- All organisms are composed of cells--the fundamental unit of life. Most organisms are single cells; other organisms, including humans, are multicellular.
- Cells carry on the many functions needed to sustain life. They grow and divide, thereby producing more cells. This requires that they take in nutrients, which they use to provide energy for the work that cells do and to make the materials that a cell or an organism needs.
- Specialized cells perform specialized functions in multicellular organisms. Groups of specialized cells cooperate to form a tissue, such as a muscle. Different tissues are in turn grouped together to form larger functional units, called organs. Each type of cell, tissue, and organ has a distinct structure and set of functions that serve the organism as a whole.
- The human organism has systems for digestion, respiration, reproduction, circulation, excretion, movement, control, and coordination, and for protection from disease. These systems interact with one another.
- Disease is a breakdown in structures or functions of an organism. Some diseases are the result of intrinsic failures of the system. Others are the result of damage by infection by other organisms.

## **Resources**

Boardgames.com, Inc. (2008). Board games – Toys and games superstore. Retrieved September 9, 2008 from <http://www.boardgames.com/index.html>

Carter, J.S. 1996. Cells and organelles. Retrieved September 9, 2008 from <http://biology.clc.uc.edu/courses/bio104/cells.htm>

Westbrook, G. (2000). Cell organelle table. Retrieved September 9, 2008 from <http://www.usoe.k12.ut.us/CURR/Science/sciber00/7th/cells/sciber/orgtable.htm>

Barkalow, S., Khalid, N., and Pongsajapan, R. (n.d.). Cellular biology: Cell structures and functions. Retrieved September 9, 2008 from <http://library.thinkquest.org/12413/structures.html>

Ireland, P. (2000). So what is an organelle? Retrieved September 9, 2008 from <http://www.usd.edu/~bgoodman/ReviewFrames.htm>

MTV Networks.2006). Making the Band. Retrieved September 9, 2008 from <http://www.mtv.com/onair/makingtheband/>

Noodlez, D. (n.d.). How to write a rap song by Dave Noodlez. Retrieved September 9, 2008 from <http://davenoodlez.tripod.com/>