

Supplemental Material

CBE—Life Sciences Education

Stoltzfus *et al.*

Pre/Post Content Knowledge Survey

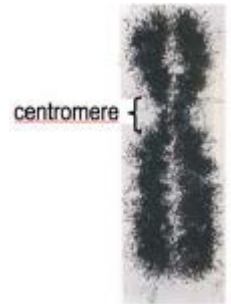
Question 1

Which of the following statements **BEST** describes why your muscle, nerve, and skin cells have different functions? **CHOOSE THE ONE BEST ANSWER.**

- Each cell type contains different genes.
- Each cell type contains different mutations.
- Each cell type activates different genes.
- Each cell type activates different mutations.
- I do not know.

Question 2

The photograph on the right shows a single replicated chromosome (consisting of two sister chromatids) just before mitosis. This chromosome contains: **CHOOSE THE ONE BEST ANSWER.**



- two single-stranded DNA molecules.
- one double-stranded DNA molecule.
- two double-stranded DNA molecules.
- many double-stranded DNA molecules.
- I do not know.

Question 3

The replicated chromosome shown on the right contains: **CHOOSE THE ONE BEST ANSWER.**



- DNA sequences from one of your parents in the sister chromatid on the left and DNA sequences from the other parent in the sister chromatid on the right.
- DNA sequence contributions from both parents, resulting from crossing over.
- DNA sequences from only one of your parents.
- I do not know.

Question 4

Which of the following BEST represents transcription? CHOOSE THE ONE BEST ANSWER.

- RNA → RNA
- DNA → DNA
- RNA → DNA
- DNA → RNA
- RNA → protein
- DNA → protein
- I do not know.

Question 5

How does a gene produce a phenotype? CHOOSE THE ONE BEST ANSWER.

- The gene codes for a carbohydrate which produces the phenotype.
- The gene codes for a protein which produces the phenotype.
- The gene codes for DNA which produces the phenotype.
- The gene produces the phenotype directly.
- I do not know.

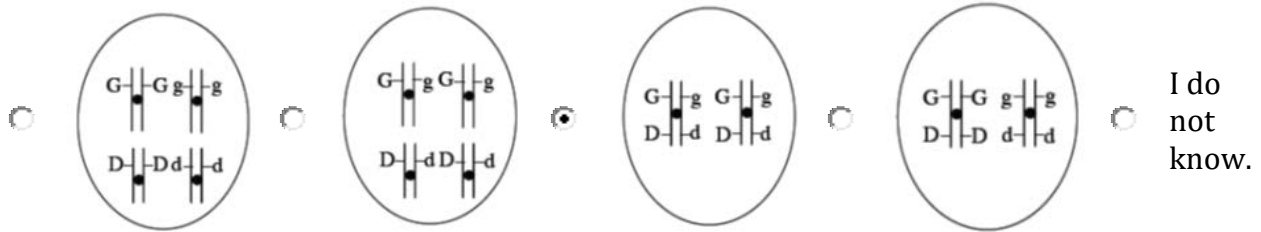
Question 6

How similar is your genetic information to that of your parents? CHOOSE THE ONE BEST ANSWER.

- For each gene, you have one version of that gene from one parent and one version from the other parent.
- For each gene, you have all the versions of that gene your parents inherited from their parents.
- Depending on how much crossing over happens, both versions of one gene can come from one parent.
- Depending on how much crossing over happens, most of your genetic information can come from one parent.
- I do not know.

Question 7

Suppose there are two genes on two different chromosomes, one gene called G and the other called D. An individual has the genotype GgDd. Which of the following drawings correctly shows cells in this individual after DNA replication but before cell division of the first stage of meiosis? Assume no crossing-over occurs between the chromosomes. CHOOSE THE ONE BEST ANSWER.



Question 8

When environmental conditions are held constant, humans have a wide variety of heights. How is human height influenced genetically? CHOOSE THE ONE BEST ANSWER.

- two versions of one gene
- a single recessive gene
- a single dominant gene
- several versions of several genes
- I do not know.

Question 9

Cystic fibrosis in humans is caused by mutations in a single gene and is inherited as an autosomal (non-sex chromosome) recessive trait. A normal couple has two children. The first child has cystic fibrosis, and the second child is unaffected. What is the probability that the second child is a carrier (heterozygous) for the mutation that causes the disease? CHOOSE THE ONE BEST ANSWER.

- 1/4
- 1/2
- 2/3
- 3/4
- 1
- I do not know.

Question 10

This is a quality control question. Please pick the second choice below. CHOOSE THE ONE BEST ANSWER.

- Do not pick this choice.
- Pick this choice.
- Do not pick this choice.
- Do not pick this choice.
- I do not know.

Question 11

What MOST IMPORTANT characteristic of DNA allows it to be copied? CHOOSE THE ONE BEST ANSWER.

- The weak hydrogen bonding of bases in DNA.
- The specific pairing of bases in DNA.
- The specific order of bases in DNA.
- The unique shapes of bases in DNA.
- I do not know.

Question 12

You are working with a strain of bacteria that is missing a particular gene and its promoter. What protein would the bacteria express if you inserted the human version of the gene with the normal bacterial promoter? CHOOSE THE ONE BEST ANSWER.

- only the bacterial version of the protein
- only the human version of the protein
- a mixed version of the protein with parts from both the bacterial and human versions
- both the bacterial version of the protein and the human version of the protein
- I do not know.

Question 13

Which of the following statements about the expression of complex traits like heart disease is MOST accurate? CHOOSE THE ONE BEST ANSWER.

- The environment determines if an individual can express a specific trait. Whether or not the trait is actually expressed depends upon genetic makeup.
- Genetic makeup determines if an individual can express a specific trait. Whether or not the trait is actually expressed depends upon the environment.
- The environment determines if an individual can express a specific trait. Whether or not the trait is actually expressed is independent of genetic makeup.
- Genetic makeup determines if an individual can express a specific trait. Whether or not the trait is actually expressed is independent of the environment.
- I do not know.

Question 14

A child has a recessive disease, but his parents do not. Which of the following statements about that child's parents is true? CHOOSE THE ONE BEST ANSWER.

- One parent has one copy of the disease-causing version of the gene.
- One parent has two copies of the disease-causing version of the gene.
- Each parent has one copy of the disease-causing version of the gene.
- Each parent has two copies of the disease-causing version of the gene.
- I do not know.

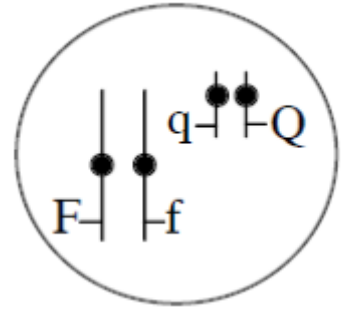
Question 15

What MOST IMPORTANT characteristic of DNA allows it to store information? CHOOSE THE ONE BEST ANSWER.

- The weak hydrogen bonding of bases in DNA.
- The specific pairing of bases in DNA.
- The specific order of bases in DNA.
- The unique shapes of bases in DNA.
- I do not know.

Question 16

As pictured on the right, "F" and "f" represent two different versions of one gene. "Q" and "q" represent two different versions of another gene. What are the possible sperm cell genotypes produced from this cell? CHOOSE THE ONE BEST ANSWER.



- F, f, Q, q
- Ff, Ff, Qq, Qq
- FQ, fq, Fq, fQ
- Ff, Qq, FQ, fq, Fq, fQ
- I do not know.

Question 17

Which of the following human cells contain genes that code for skin color? CHOOSE ALL THAT APPLY.

- Skin cells
- Heart cells
- Brain cells
- Sperm cells
- I do not know.

Question 18

Why are geneticists able to apply what they learn from mice, fruit flies, and yeast to humans? CHOOSE ALL THAT APPLY.

- Mice, fruit flies, yeast and humans all have DNA as their genetic material.
- Mice, fruit flies, yeast and humans all have RNA as their genetic material.
- Mice, fruit flies, yeast and humans all have protein as their genetic material.
- Mice, fruit flies, yeast and humans all have amino acids as their genetic material.
- I do not know.

Question 19

Below are DNA triplet sequences found within a gene. Which of the following DNA mutations underlined below will result in a shorter than normal protein? CHOOSE ALL THAT APPLY.

CODON KEY: TGA = Stop GGA = Glycine TGG = Tryptophan

- TGA → GGA
- TGA → TGG
- GGA → TGA
- TGG → TGA
- I do not know.

| Question Number | Original Question Source |
|-----------------|--------------------------|
| #1 | GLAI #22 |
| #2 | IMCA #19 |
| #3 | IMCA #20 |
| #4 | IMCA #22 |
| #5 | GLAI #4 |
| #6 | BCI #22 |
| #7 | GCA #23 |
| #8 | GLAI #3 |
| #9 | GCA #10 |
| #10 | Quality Control – NA |
| #11 | BCI #11 |
| #12 | IMCA #23 |
| #13 | GLAI #18 |
| #14 | GLAI #17 |
| #15 | BCI #10 |
| #16 | GCA #2 |
| #17 | GCA #1 |
| #18 | GLAI #13 |
| #19 | GCA #12 |

Traditional Room Technology and Infrastructure Survey

Question 1

Which of the following devices are you able to bring to class to complete internet based assignments like Learning Catalytics? **Choose all that apply.**

- Laptop Computer
- Tablet
- Smart Phone
- None of the Above
- I am not comfortable answering this question.

Question 2

Do you know how to connect a laptop, tablet, or other device to the projector at the front of the room?

- I definitely know how to do this.
- I might know how to do this.
- I do not know how to do this.
- I am not comfortable answering this question.

Question 3

If it were available, how often do you think your team would have used a large monitor on which your team could display a laptop, tablet or other device while working on classroom activities?

- More than once each week.
- About once each week.
- About once every other week.
- Only a few times during the semester.
- Never.
- I am not comfortable answering this question.

Question 4

How useful do you think a monitor that you could connect a laptop, tablet, or other device to would have been during classroom activities.

- Very useful.
- Somewhat useful
- Not useful
- I am not comfortable answering this question.

Question 5

If it were available, how do you think a large monitor on which your team could display a laptop, tablet or other device while working on classroom activities would have changed your team's performance on classroom activities?

- My team's performance on classroom activities would have suffered if there was large monitor on which my team could display a laptop, tablet or other device while working on classroom activities.
- My team's performance on classroom activities would not have changed if there was large monitor on which my team could display a laptop, tablet or other device while working on classroom activities.
- My team's performance on classroom activities would have improved if there was large monitor on which my team could display a laptop, tablet or other device while working on classroom activities.
- I am not comfortable answering this question.

Question 6

How useful was your team's tablet for classroom activities?

- Very useful
- Somewhat useful
- Not useful
- I am not comfortable answering this question.

Question 7

How would your team's performance on classroom activities have changed if the team tablet was not available?

- My team's performance on classroom activities would have suffered without the tablet.
- My team's performance on classroom activities would not have changed without the tablet.
- My team's performance on classroom activities would have improved without the tablet.
- I am not comfortable answering this question.

Question 8

This is a quality control question. Please pick "Choose this answer".

- Do not choose this answer.
- Choose this answer.
- Do not choose this answer.
- I am not comfortable answering this question.

Question 9

How useful were the fixed desks during classroom activities?

- Very useful
- Somewhat useful
- Not useful
- I am not comfortable answering this question.

Question 10

This course was taught in a traditional classroom with fixed desks. How would your team's performance on classroom activities have changed if the course had been taught in a room with tables and movable chairs?

- My team's performance on classroom activities would have suffered in a room with tables and movable chairs.
- My team's performance on classroom activities would not have changed in a room with tables and movable chairs.
- My team's performance on classroom activities would have improved in a room with tables and movable chairs.
- I am not comfortable answering this question.

Question 11

How did the layout of the classroom impact the ability of the instructor to interact with your team during class?

- The layout of the classroom enhanced the ability of the instructor to interact with my team.
- The layout of the classroom had no impact on the ability of the instructor to interact with my team.
- The layout of the classroom hindered the ability of the instructor to interact with my team.
- I am not comfortable answering this question.

Question 12

How often did the instructor interact with your team during the semester?

- Several times each class meeting.
- About once each class meeting.
- About once each week.
- About once every other week.
- Only a few times during the semester.
- Never.
- I am not comfortable answering this question.

Question 13

How frequently did the battery on your mobile device run low during class?

- Almost every class.
- About every other class.
- About every other week.
- A few times during the semester.
- Never.
- I am not comfortable answering this question.

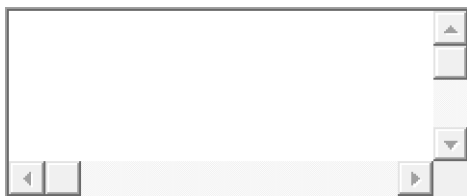
Question 14

Please comment on anything about the layout of the classroom that could have been changed to help you learn the course material better. If you do not want to answer this question, just leave it blank.



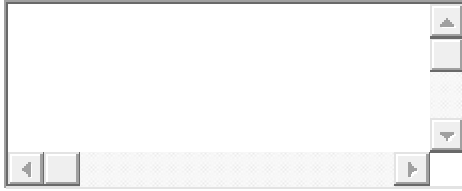
Question 15

Please comment on anything about the technology used in the course that was particularly helpful as you learned the course material. If you do not want to answer this question, just leave it blank.



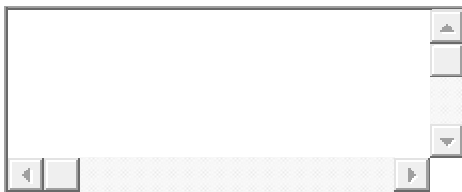
Question 16

Please comment on anything about the technology used in the class that could have been changed to help you learn the course material better. If you do not want to answer this question, just leave it blank.

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Question 17

Please comment on anything about the layout of the classroom that was particularly helpful as you learned the course material. If you do not want to answer this question, just leave it blank.

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SCALE-UP Room Technology and Infrastructure Survey

Question 1

Which of the following devices are you able to bring to class to complete internet based assignments like Learning Catalytics? **Choose all that apply.**

- Laptop Computer
- Tablet
- Smart Phone
- None of the Above
- I am not comfortable answering this question.

Question 2

Do you know how to connect a laptop, tablet, or other device to the monitor at your table?

- I definitely know how to do this.
- I might know how to do this.
- I do not know how to do this.
- I am not comfortable answering this question.

Question 3

How often did your team use the monitor on your team's table to display a laptop, tablet, or other device while you were working as a team?

- More than once each week.
- About once each week.
- About once every other week.
- Only a few times during the semester.
- Never.
- I am not comfortable answering this question.

Question 4

How useful was the computer monitor on your team's table for classroom activities?

- Very useful
- Somewhat useful
- Not useful
- I am not comfortable answering this question.

Question 5

How would your team's performance on classroom activities have changed if the monitor on your team's table was not available?

- My team's performance on classroom activities would have suffered without the monitor.
- My team's performance on classroom activities would not have changed without the monitor.
- My team's performance on classroom activities would have improved without the monitor.
- I am not comfortable answering this question.

Question 6

How useful was your team's tablet for classroom activities?

- Very useful
- Somewhat useful
- Not useful
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- My team's performance on classroom activities would have improved without the tablet.
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Question 8

This is a quality control question. Please pick "Choose this answer".

- Do not choose this answer.
- Choose this answer.
- Do not choose this answer.
- I am not comfortable answering this question.

Question 9

How useful were the tables and movable chairs during classroom activities?

- Very useful
- Somewhat useful
- Not useful
- I am not comfortable answering this question.

Question 10

This course was taught in a room with tables and movable chairs. How would your team's performance on classroom activities have changed if the course had been taught in a traditional lecture hall with fixed desks?

- My team's performance on classroom activities would have suffered in a traditional lecture hall with fixed desks.
- My team's performance on classroom activities would not have changed in a traditional lecture hall with fixed desks.
- My team's performance on classroom activities would have improved in a traditional lecture hall with fixed desks.
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Question 11

How did the layout of the classroom impact the ability of the instructor to interact with your team during class?

- The layout of the classroom enhanced the ability of the instructor to interact with my team.
- The layout of the classroom had no impact on the ability of the instructor to interact with my team.
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Question 12

How often did the instructor interact with your team during the semester?

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- About once each week.
- About once every other week.
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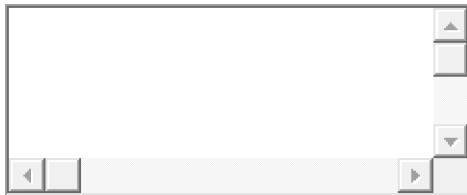
Question 13

How frequently did you use the outlets at your tables to charge your mobile device during class?

- Almost every class.
- About every other class.
- About every other week.
- A few times during the semester.
- Never.
- I am not comfortable answering this question.

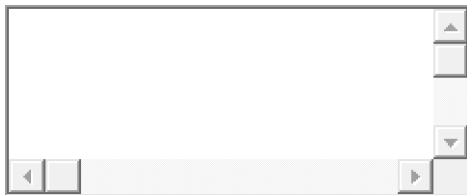
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Question 15

Please comment on anything about the layout of the classroom that could have been changed to help you learn the course material better. If you do not want to answer this question, just leave it blank.



Question 16

Please comment on anything about the technology used in the course that was particularly helpful as you learned the course material. If you do not want to answer this question, just leave it blank.

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