Diverse Assessments that encourage creativity among gifted students

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Abstract

Gifted children require constant stimulation. I have implemented innovative hands-on, inquiry based projects in my Pathophysiology classroom in an effort to encourage their creativity and understanding of the material. Students demonstrate their understanding through modeling projects such as the heart model project and graphic novel project. Assessment of these projects is based on accuracy, completeness and creativity.
Understanding Gifted Children

- Engaging students’ attention is core to the teaching process, and stimulating them while encouraging their creativity becomes quite challenging.
- I have worked for the last 17 years at a school for students gifted in math and science and have learned quite a bit about them during this time.
- I have found that students respond best to hands-on activities and to interactive learning.
How to help gifted students embrace their creativity?

- Gifted students often give up their creativity to concentrate on their academics, so I started thinking about how I could encourage this in them.
- In order to help my students’ articulation on assessments, and enhance their understanding of class material, I have successfully introduced several projects into my Pathophysiology classroom.
- These projects have been carefully crafted to be diverse and cater to all kinds of learners, engage and challenge students, and also enable them to make conclusions based on evidence.
- Assessment of student work on these projects included creativity, accuracy and completeness.
Desired Student Learning Outcomes

- Understanding Structure- function relationships in systems
- Investigating or designing new systems and connections of components to reveal its function and/or solve a problem
- Understanding how systems of specialized cells within organisms help them perform the essential functions of life.
Equity in Assessments

- Identifying Biases
- Multiple sources of evidence for assessing work
- Reflective practices
Creating Equitable Assessments

- Avoid making assumptions
- Offer students choices to demonstrate their learning
- Offer a variety of assessments to cater to individual student needs
Relationship between Equity and Diversity

- Equity is the process
- Diversity is the outcome
What does a diverse and inclusive classroom mean to me?

- Building a culturally responsive classroom
- Providing equal access to all students
- Promoting a safe learning environment
- Accommodating students with differences in race, gender, socio-economic status, ethnicity, sexual orientation, etc.
Which class to choose?

- Pathophysiology - Biology elective for juniors and seniors
- Focus on modeling biological systems
- How homeostasis is maintained
- How disruption of homeostasis leads to pathologies (symptoms)
How I created equitable assessments

Introduced innovative hands-on assessments to replace some written assessments

- Heart Model Project
- Graphic Novels Project
The Heart Model Project

- Introduced as a replacement for the written cardiovascular unit test
- Intended to remove inherent fear of written assessments
- Gave students an innovative way to express their creativity in applying what they had learned in class
- Gave them an opportunity to reflect on their learning
Steps for making the heart model

- Blueprint of heart model
- Building the Model
- Demonstrating the Model
- Reflecting on the Model
Example from a student heart model blueprint

Overall Dimensions: 4” (H) x 3” (W) x 2.5” (D)

Materials

- Pawfly 7 Feet Airline Tubing Standard Aquarium Air Pump Accessories with Air Stones, Check Valves, Suction Cups and Connectors
- Siphon Hose, 6', 1/2" ID
- Sargent Art Plastilina Modeling Clay, 2-Pound, White
- White, Red, and Blue paint
- String
- Glue
- Rubber bulb
Components

- 6.5” x 3/16” Airline Tubing for Veins
- 4” x 3/16” Airline Tubing for Arteries
- 3” x ½” Plastic Tubing for Aorta
- 2 Pounds of Modeling Clay for Heart Tissue
- Blue and Red Paint for Labeling

Deoxygenated Blood Flow

Oxygenated Blood Flow

3 in.

4 in.
Blood (water with red food coloring) will circulate through a closed-loop system.

The liquid will be pushed through using a dropper bulb, putting higher pressure on the inlet side of the one-way check valves to ensure flow is in correct direction.
Coronary Circulation

Components
Coronary arteries outlined using red string (5")
Coronary veins outlined using blue string (4.5")
Student Procedure

- Model the Atriums and Ventricles with Modeling Clay
- Before the clay dries, conduct a tube fitting to ensure they fit
- Paint the Atria and Ventricles pink on the outside and their corresponding color (as shown on drawing) on the inside after the clay dries
- Insert the tubing and glue them into place on the clay model
- Attach the rubber bulb to the tubing and test the circulation of blood
Student Heart Model Projects
Graphic Novels Project

- Introduced as a novel replacement for oral presentations because most students do not pay attention when their peers are presenting.
- Students are encouraged to choose any two organ systems not studied in class and research two diseases of each system.
- Students draw comics of the diseases they have chosen in groups of 2-3.
- Students reflect on their work in terms of disruption of homeostasis and how the body strives to maintain equilibrium.
- Gives students an opportunity to apply what they have learned and extrapolate it to real life examples.
Student Graphic Novel Example 1
Student Graphic Novel Example 2
How to test the efficacy of my model?

- Student feedback
- Reflection
- Quantitative – pre and post quizzes on the relationship between the structure and function of the heart
Student Feedback

“This is a cool way to understand Physiology.”

“I loved making the heart, it taught me so much. I learned that it is okay to fail many times before I succeed!”

The graphic novels are so awesome, I have never done anything like this before. I learned so much more than just giving a presentation and it was fun too.”

“I did better on the quizzes because I understood the material better by doing these projects.”

“I could use my artistic skills to do these projects.”

“I finally found a class where I could learn material in a different way.”
Reflection

- Students were required to reflect on their models and graphic novels to identify problems, describe how they solved them and how they would modify their design for future purposes.

- I also reflected on how the assessments helped students articulate their understanding better, and what I could do based on student feedback to improve these assessments.
Pre and Post Model Assessments

- Naming heart structures
- Understanding their function
- Distinguishing between the systemic/pulmonary circuits and mechanical/electrical systems of the heart
- Being able to solve real life case studies using what they learned in class
You can do it, too!


Please contact me!

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I am always happy to help or collaborate with you!
Questions?
Thank you for listening!