Deerfield Beach High School
I.B. Theory of Knowledge
Application Assessment #2
Natural Sciences and Mathematics as Areas of Knowledge

DIRECTIONS

CONTEXT: In this set of units, we have discussed the broader contributions of natural sciences and mathematics to our knowledge and understanding of the world around us. We have considered their nature, limitations, methods, and applications. Additionally, we have re-explored the concept of truth, certainty, facts and informed opinions. These questions will require you to consider what you learned in these discussions and apply these ideas in your responses.

PREPARATION & RESOURCES:

Objective:
To consider in a deliberative series of discussions/responses the key knowledge questions in mathematics and the natural sciences.

Resources:
Where appropriate, any of the readings and resources used in the natural sciences and mathematics units should be utilized to respond to these questions. These are a good source of examples to justify your responses.

Parameters & Requirements:
Read carefully the following set of questions, and answer each of the questions with a well-argued and supported response. Such a response should include evidence of a personal connection, careful consideration of the explicit and implicit aspects of the question, and clear examples to support your claims. Please refer to the learning scale for this assignment.

1. **Mathematics as Empirical**: Imagine that you try to teach a child arithmetic by beginning with concrete examples. When you present them with various quantities of apples and oranges, they can do the relevant sums, but they never make the 'leap of abstraction'. They accept that 2 apples + 2 apples = 4 apples in this case, but they keep insisting that they cannot see why this should always be true. What, if anything, could you do to convince them of the general truth that 2 + 2 = 4? (3 pts)

2. **Discovered vs. Invented**: What is the difference between saying that something has been 'discovered' and saying that it has been 'invented'? What sorts of things do we usually say are discovered, and what sorts of things invented? Discuss these questions within the context of both theoretical/pure & applied/real world math, and even natural sciences, where appropriate. (3 pts)

3. **Math as a Formal System**: Describe how mathematics, influenced by Euclid's systematic investigation of geometric shapes, is conducted as a 'formal system' (hint: methodology). How is this considered a mathematical paradigm? Explain. (3 pts)

But wait, there's more… #4-6 are on the next page! ;-)

4. **Observation in Applied Math & Sciences**: "An uneducated child and a trained astronomer, both relying on the naked eye and twenty-twenty vision, will literally see a different sky." What do you understand by this quotation and how does it relate to our discussions throughout the course? (3 pts)

5. **Technology in Natural Sciences**: Scientists, of course, use instruments to enhance their observational abilities. Are these instruments themselves capable of being deceived in the same way as human senses are? Consider why or why not and relate this to knowledge questions as we have discussed them in class. (3 pts)

6. **Morality & Ethics in the Sciences**: Recently, a Chinese scientist claimed he successfully altered the DNA of twin girls born earlier this month to try to make them resistant to infection with the AIDS virus. Mainstream scientists have condemned the experiment, and universities and government groups are investigating. How does this real life situation represent our considerations regarding morality and ethics in the field of natural sciences and how the scientific community functions to create and share knowledge? (5 pts)

Source References for #6:
Sun-Sentinel News: http://enewspaper.sun-sentinel.com/infinity/article_share.aspx?guid=9bb0d500-a274-4036-8916-03168efae7b2
CBS News Miami: https://www.youtube.com/watch?v=j4sepzbAG0c

FORMAT: Your question responses must be typed into the body of an email sent to Mr. Collazo. Each question must be numbered to show clear organization. The subject title MUST be **YourLastName-Period__-AA#2** (so if it were my assignment: *Collazo-Period1-AA#2*). There is no minimum or maximum word limit, so there is no guideline for length here; please answer the questions or explain yourself in the report as fully and as thoroughly as you can.

Failure to comply with these formatting specifications and requirements will result in an immediate 2 point deduction before scoring commences.

DEADLINE:
Submit by 11:59pm on 12/9/2018 (Su), sent to dbhssensei@gmail.com
Failure to meet this deadline will result in a 4-point deduction for each day it is late, beginning at 12:00am on 12/10/2018 (M).

Assessment Application #2: Learning Scale for Task

Standard: **LAFS.1112.L.3.6 -** Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	
Based on Depth of Knowledge (DOK) Levels	
DOK Level 4 ***Score: 19-20***	**In addition to Score 3,** in-depth inferences and applications that go beyond instruction are demonstrated by the student in a well-developed, critical response. The student's response includes evidence of a personal connection and identifies key knowledge questions in which the student describes and applies ideas/concepts within the context and therefore demonstrates mastery.
DOK *Level 3 ***Score: 17-18***	**In addition to Score 2,** the student identifies and applies specific terminology noted at Score 2. The student research clearly addresses the category tasks and he/she responds to the questions in the task with a well-argued and supported response. The response includes evidence of a personal connection, demonstrates a careful consideration of the explicit and some implicit aspects of the question, and utilizes supporting evidence to support the student's claims.
DOK Level 2 ***Score: 15-16***	The student recognizes and describes specific terminology in math and the sciences such as proof, axioms, theorems, scientific method, facts, theories, hypotheses, inductive vs. inductive reasoning, and experimentation, as well as perspectives, truth, knowledge claims and questions. * The student's consideration is adequate, but not thorough. No major errors or omissions regarding the simpler details of the above noted ideas/concepts, but major errors or omissions regarding the more complex ideas/concepts.
DOK Level 1 ***Score: 13-14***	With help, a partial understanding of some of the simpler details and implications of the more complex ideas/concepts being assessed in the question or task. The student's consideration and research may not be completely adequate for the task.
DOK Level* 0** ***Score: 0-12	Even with help, little to no understanding or skill demonstrated; or student did not respond to this question/task; or student submitted the assignment beyond the 4-day late grace period.