Theme

How can citizens innovate, manage, and use technology in ways that are socially responsible?

STEM Innovation Academy Unit 2 Plan

Subject: Principles of Biomedical Science	Teacher: Macri
Unit Title: Clinical Care	Duration: 9 weeks
Grade: 9	

Summary of Unit

In Unit 2, students explore the day-to-day operations of a primary care office. Students will take on the role of primary care physicians and visit with a series of patients. Along the way, they will compile resources to create a formal report containing patient files from each individual lesson. Throughout the unit, they will explore case studies of Type 1 Diabetes, basal cell carcinoma, neurofibromatosis, chromosomal abnormalities, and familial hypercholesterolemia. In Lesson 1 (9-10 blocks), students will learn how to conduct a doctor's visit and fill out a patient chart. They will start by conducting interviews to learn a patient's medical history and then take vital signs, and simulate routine testing done both in the office and in the lab. They will then consider aspects of primary healthcare including telehealth and patient privacy. In Lesson 2 (11-12 blocks), students will build on their learning in Lesson 1 by using their simulated patient information and test results to determine a diagnosis and provide recommendations for next steps. Students explore the processes of mitosis, meiosis, and protein synthesis as they visit with patients with cancer and chromosomal abnormalities. They learn how genetic disorders are inherited and construct pedigrees representing their patients' families. In Lesson 3 (2-3 blocks), students put together everything they have learned in the unit to meet and diagnose a new patient from start to finish. At the end of the unit, students will submit their final culmination of patient files as a formal report.

Stage 1 – Desired Results

Standards/Outcomes/ PARCC Related items:

NGSS and CCSS standards covered in each lesson included in the following link:

https://drive.google.com/file/d/1hUgD4cfwwrXHu3YIKGdX-amU4qy0ZqNB/view?usp=sharing

Essential Questions:

Unit 2 Lesson 1

- 1. How can an individual's health status be assessed and evaluated?
- 2. What factors make an individual more susceptible to disease?
- 3. What are strategies for maintaining health?
- 4. What are effective means of communicating with others in order to reach common goals?
- 5. What qualities make for an effective medical professional?
- 6. In what ways, and for what purpose, can patient confidentiality be maintained?

Unit 2 lesson 2

- 1. How can changes in a genome lead to disease?
- 2. Why is an understanding of heredity an important factor in human health?
- 3. In what ways are genetic changes acquired?
- 4. In what ways can altered biological processes lead to disease?
- 5. How can the genetic health of an individual be evaluated?

Stage 2 – Assessment Evidence

Unit Pre-Assessment:

1. Fact of fiction: Students will be given a series of statements, and they must indicate whether they agree or disagree with each and why. This will provide information about prior knowledge and preconceptions.

Performance Task(s):

*Science Journal: Students will be responsible for maintaining a Science Journal throughout the unit in which they include career connections, ethical discussions, procedures for new lab skills they learn, patient recommendations, lab reports, data, charts, diagrams, and models that are relevant to the unit.

*Career Journal Entries: At various points throughout the unit, students research and report on professionals involved in primary healthcare (primary care physician, nurse, physician assistant, phlebotomist, etc.) They must find reliable APA cited sources, document the training required/ daily responsibilities, and write a reflection on their personal interest in the career and why.

*Complete Patient Files Report: Throughout the unit, students will put together medical files for each of the patients they visit, including medical histories, vital signs, lab results, imaging, diagnoses, and plans of care. These will all be compiled into one final unit project.

Lesson 2.1: Talk to Your Doc

*Patient History Report: Students will fill out a patient history report for their first patient, Charlie Nowak, including a patient history, vital signs, lab reports, imaging, and a plan of care.

*HIPAA Infographic: Students will create an infographic that could be used in a clinic to demonstrate to staff what types of information is protected by HIPAA and how they can ensure they are being safe or an infographic that could be used to demonstrate to patients what their rights are.

* Proposed Visit Plan: Students will be assigned the file of a patient who is transferring to the clinic. They must review the file a propose a plan for this patient's appointment. The plan could take on whichever format students prefer and should include a patient summary, a plan for the first visit, suggestions for preventive measures, an analysis of telehealth and remote monitoring options, and details about how privacy will be protected.

Lesson 2.2: Decoding A Diagnosis

*Microscope Drawings and Analysis: Students will use microscopes to look at various samples over the course of the unit. They will create sketches of what they see, including a name of the specimen, total magnification, size, and any other notable features.

*Cytogeneticist Report: Students will fill in a template of a cytogenetics report about Riley's karyotype. This will include determining the patient's gender, chromosome number, chromosomal abnormalities, and diagnosis.

*A Family Affair Report: Students will complete a genetic investigation for the Kim family, who is concerned about the presence of familial hypercholesterolemia. Their final report will include background information about the condition, a summary of lab results, a pedigree and Punnett square analysis, and a discussion of prognosis and treatment options.

Lesson 1.3: Crack the Case

*A New Patient Exam and Diagnosis Report: Students will complete a patient report for a new patient, a baby that has just been born. Students will review a family history, analyze lab test results, diagnose any conditions, create a plan of care, and determine how to present this information to the baby's mother.

Authentic Experiences:

*Taking vital signs

*Laboratory activities: microscopy, karyotype analysis

*Blood draw

*Analysis of histological imaging and gross examination for evidence of pathology: MRI scans,

microscope slides, karyotypes

*Pedigree construction

Extensions (Tier I):

- Optional remote patient monitoring case study
- Experimental critique extended with more complex examples
- Analysis of sources of error and limitations of investigations
- Generate new questions and predictions based on pedigrees
- Consider cases of multiple conditions in the same individual/family
- Research and analysis of conditions discussed in class and similar conditions
- Effect of inbreeding activity

Differentiation (Tiers 2 and 3)

- Group work
- Feedback on pre-labs prior to start of labs
- Study skills (studyblue.com, study guide questions, Frayer model notecards, playposit.com)
- Options for potential research websites provided
- Chunked assignment with embedded checkpoints
- Checklists with added conferences with teacher

Stage 3 – Learning Plan

Principles of Biomedical Science: Unit 2 Digital Access (Password Required): https://pltw.read.inkling.com/a/b/d47610f05df0403b90d9d82f476be45e/p/5f04c4f79722460eae84519 f9950fe42

Vocabulary

•	Diagnosis	Chemical reactions	Protein synthesis
٠	Vital signs	• ATP	• RNA
٠	Homeostasis	Carbohydrates	• mRNA
٠	Pulse	Metabolize	Transcription
٠	Respiratory rate	• Insulin	Translation
•	Blood pressure	Type 2 Diabetes	• Genome
•	Triage	Health Insurance Portability	Prognosis
•	Heart rate	and Accountability Act	Genotype
•	Systolic pressure	(HIPAA)	Phenotype
•	Diastolic pressure	Magnetic Resonance	• Allele
•	Systole	Imaging	Dominant
•	Diastole	Eukaryotic	Recessive
•	Sphygmomanometer	Somatic cell	Homozygous
•	Hypertension	Mitosis	Heterozygous

Cancer	• DNA	Pedigree	
Erythrocyte	Chromosome	Autosome	
Leukocyte	Homologous chromosomes	Sex chromosome	
Thrombocyte	Chromatid	Punnett square	
Plasma	Centromere	Karyotype	
Cholesterol	Tumor	Meiosis	
Risk factors	Benign	Nondisjunction	
Metabolism	Malignant	• Familial	
Hormone	Metastasis	hypercholesterolemia	
Type 1 Diabetes	• Gene	Polymerase Chain Reaction	
Biomolecules	Mutation	Restriction enzyme	
	Protein		
Extensions: Expert/Field Experience(s)			
Potential guest speakers: primary	care physician, genetic counselor, cy	togeneticist, oncologist	
Potential field trips: primary care of	linic, clinical lab		
Literacy Connections/Research			
- Formal case reports			
- Career journal entries			
- Ethics Analysis			
- Evidence analysis activities			
- HIPAA infographic			

Modifications

Special Education/504:	English Language Learners:
-Adhere to all modifications and health concerns stated in each IEP. -Accommodate Instructional Strategies: reading aloud text, graphic organizers, one-on-one instruction, class website (Google Classroom), handouts, definition list with visuals, extended time -Provide breaks between tasks, use positive reinforcement, use proximity -Assure students have experiences that are on the Concrete- Pictorial- Abstract spectrum by using manipulatives -Implement supports for students with disabilities (click here) - Make use of strategies imbedded within lessons -Common Core Approach to Differentiate Instruction: Students with Disabilities (pg 17-18)- Use n unders - Use n unders	manipulatives to promote conceptual rstanding and enhance vocabulary usage vide graphic representations, gestures, drawings, tions, realia, and pictures during all segments of action ize graphic organizers which are concrete, pictorial of constructing knowledge and organizing mation ize program translations (if available) for L1/L2 ents vord questions in simpler language folding instruction for ELL Learners mon Core Approach to Differentiate Instruction: ents with Disabilities (pg 16-17)

Gifted and Talented:	Students at Risk for Failure:
 Elevated contextual complexity Inquiry based or open ended assignments and projects More time to study concepts with greater depth Promote the synthesis of concepts and making real world connections Provide students with enrichment practice that are imbedded in the curriculum such as: Application / Conceptual Development Are you ready for more? Provide opportunities for science competitions Alternative instruction pathways available 	 Assure students have experiences that are on the Concrete- Pictorial- Abstract spectrum Modify Instructional Strategies, reading aloud text, graphic organizers, one-on-one instruction, class website (Google Classroom), inclusion of more visuals and manipulatives, Peer Support Parental/ guardian contact Provide academic contracts to students & guardians Create an interactive notebook with samples, key vocabulary words, student goals/ objectives. Plan to address students at risk in your learning tasks, instructions, and directions. Anticipate where the needs will be, then address them prior to lessons. Common Core Approach to Differentiate Instruction: Students with Disabilities (pg 19)

21st Century Life and Career Skills:

Career Ready Practices describe the career-ready skills that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

https://www.state.nj.us/education/cccs/2014/career/9.pdf

 CRP1. Act as a responsible and contributing citizen and employee. CRP2. Apply appropriate academic and technical skills. CRP3. Attend to personal health and financial well-being. CRP4. Communicate clearly and effectively and with reason. CRP5. Consider the environmental, social and economic impacts of decisions. CRP6. Demonstrate creativity and innovation. 	 CRP7. Employ valid and reliable research strategies. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP9. Model integrity, ethical leadership and effective management. CRP10. Plan education and career paths aligned to personal goals. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence.
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Students are given an opportunity to communicate with peers effectively, clearly, and with the use of technical language. They are encouraged to reason through experiences that promote critical thinking and emphasize the importance of perseverance. Students are exposed to various mediums of technology, such as digital learning, calculators, and educational websites.