Biology: Grade 2, Semester 1

Genetically Modified Food

Weeks: Week 01 - Week 01
HSS-Bi 2.02.04; HSS-Bi 2.02.05
BI.2.01:
Use evidence to evaluate the trade-offs of using genetically modified food to support economic, social and environmental sustainability.

- Describe the tradeoffs of the use of genetically modified food
- Explain the intended and unintended consequences of the use of GMO's

Concepts	Skills
1. Genetically modified organisms 2. Beneficial characteristics (example: disease resistance, drought tolerance, higher nutritional value). 4. Unintended consequences for humans and ecosystems.	1. Evidence-based debate 2. Identify and describe trade-offs 3. Argue a stance and support it with evidence

Essential Question(s): Should people engineer organisms?
Big Idea:
Genes are the codes for an organism's characteristics and determine the inheritance of traits. Many of Egypt's problems can be solved through genetic modification.

Textbook and Resource Materials:
SEPUP Book - Unit 4 - Genetics: Feeding the World
Students p. 260-268
Teachers p. 407-418; SS 1.1

Evidence of Learning:
(BA); Explain the intended and unintended consequences of Genetic modification
(ST): Solve Analysis ques.4 in student book P. 286
(ST) Did your initial ideas about Bt corn change? Explain your initial ideas. If they have changed, explain how and why. What arguments made you change your mind? If they have not changed, explain why not.

Capstone Connection:
-Some plant species, such as rice, can be modified to grow under different conditions of water availability impacting water needs for irrigation.
Other subject connection:

- CH.1.01 chemistry 2 water treatment, 3 acids and bases
- ES.1.0.4 water treatment
- Arabic – ask to write an article or research paper about biology topics
- English- reading, speaking, writing and listening skills- EnS2-11- EnS2-12
- French-reading, speaking and writing- (experimes ses gôuts)
- German- reading, speaking and writing-DE-21(food debate)
- Citizenship-grade 10 (G.M.O), genetic modified organisms.
- Art-drawing about rationalizing the consumption of water.
- Home economy- 1.0.2.01 malnutrition and cures
- Music- vocal modification of sounds in singing
- P.E. public health to increase fitness

Weeks: Week 02 - Week 03
HSS-Bi 2.02.6; HSS-Bi 2.0.7; HSS-Bi 2.0.8; HSS-BI 2.01.11
BI.2.02:
Create a model to show the process of genetically modifying organisms and how the new genetic material is inherited:
1) conduct experiments on the process of creating GMO's; and
2) model inheritance by mitosis.

Concepts	Skills
1. Bacterial transformation technique. 2. Plasmids 3. Genes and chromosomes (as a definition only) 4. Mitosis	1. Use good laboratory technique (sterile technique) 2. Make and record observations 3. Identify and describe trends in data 4. Make predictions

	5. Develop conclusions based on evidence

Essential Question(s): How can GMO's affect our lives?
Big Idea:
Genes are the codes for an organism's characteristics and determine the inheritance of traits. Many of Egypt's problems can be solved through genetic modification.

Textbook and Resource Materials:
SEPUP Genetic: Activity 2 (student p. 269--277) ,(teacher p.419--434)
Act 2 SS 2.1; 2.2; and 2.3
Activity 3: (Students p 278- -281) ,(teacher p 435--439)
Act 3 SS 3.1

Evidence of Learning:
Q1 & 4 in SEPUP student book p.277
(BA) Students are going to read the case study on biofuel to define the type of modification, benefits, risks, status of development and other solutions in the case study on GMOs and should answer the Analysis question (Q 4) page 277
(ST) : Analyze your work in this activity and that of the other groups, according to your teacher's instructions. Analysis should include a summary of the data collected and conclusions you and your group draw from the data about the bacteria on the plates. Explain possible sources of experimental error. (Q1) page 277

Capstone Connection:
Apply the process of genetic modification of organisms to support improved conditions of a water supply

Other subject connection:
- Physics- 1.02 attraction
- Chemistry- 1.0.10-1.0.11
- Arabic – ask to write an article or research paper about biology topics
- English- reading, speaking, writing and listening skills
- French-reading, speaking and writing.

- German- reading, speaking and writing
- Computer science 1.0.1 to 4 designing and programming

Weeks: Week 04 - Week 06
HSS-Bi 2.01.01; HSS-Bi 2.01.02; HSS-Bi 2.01.03; HSS-Bi 2.01.04; HSS-Bi 2.01.05; HSS-Bi 2.01.07; HSS-Bi 2.01.08; HSS-Bi 2.01.09; HSS-Bi 2.01.10; HSS-Bi 2.01.11; HSS-Bi 2.01.12; HSS-Bi 2.01.13; HSS-Bi 2.01.15; HSS-Bi 2.01.16; HSS-Bi 2.02.01; HSS-Bi 2.02.12

BI.2.03:
Discuss how the chemical and structural properties of DNA and its replication result in the creation of a new genotypes:
1) design a model to show the structure of DNA; and
2) determine how DNA replicates
3) gene expression and protein synthesis

Concepts	Skills
1. Deoxyribonucleic acid (DNA). a. Macromolecule with nucleotide subunits. b. Double helix and Complementary strands c. Sugar–phosphate backbone and nitrogenous bases. (Adenine, guanine, cytosine, and thymine represented as A, G, C, and T). d. Nucleotide sequences- (Coded instructions) 2. DNA replication by semiconservative template mechanism. 3. Transcription and translation.	1. Perform DNA isolation. 2. Make and record observations 3. Identify, describe trends and Interpret in data 5. Develop claims based on evidence and reasoning 6. Recognize and analyze alternative explanations and models 7. Express and defend a scientific argument

4. RNA types and structure 5. Protein Synthesis.	

Essential Question(s): How does DNA's structure enable its function?
Big Idea:
Genes are the codes for an organism's characteristics and determine the inheritance of traits. Many of Egypt's problems can be solved through genetic modification.

Textbook and Resource Materials:
Activity 9: SEPUP,Genetics,(student p.324- 327).(teacher p.500- 506)
Activity 10: SEPUP,Genetics. (student p.328-333).(teacher p.507-515)
Activity 12. (student p.343-345).(teacher p.528-531)
Meselson and stahl experiment : http://highered.mcgraw-hill.com/olcweb/cgi/pluginpop.cgi?it=swf::535::535::/sites/dl/free/0072437316/120076/bio22.swf::Meselson%20and%20Stahl%20Experiment
- Act 16 - (Protein Synthesis - Transcription and Translation (Te SEPUP 559-567 S SEPUP 366-375) Unit 4-Act 16 TR 16.1; TR 16.2

Evidence of Learning:
- Activity (9):Successful isolation of DNA results during lab
Exit ticket: Students individually will answer question (2) and (5) from the Analysis question p 327 SEPUP.
Students investigate the molecular structure of DNA that gives its shape and properties also why the DNA does not dissolve in alcohol, giving the answer in a paper to be handed next time.
-Activity (10):students answer the Analysis Questions p333
-Activity (12): Students solve the Analysis question 1 in p 345
Genetics Unit 4 http://SEPUPlhs.org/high/sgi/teachers/genetics_act16_sim.html

Other subject connection:
- PH.1.02 attraction
- MA.1.05 probability
- CH.1.0.10; CH.1.11
- Arabic – ask to write an article or research paper about biology topics
- English- reading, speaking, writing and listening skills- process analysis

(argument essays)

- French-reading, speaking and writing.
- German- reading, speaking and writing
- Art – making models from using recycled materials and modified substances
- Computer science-1.0.3 sketch up program to design models
- Library – archiving- documenting updates

Weeks: Week 07 - Week 08
HSS-Bi 2.02.02; HSS-Bi 2.02.03; HSS-BI 2.02.11; HSS-BI 2.02.12
BI.2.04:
Describe the key steps in the creation of genetic modifications and analyze the DNA of organisms to determine whether it is modified or not using electrophoresis.

Concepts	Skills
1. Genetically modified organisms 2. Desirable traits (e.g.: pest or disease resistance, drought tolerance, or enhanced nutritional qualities). 3. Genetic manipulation for new combinations of traits 4. DNA electrophoresis 5. Steps in GMO: a. identification of desirable gene; b. isolation of gene; c. preparation of a DNA construct - adding markers d. delivery of the desired gene into target organism; e. raising the transformed organisms using a selective medium 6. DNA constructs insertion a. shooting with gene gun, b. bacterial transformation, c. viral delivery	1. Develop conclusions based on evidence and reasoning 2. Consider and evaluate multiple perspectives on an issue 3. Identify and describe trade-offs of decisions 4. Argue a position and support it with evidence

Essential Question(s): Are GMO's the solution?

Big Idea:

Genes are the codes for an organism's characteristics and determine the inheritance of traits. Many of Egypt's problems can be solved through genetic modification.

Textbook and Resource Materials:

SEPUP Science and Global Issues

- Activity 15 (teacher p.549) (student p.361)
- Activity 18 (teacher p.583) (student p.385).
- Activity 19 (teacher p. 596) (students' 393)

Modern Biology Ch 13 p 257-259

Campbell 9th edition, Ch 20 (p.399) +(from p.405 to 409)

Evidence of Learning:

-Students produce a poster about one of the GMO organisms

-The final arrangement of the 8 cards about the genetic modification of lettuce as done in class (Activity 19). from science notebooks

- Students answer Analysis Question 2 (p 391 SEPUP) in groups
- Answer questions 1 and 3 p. 391 individually
- SEPUP Analysis Questions p 399
- An exam (done on google form)

Capstone Connection:

Students could use edible vaccines to improve the medicine industry

Other subject connection:

- Physics- 1.02 attraction
- Chemistry- 1.0.7 buffer and electrolysis-1.0.8
- Arabic – ask to write an article or research paper about biology topics-writing essays
- English- reading, speaking, writing and listening skills
- French-reading, speaking and writing.
- German- reading, speaking and writing- LO.2.1 debate

- Home economy -1.0.1 malnutrition and cures
- Library- making orientation about GMO pros and cons

Weeks: Week 09 - Week 10
HSS-BI 1.05.01; HSS-BI 1.05.02; HSS-BI 1.05.03; HSS-Bi 2.02.09; HSS-Bi 2.02.10; HSS-Bi 2.02.11

BI.2.05:
Compare and contrast selective breeding and genetic modification to breed a new type of wheat in Egypt with a minimum of two desired traits.

Concepts	Skills
1. Distinguish between genes and alleles. 2. Use Punnett squares to predict outcomes of genetic crosses. 3. Phenotypic and genotypic results (Heterozygote -Homozygote). 4. Selective breeding 6. Gregor Mendel's contributions to our understanding of genetics. 7. Patterns of inheritance a. Simple dominance (Laws of simple dominance- first and second Mendelian laws) b. Incomplete dominance c. Codominance	1. Collect, record and interpret data 2. Develop conclusions based on evidence

Essential Question(s): - How could genetic modification improve the agricultural wealth or food deficiency in Egypt?

Big Idea:
Genes are the codes for an organism's characteristics and determine the inheritance of

traits. Many of Egypt's problems can be solved through genetic modification.

Textbook and Resource Materials:
SEPUP Genetics Activity 4 (Breeding Corn) (student p. 282-289) (teacher p. 442-454)
Act 4 SS 4.1 & 4.2
SEPUP Genetics. Activity 5. (Genes and Traits) (student p. 290--299).(teacher p.453--463)
SEPUP Genetics, Activity 6 (Breeding Corn for Two Traits) (student p.300--306). (teacher p.464--476)
Act 6 SS 6.1 & 6.2
SEPUP Genetics Activity 7 (Breeding Better Rice) (student p.307--315). (Teacher p.477--487)
Act 7 SS 7.1

Websites:
(file:///F:/content/genetics.html)
Other subject connection:

- MA.1.05 probability
- ES.1.04 water treatment
- Arabic – ask to write an article or research paper about biology topics- Debate.
- English- reading, speaking, writing and listening skills
- French-reading, speaking and writing.
- German- reading, speaking and writing
- Citizenship- prominent scientists (Mendel)
- Home economy- 1.0.2.3 determination of nutritional values.
- Music- graduation from simple to more complex

Evidence of Learning:
Students will solve all Analysis questions page 306
(ST) Students will prepare a plan for a cross of new type of wheat with a minimum of two desirable traits
(ST)Students are going to solve question Analysis 3 & 4 , page 314

Weeks: Week 11 - Week 12
HSS-Bi 2.02.08; HSS-BI 1.05.04; HSS-BI 1.05.05; HSS-BI 1.05.06; HSS-BI 2.03.01; HSS-BI 2.03.02

BI.2.06:
Interpret how sex-linked chromosomes and abnormalities of chromosomes affect the inheritance of traits and solve problems about sex-linked traits.

Concepts	Skills
Student review all the previous concepts about meiosis and mitosis and chromosomes. 1. Genes 2. Chromosomes 3. Mitosis 4. Crossing over 5. Hybrid/Dihybrid crosses 6. Haploid 7. Diploid 8. Gametes 9. Fertilization 10. Karyotype(definition and description) 11. Independent segregation 12. Segregation and cross over 13. Abnormalities (chromosomal mutation)-	Compare and contrast two processes of reproduction

Essential Question(s): Why and how there is variation among living organism?

Big Idea:
Genes are the codes for an organism's characteristics and determine the inheritance of traits. Many of Egypt's problems can be solved through genetic modification.

Textbook and Resource Materials:
Activity 13. (student p.346-352).(teacher p.530-538)
Act 13 SS 13.1; SS 13.2

Activity 14. (student p.353-360).(teacher p.539-547)
Act 14 SS 14.1

Evidence of Learning:
Act 13 - All Analysis Questions - Question 4 is (ST)
Act 14- Students solve AQ.1, 3 &7 p 359 , 14.1 student sheet
https://docs.google.com/document/d/1saD9Ngq0iUgb6_QisKNnB22O6BjEb9L34ojONcM8csM/edit

Other subject connection:

- Arabic – ask to write an article or research paper about biology topics
- English- reading, speaking, writing and listening skills
- French-reading, speaking and writing.
- German- reading, speaking and writing
- Computer science- determination of errors

Weeks: Week 13 - Week 14
HSS-BI 1.05.07; HSS-BI 1.05.08; HSS-Bi 2.02.13; HSS-Bi 2.02.14; HSS-Bi 2.02.15; HSS-Bi 2.02.16

BI.2.07:
Explain how genomics has the potential to contribute in solving sustainability problems to infer the genetic mechanism of inheritance for a given trait.

Concepts	Skills
1. Genomics 2. The Human Genome Project 3. Genomics and biodiversity, alternative energy, and human and animal health.	1. Develop and test a hypothesis 2. Analyze and interpret pedigrees. 3. Develop conclusions based on evidence 4. Apply logic, knowledge and reasoning to construct explanations

Essential Question(s): - How has genomics contributed to our understanding of inheritance mechanisms of trait and genetic disease?

Big Idea:
Genes are the codes for an organism's characteristics and determine the inheritance of traits. Many of Egypt's problems can be solved through genetic modification.

Textbook and Resource Materials:
Activity (8) SEPUP, Genetics, (student p.316 -- 323). (teacher p.490- 499) Act 8 SS 8.1

links for Activity (8):
http://www.mayoclinic.org/diseases-conditions/huntingtons-disease/basics/definition/con-20030685
http://www.ncbi.nlm.nih.gov/books/NBK115557/
http://www.mayoclinic.org/diseases-conditions/hemophilia/basics/definition/con-20029824
http://www.mayoclinic.org/diseases-conditions/phenylketonuria/basics/definition/con-20026275
http://biology.about.com/od/genetics/ss/sex-linked-traits.htm

Activity (11): SEPUP, Genetics, Activity 11. (student p.334--342). (teacher p.514---525) Act 11 SS 11.1

Evidence of Learning:
Activity (11)
- (Exit ticket) Students solve analysis question is 5 in SEPUP book p.342
(Homework) Solving the analysis questions in the book p 342
Activity (8):
-Analysis Question 2 in page 321 is a Quick Check for you to monitor students understanding of pedigrees and the information they convey.

Capstone Connection:
Apply the process of genetic modification of organisms to support improved conditions of a water supply

Other subject connection:
- MA.1.05 probability

- ES.1.15 climatic changes
- Arabic – ask to write an article or research paper about biology topics- writing essays including genetic history
- English- reading, speaking, writing and listening skills – use vocab needed to express STEM related topics.
- French-reading, speaking and writing- grade 10 arbre chronologies.
- German- reading, speaking and writing
- CS..05; CS.1.06- designing websites- TCB protocol
- Library 1.0.1 basics of classification
- MU 1.09