



Gifted LearningLinks Program

Instructor name: Kate Yohay

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Course Title: From Peas to Hereditary Disease: Exploring Genetics

Session Date: *Monthly Enrollment, 2011-2012*

Course Description:

The field of genetics began with Mendel's study of pea plants in the late 1800s. Since then, improvements in technology and techniques have allowed scientists to unravel the mysteries of DNA. Students learn from a variety of resources, including computer simulations, labs and case studies. Discover how responsible genes are for many features of human life and evolution.

Outcomes: Upon successful completion of this course, students will:

- a. Understand genetics on the molecular, cellular, systems, and organismal levels
- b. Know how biotechnology is used to learn the mechanism of genetic diseases and develop treatments
- c. Understand the various ways that genes are inherited
- d. Understand how the expression of genes is regulated
- e. Learn the basic historical timeline of genetics
- f. Understand changes in the genetic code can lead to disease
- g. Analyze the effect of new genetics research on the future of medicine
- h. Use the scientific method to perform experiments
- i. Know some of the current research in the genetics field
- j. Be able to think critically, apply knowledge to new examples/case studies, and synthesize potential mechanisms, studies, and treatments
- k. Find and use reliable Internet sources for research purposes
- l. Know how to employ a variety of successful study skills
- m. Understand the subfields of biomedicine and the professional opportunities available in the field

Resources and Materials:

Textbooks

- Leja, D. et al. *An A to Z of DNA Science: What Scientists Mean When They Talk About Genes and Genomes*. ISBN-10: **0879696001**
- Elgin, S. et al. *Modern Genetics for All Students*. (PDF on Blackboard)
- Willet, E. *Genetics Demystified*. (PDF on Blackboard)

Selections from:

- Lewis, R. *In the Family: A Case Workbook* (PDF on Blackboard)

Web Resources

- *Learn.Genetics: Genetics Science Learning Center* (University of Utah)
<http://learn.genetics.utah.edu/>

- Nobel Prize –Education www.nobelprize.org/educational
- DNA From the Beginning <http://www.dnafb.org/>
- Howard Hughes Medical Institute (HHMI) BioInteractive www.hhmi.org/biointeractive
- DNA Interactive www.dnai.org

Other Supplies & Resources

- Notebook or laptop
- Supplies for at home labs (can be obtained from a grocery store or hardware store)

CTD Statement on Third-Party Web Sites

Instructors are required to thoroughly review any third-party web sites they intend to use in their courses for inappropriate content. However, because web content continuously changes, CTD disclaims any responsibility for any of the content contained on third-party web sites used in course materials. If you become aware of anything that may be inappropriate, please notify CTD staff immediately.

Schedule:

***Assignments are subject to change. All assignments will be explained in greater detail on a detailed weekly syllabus that will be posted on Blackboard.**

	Topic/Focus	Activities & Reading Assignments	What do I need to post to the Discussion Board?	What do I need to turn in?
Week 1	Orientation to Online Learning	Introductory case study	Current Events in Genetics 3n3 (three questions & three things you are not totally clear on)	Introduction assignment Pre-test answers Case study follow up questions
Week 2	Introduction: What is Genetics?	Textbook reading “Genetics, DNA, & Heredity” PowerPoint (pdf) Online modules & interactive activities Lab: DNA Extraction	3n3	Reading notes Follow-up reading questions Lab photos & analysis questions

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Week 3	How is DNA Structured to be the “Code of Life?” (DNA Structure)	Textbook reading “Genetics, DNA, & Heredity” PowerPoint (pdf) Online modules & interactive activities Lab: Build DNA	3n3 DNA model photo	Reading notes Follow-up reading questions Lab photos & analysis questions Quiz 1
Week 4	How is DNA packaged in a cell? (Chromosomes)	<i>Chromosomal Analysis</i> presentation Textbook readings Online modules & interactive activities Lab: Karyotypes	3n3 Chromosomal abnormality research paragraph Prep for online Class Meeting	Reading notes Photos from Karyotype Lab questions & analysis questions
Week 5	How does DNA replicate so it is (almost always) the same in every cell? (Cells, Cell Division, & DNA Replication)	<i>Chromosomal Analysis</i> presentation Textbook readings Online modules & interactive activities	DNA Replication comic 3n3 Current Events	Reading notes Quiz 2
Week 6	How do genes code for proteins? (DNA Expression: Transcription, Translation, & Proteins)	<i>Modern Genetics</i> reading <i>Molecules of Genetics</i> activities/reading <i>Learn.Genetics</i> game <i>HHMI BioInteractive</i> animations	3n3 Comic of transcription & translation	Reading notes Analysis questions

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Week 7	How are genes inherited? (Basic Inheritance Patterns & Trains)	Textbook readings Online modules & interactive activities Lab: "Relating to Rebops"	3n3 Rebop lab photos Current Events	Reading notes Analysis questions Lab analysis questions Quiz 3
Week 8	How are genes regulated so they produce the right proteins in the right cells? (Gene regulation)	Textbook readings Online modules & interactive activities	3n3 Prep for Class Meeting	Reading notes Analysis questions Research report: examples of Genetic diseases related to gene regulation problems
Week 9	How do genes code for very complex human traits? (Complex Inheritance & Human Traits)	Textbook readings Online modules & interactive activities Lab: Comparing Traits	Current Events (related to complex inheritance) 3n3	Reading notes Lab analysis questions Quiz 4
Week 10	How does our environment affect our DNA? (Epigenetics & Mutations)	Textbook readings Online modules & interactive activities Find & read a published research review article related to epigenetics	3n3	Reading notes Analysis questions Opinion report on Epigenetic research article

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Week 11	How do we study genetics in humans? (1) (Biotechnology)	Textbook readings Online modules & interactive activities Online Lab: Polymerase Chain Reaction & Gel Electrophoresis	3n3 Comic of PCR & Gel Electrophoresis	Analysis questions Self-designed experimental Protocol Quiz 5
Week 12	How do we study genetics in humans? (2) (Biotechnology)	Textbook readings Online modules & interactive activities Online Lab: DNA Microarray & DNA Sequencing	3n3 Prep for Class Meeting	Reading notes Analysis questions Genetic disease report proposal
Week 13	How do changes in some genes lead to disease? (Genetic Disease)	Textbook readings Online modules & interactive activities	3n3 Current Events	Reading notes Analysis questions Quiz 6
Week 14	How do we discover & study genetic diseases in the lab? (1) (Biomedical Research)	Textbook readings Online modules & interactive activities	3n3 Profile of a Biomedical Researcher	Reading notes Analysis questions
Week 15	How do we discover & study genetic diseases in the lab? (2) (Biomedical Research)	Published research paper article analysis Textbook readings Online modules & interactive activities	3n3 Genetic disease report	Reading notes Analysis questions Quiz 7 Final Project proposal

	Topic/Focus	Activities & Reading Assignments	What do I need to post to the Discussion Board?	What do I need to turn in?
Week 16	How will our knowledge of genetics affect the future of medicine? (Genetics, Health, & Personalized Medicine)	Podcast: Future of Personalized Medicine Textbook readings Online modules & interactive activities How to study for your Final Exam	3n3 Opinion paper: Personalized Medicine Prep for Class Meeting	Reading notes Analysis questions
Week 17	Final Project	Work on Final Project “Meet” with Instructor about Final Project & Exam Prep		Study Guide for Exam
Week 18	Final Project & Final Exam	Present Project for Class Meeting		Final Exam Final Project

Student Evaluation and Grading Policies for Credit Courses Only:

a. CTD Grading scale

A+ 97-100	B+ 87-89	C+ 77-79	D+ 67-69	F Below 60
A 93-96	B 83-86	C 73-76	D 63-66	
A- 90-92	B- 80-82	C- 70-72	D- 60-62	

b. Breakdown of final grade

- 10% - Quizzes
- 30% - Weekly homework assignments
- 30% - Written reports
- 20% - Final Project
- 10% - Final Exam

Instructor Biography: Kate Yohay is a graduate of Smith College (Northampton, MA) and holds a B.A. in Biological Sciences, with a concentration in developmental neurogenetics. She has done genetics research at the University of Michigan Medical School and Tufts University. Previously, Kate taught undergraduate genetics and developmental biology laboratory classes at Mount Holyoke College. She has spent the last two years teaching 7th and 8th graders at Near North Montessori School in Chicago. In addition, she developed and taught *Breakout Biology: Infectious Disease* and *Introduction to Biomedicine* at the CTD Summer Programs since 2009.

Kate recently relocated to the Boston area to pursue a graduate degree in working with students with mild/moderate learning disabilities and do research on gifted students with learning differences. She is excited to share her passion for genetics and biotechnology with *Gifted Learning Links* students.

Contact Information:

Kate can best be reached by email at xxx@xxx.xxx

GLL Sample