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| Name of Unit/Course: Biology | | |
| **Overall Unit Information (Required for MOOC participants)** | | **Self-Check** |
| Unit or Course Goal(s) | This blended learning unit will cover the discovery of DNA, DNA structure, replication, the cell cycle, and protein synthesis. | See A1 |
| Standards | Name of standards: Next Generation Science Standards  Link to standards: <http://www.nextgenscience.org/hsls-ivt-inheritance-variation-traits> and <http://www.nextgenscience.org/hsls-sfip-structure-function-information-processing>  Location information:  Grade/Year: 9th Grade (14 – 15 years old)  Subject: Biology  Standard (as written):  HS-LS1-1: Construct an argument based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.  HS-LS1-4: Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.  HS-LS3-1: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristics traits passed from parents to offspring  HS-LS3-2: Make and defend a claim based on evidence that inheritable genetic variations may result from: 1) new genetic combinations through meiosis, 2) viable errors that occur during replication, and/or 3) mutations caused by environmental factors | See A2 |
| Learner Characteristics | The learners are 9th grade students at a rural Georgia high school which houses freshman students only.  Special Education or IEP: 10%  Students Qualifying for Free/Reduced Lunch: 41%  Non-native English Speakers: 1.2%  Met or exceeded expectations 8th Grade Science CRCT: 85% | See B1 |
| Technology requirements | Internet connected computer  Edmodo account  Quizlet account  Kidblog account  Account for one of the following   * Google Slides * Prezi * Glogster * Powtoon * iMovie * Movie Maker   Digital camera (smart phone or handheld device acceptable) | See D5 |
| Prerequisite Skills | 8th Grade Reading Proficiency (differentiation or assistance provided as necessary)  Ability to create a user account (if applicable)  PC Computer use  Safe and effective internet research skills | See A4 &D6 |
| Introductory Communication Plans | Students are expected to participate in daily discussions and activities in class. Students will also be expected to contribute to class discussions weekly on their blog and respond to at least one peer per week. Students will be expected to attend two Google+ Hangout sessions. Students may also communicate via Edmodo if they have any questions that peers may assist with. All student communications must be respectful of themselves and others, especially privacy. Language should be appropriate for the learning context. Students will be held to communication guidelines given at the beginning of the school year (also outlined in the class syllabus). | See A4 B9 & B10 |
| Universal Design Principles Considered | Multiple forms of representation: Textbook, videos, transcripts, subtitles, webpages  Multiple forms of expression: Online quizzes, blogs, project (presentations, videos, interactive posters), lab reports  Multiple forms of engagement: face-to-face (in class), online (Google+ Hangouts), social media (Edmodo) | See B4 |
| Number of Modules or Weeks | This will be a six-week blended learning unit. Each Monday students will be given access to a new module and all module assignments will be due the following Monday. | See A3 |

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| **Module 1 Plan** *(Note: “module” and “lesson” used interchangeably)***(Required for MOOC participants)** | | **Self-Check** |
| Module Objective(s) | HS-LS1-1: Students will investigate the history of the discovery of DNA and the structure of DNA. Students will prove the mastery of the concept by achieving a minimum of 75% on the module quiz and by a response of acceptable or exemplary on their blog response. Students will participate in a DNA Extraction lab and analyze their results. | See A1 & A2 |
| Module Assessment(s) | 1. Module quiz (Edmodo) about history and structure, graded automatically 2. Blog response to weekly prompt (Rubric) 3. Pre-lab quiz (Edmodo) on lab procedures (graded automatically) 4. Lab analysis submitted via Edmodo. (rubric) | See A2 A3 C1 C2 & C5 |
| Description of Learning Activities | 1. Students will explore the DNA Interactive timeline and use the guided worksheet as they explore. Students will also view the Discovery of DNA video. 2. Students will read chapter 10, section 1 of their textbook and complete the chapter review questions for section 1. 3. Students will watch the lecture video and complete the accompanying note sheet. 4. Students will watch the HHMI video on the structure of DNA. 5. Students will participate in daily class discussions of material. 6. Students will participate in a DNA Extraction lab and complete the pre- and post-lab assignments. 7. Students will respond to the weekly discussion prompt on their blog and respond to one peer. 8. Students will participate in a Google+ Hangout session (if needed but towards a minimum of 2 for the unit). | See A2 A3 B3 B4 & B10 |
| Formative Evaluation & Feedback | * Face-to-face class time (daily from 9 AM to 10 AM) * Blog reflection: Who in your opinion contributed the most to the research that led to our current understanding of DNA? Why? * Chapter review exercises * Note sheets * Edmodo review quiz * DNA extraction lab – pre-lab quiz and post-lab reflection submitted on Edmodo * Hangout session | See A3 C1 C3 & C5 |
| Physical Learning Materials | * District approved textbook * Equipment needed to complete lab activity | See A3, A9, B1, B4, & B6 |
| Digital Learning Objects | [DNA Interactive: Timeline](http://www.dnai.org/timeline/index.html) , accompanying downloadable handout (DNA Timeline)  [The Great Discovery of DNA](http://media.hhmi.org/biointeractive/films/Double_Helix.html) video  [DNA Structure](http://prezi.com/swbdahwrfj9i/?utm_campaign=share&utm_medium=copy&rc=ex0share) lecture, accompanying downloadable handout (DNA Structure Guided Notesheet)  [Building Blocks of DNA](http://www.hhmi.org/biointeractive/building-blocks-dna) from HHMI video  Module Review Quiz ([Edmodo](http://edmodo.com)) | See A3, A9, B1, B4, & B6 |
| Plans for Differentiation | An outline of notes on each section will be provided as directed for the IEP.  Students with limited reading proficiency will be provided assistance in class as needed in order to ensure understanding.  All students will be provided with virtual office hours via Hangout and will be able to ask questions as needed in the class forum on Edmodo. | See B1 B4 & B6 |

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| **Module 2 Plan (Optional for MOOC participants)** | | **Self-Check** |
| Module Objective(s) | HS-LS1-1, HS-LS3-1: Students will investigate the process of replication of a DNA molecule and DNA packaging into chromosomes. Students will prove the mastery of the concept by achieving a minimum of 75% on the module quiz and by a response of acceptable or exemplary on their blog response. Students will participate in a Karyotyping lab and analyze their results. | See A1 & A2 |
| Module Assessment(s) | 1. Module quiz (Edmodo) about replication process, correction of errors and chromosomal structure (graded automatically) 2. Blog response to weekly prompt (Rubric) 3. Pre-lab quiz (Edmodo) on lab procedures (graded automatically) 4. Lab analysis submitted via Edmodo. (rubric) 5. Quizlet virtual flash cards created (checklist) | See A2 A3 C1 C2 & C5 |
| Description of Learning Activities | 1. Students will read Chapter 10, Sections 2 and 3 of their textbook and complete the accompanying chapter review exercises. 2. Students will create virtual flash cards on Quizlet for the Chapter 10 vocabulary. 3. Students will watch the lecture video and complete the accompanying note sheet. 4. Students will watch the HHMI videos on the replication and packaging of DNA. 5. Students will complete an interactive matching replication game. 6. Students will participate in daily class discussions of material. 7. Students will participate in a Karyotyping lab and complete the pre- and post-lab assignments. 8. Students will respond to the weekly discussion prompt on their blog and respond to one peer. 9. Students will participate in a Google+ Hangout session (if needed but towards a minimum of 2 for the unit). | See A2 A3 B3 B4 & B10 |
| Formative Evaluation & Feedback | * Face-to-face class time (daily from 9 AM to 10 AM) * Blog reflection: What problems do you think could occur if there was not a way for errors in replication to be fixed? * Chapter review exercises * Note sheets * Edmodo review quiz * Karyotyping lab – pre-lab quiz and post-lab reflection submitted on Edmodo * Hangout session | See A3 C1 C3 & C5 |
| Physical Learning Materials | * District-approved textbook * Equipment needed for Karyotyping lab | See A3, A9, B1, B4, & B6 |
| Digital Learning Objects | [DNA Packaging](http://www.hhmi.org/biointeractive/dna-packaging) video  [DNA Replication](http://www.hhmi.org/biointeractive/dna-replication-basic-detail) video  [DNA Replication schematic](http://www.hhmi.org/biointeractive/dna-replication-schematic) video  [DNA Replication and Chromosome Structure](http://prezi.com/swbdahwrfj9i/?utm_campaign=share&utm_medium=copy&rc=ex0share) lecture, accompanying note sheet (downloadable)  [Mismatch Repair](http://www.hhmi.org/biointeractive/mismatch-repair) video  [Replication Interactive](http://learn.genetics.utah.edu/content/molecules/builddna/) game  [Quizlet](http://quizlet.com/) to create virtual flash cards  Module Review Quiz ([Edmodo](http://edmodo.com)) | See A3, A9, B1, B4, & B6 |
| Plans for Differentiation | An outline of notes on each section will be provided as directed for the IEP.  Students with limited reading proficiency will be provided assistance in class as needed in order to ensure understanding.  All students will be provided with virtual office hours via Hangout and will be able to ask questions as needed in the class forum on Edmodo. | See B1 B4 & B6 |

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| **Module 3 Plan (Optional for MOOC participants)** | | **Self-Check** |
| Module Objective(s) | HS-LS1-4, HS-LS3-2: Students will investigate the process of mitosis and meiosis. Students will prove the mastery of the concept by achieving a minimum of 75% on the module quiz and by a response of acceptable or exemplary on their blog response. Students will participate in a Onion Cell Mitosis lab and analyze their results. | See A1 & A2 |
| Module Assessment(s) | 1. Module quiz (Edmodo) about mitosis and meiosis (graded automatically) 2. Blog response to weekly prompt (Rubric) 3. Pre-lab quiz (Edmodo) on lab procedures (graded automatically) 4. Lab analysis submitted via Edmodo. (rubric) 5. Quizlet virtual flash cards created (checklist) | See A2 A3 C1 C2 & C5 |
| Description of Learning Activities | 1. Students will read Chapter 8 of their textbook and will complete the accompanying chapter review exercises. 2. Students will view the Cell Reproduction lecture and complete the accompanying note sheet. 3. Students will create virtual flash cards on Quizlet for the Chapter 8 vocabulary. 4. Students will complete the Cells Alive Mitosis interactive. 5. Students will complete the Meiosis Internet lesson and accompanying worksheet. 6. Students will complete the Cellular Mutations interactive. 7. Students will participate in daily class discussions of material. 8. Students will participate in a Onion Cell Mitosis lab and complete the pre- and post-lab assignments. 9. Students will respond to the weekly discussion prompt on their blog and respond to one peer. 10. Students will participate in a Google+ Hangout session (if needed but towards a minimum of 2 for the unit). | See A2 A3 B3 B4 & B10 |
| Formative Evaluation & Feedback | * Face-to-face class time (daily from 9 AM to 10 AM) * Blog reflection: What would happen to a cell and its offspring if the cells did not go through a *G1* phase during their cell cycle? Explain. * Chapter review exercises * Note sheets * Edmodo review quiz * Onion Cell Mitosis lab – pre-lab quiz and post-lab reflection submitted on Edmodo * Hangout session | See A3 C1 C3 & C5 |
| Physical Learning Materials | * District-approved textbook * Equipment needed for Mitosis lab | See A3, A9, B1, B4, & B6 |
| Digital Learning Objects | [Cell Cycle and Reproduction](http://prezi.com/fg-zpd8xflld/mendelian-genetics/?utm_campaign=share&utm_medium=copy) lecture video, accompanying note sheet (downloadable)  [Mitosis: Cells Alive](http://www.cellsalive.com/mitosis.htm) interactive  [Meiosis Animation](http://www.hhmi.org/biointeractive/meiosis) video  [Meiosis Internet](http://www.biologycorner.com/worksheets/meiosis_internet.html#.U3ylZtJdUrU) lesson  [Cellular Mutations](http://learn.genetics.utah.edu/content/variation/mutation/) interactive  [Quizlet](http://quizlet.com/) to create virtual flash cards  Module Review Quiz ([Edmodo](http://edmodo.com)) | See A3, A9, B1, B4, & B6 |
| Plans for Differentiation | An outline of notes on each section will be provided as directed for the IEP.  Students with limited reading proficiency will be provided assistance in class as needed in order to ensure understanding.  All students will be provided with virtual office hours via Hangout and will be able to ask questions as needed in the class forum on Edmodo. | See B1 B4 & B6 |

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| **Module 4 Plan (Optional for MOOC participants)** | | **Self-Check** |
| Module Objective(s) | HS-LS1-1: Students will investigate the process of protein synthesis: transcription and translation. Students will prove the mastery of the concept by achieving a minimum of 75% on the module quiz and by a response of acceptable or exemplary on their blog response. Students will participate in a Transcription quicklab and analyze their results. | See A1 & A2 |
| Module Assessment(s) | 1. Module quiz (Edmodo) about mitosis and meiosis (graded automatically) 2. Blog response to weekly prompt (Rubric) 3. Pre-lab quiz (Edmodo) on lab procedures (graded automatically) 4. Lab analysis submitted via Edmodo. (rubric) | See A2 A3 C1 C2 & C5 |
| Description of Learning Activities | 1. Students will read Chapter 11 of their textbook and will complete the accompanying chapter review exercises. 2. Students will view the Protein Synthesis lecture and complete the accompanying note sheet. 3. Students will view the HHMI animation videos for transcription and translation. 4. Students will complete the DNA Workshop lesson and accompanying worksheet. 5. Students will complete the Transcribe and Translate interactive. 6. Students will participate in daily class discussions of material. 7. Students will participate in a Transcription quicklab and complete the pre- and post-lab assignments. 8. Students will respond to the weekly discussion prompt on their blog and respond to one peer. 9. Students will participate in a Google+ Hangout session (if needed but towards a minimum of 2 for the unit). | See A2 A3 B3 B4 & B10 |
| Formative Evaluation & Feedback | * Face-to-face class time (daily from 9 AM to 10 AM) * Blog reflection: How would a deletion of one nucleotide in the middle of an mRNA transcript affect the polypeptide specified by that transcript? * Chapter review exercises * Note sheets * Edmodo review quiz * Transcription quicklab – pre-lab quiz and post-lab reflection submitted on Edmodo * Hangout session | See A3 C1 C3 & C5 |
| Physical Learning Materials | * District-approved textbook * Equipment needed for Transcription lab | See A3, A9, B1, B4, & B6 |
| Digital Learning Objects | [Protein Synthesis](http://prezi.com/nm4otfnkrzjo/?utm_campaign=share&utm_medium=copy) lecture video; accompanying note sheet (downloadable)  [Transcription](http://www.hhmi.org/biointeractive/dna-transcription-basic-detail) video  [Translation](http://www.hhmi.org/biointeractive/translation-basic-detail) video  [Transcribe and Translate](http://learn.genetics.utah.edu/content/molecules/transcribe/) interactive  Module Review Quiz ([Edmodo](http://edmodo.com)) | See A3, A9, B1, B4, & B6 |
| Plans for Differentiation | An outline of notes on each section will be provided as directed for the IEP.  Students with limited reading proficiency will be provided assistance in class as needed in order to ensure understanding.  All students will be provided with virtual office hours via Hangout and will be able to ask questions as needed in the class forum on Edmodo. | See B1 B4 & B6 |

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| **Module 5 Plan (Optional for MOOC participants)** | | **Self-Check** |
| Module Objective(s) | HS-LS1-1, HS-LS1-4, HS-LS3-1, HS-LS3-2: Students will investigate new and innovative DNA technology that has had or will have a significant impact on our society. Students will show mastery of the concept by preparing a presentation, movie, or interactive poster that is shown to be acceptable or exemplary based on the rubric. | See A1 & A2 |
| Module Assessment(s) | Students will prepare a presentation, movie, or interactive poster which covers the DNA technology topic of their choice which will be graded by a rubric. | See A2 A3 C1 C2 & C5 |
| Description of Learning Activities | 1. Students will choose one DNA technology topic from a list (human cloning, animal cloning, designer babies, embryonic stem cells, adult stem cells, transgenic crops, transgenic animals, DNA sequencing, DNA fingerprinting, gene therapy) 2. Students will prepare a presentation, movie, or interactive poster which covers the following: explanation of how technique is performed, potential uses of the technology, potential disadvantages of the technology, current or historical issues regarding the technology 3. Students will post the link to their presentation on their blog page along with two discussion prompts for classmates (to be used in Module 6). 4. Students will participate in a Google+ Hangout session (**highly recommended**, towards a minimum of 2 for the unit). | See A2 A3 B3 B4 & B10 |
| Formative Evaluation & Feedback | * Face-to-face class time (daily from 9 AM to 10 AM) * Project checklist * Hangout session | See A3 C1 C3 & C5 |
| Physical Learning Materials | * District-approved textbook | See A3, A9, B1, B4, & B6 |
| Digital Learning Objects | Google Sign Up Sheet (for topic selection)  Downloadable project instructions  Downloadable project checklist  Downloadable project rubric  Students will choose from one of the following   * [Google Slides](http://www.google.com/slides/about/) * [Prezi](http://prezi.com/your/) * [Glogster](http://edu.glogster.com/?ref=com) * [Powtoon](http://www.powtoon.com/) * [iMovie](https://www.apple.com/mac/imovie/) * [Movie Maker](http://windows.microsoft.com/en-us/windows-live/movie-maker)   Students may also choose a different media but it must receive approval. | See A3, A9, B1, B4, & B6 |
| Plans for Differentiation | Though provided for all students, the project checklist is provided as assistance for students with SLDs.  Students with limited reading proficiency will be provided assistance in class as needed in order to ensure understanding.  Students will be given guidance on research techniques as needed.  Students are given choice for their project topic and presentation format.  All students will be provided with virtual office hours via Hangout and will be able to ask questions as needed in the class forum on Edmodo. | See B1 B4 & B6 |

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| **Module 6 Plan (Optional for MOOC participants)** | | **Self-Check** |
| Module Objective(s) | HS-LS1-1, HS-LS1-4, HS-LS3-1, HS-LS3-2: Students will investigate new and innovative DNA technology that has had or will have a significant impact on our society. Students will prove mastery of the concept by responding to a peer’s presentation and discussion prompts for each topic and receiving a grade of acceptable or exemplary on their blog response. Students will also complete a unit review module in preparation for a summative assessment. | See A1 & A2 |
| Module Assessment(s) | 1. Peer response to each of the DNA technology topics. (rubric) 2. Online unit review module (quiz; automatically graded) 3. Summative assessment (Part 1 automatically graded with answer key) | See A2 A3 C1 C2 & C5 |
| Description of Learning Activities | 1. Students will review a peer project for each of the DNA technology topics and respond to the discussion prompts for each. 2. Students will complete a unit review practice quiz in preparation for their unit summative assessment. Students may also download a printable review packet if needed. 3. Students will complete a unit summative assessment (to be administered the Monday after the completion of Module 6 activities). Assessment will cover DNA history, structure, replication, cellular reproduction, mutations, protein synthesis, and DNA technology. 4. Students will participate in a Google+ Hangout session (optional but towards a minimum of 2 for the unit). | See A2 A3 B3 B4 & B10 |
| Formative Evaluation & Feedback | * Face-to-face class time (daily from 9 AM to 10 AM) * Blog reflections on each topic * Edmodo review quiz * Hangout session | See A3 C1 C3 & C5 |
| Physical Learning Materials | * District-approved textbook | See A3, A9, B1, B4, & B6 |
| Digital Learning Objects | Downloadable checklist for peer responses  Downloadable rubric for peer responses  Unit Review Quiz ([Edmodo](http://edmodo.com)); printable version (downloadable) | See A3, A9, B1, B4, & B6 |
| Plans for Differentiation | Though provided for all students, the checklist and printable version of the Unit Review quiz is provided as assistance for students with SLDs and as assistance for students as needed.  Students with limited reading proficiency will be provided assistance in class as needed in order to ensure understanding.  All students will be provided with virtual office hours via Hangout and will be able to ask questions as needed in the class forum on Edmodo. | See B1 B4 & B6 |