Pilot Course Proposal

Submitted by: Nicholas Lowrey　　　　　　　　Building: Lindbergh High School

Proposed Course Title: College in the High School Biology

Grade Level: 9-12　　　　Department: Science

PLEASE ATTACH THE FOLLOWING:
Description of course content and how this course will meet current needs not being met by other courses. Description must also include the needs assessment data.

Specifically, what will the student know and be able to do as a result of this course?

This course will be a modification of the pre-existing AP Biology course that I currently teach, and will run for the full school year (3 trimesters).

By the end of this course, students will be able to demonstrate mastery of the following concepts:

- Illustrate the organization and complexity of life based on the structure and function of biological molecules and cells.
- Compare and contrast the concept of photosynthesis and cellular respiration and the inter-relatedness of mitochondria and chloroplasts in the energy exchanges important to living organisms.
- Present the historical and modern foundational knowledge underlying genetics and heredity.
- Explain the transmission of information within a cell involving DNA, RNA and proteins.
- Apply observation and experimentation using the scientific method to understand natural events or phenomena.
- Provide examples that illustrate evolution as the central organizing theme of biology that explains the continuity and diversity of life.
- Investigate current technology in biological research, such as light microscopy and gel electrophoresis.

Upon completion of this course students will be able to meet the following Washington State ______K-12 Learning Standards:

Standards related to: Structure and Function

HS-LS1-1. Construct an explanation 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-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms
HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Standards related to: Matter and Energy in Organisms and Ecosystems

HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
HS-LS1-6. Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
HS-LS1-7. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.
HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

Standards related to: Interdependent Relationships in Ecosystems

HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.

Standards related to: Inheritance and Variation of Traits

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 characteristic 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 occurring during replication, and/or (3) mutations caused by environmental factors.

HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

Standards related to: Natural Selection and Evolution

HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.

HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.

HS-LS4-3. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.

HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

What are the assessments that will be used to determine student achievement of the goals of this course? (Attach to this proposal.)

- Each trimester class will have a final exam just like the equivalent Bellevue College class. Along with the final exam there will be other unit assessments which could be tests or projects. There will also be various quizzes, homework assignments and lab experiences that will all be part of the student learning for the course.

Describe how this course will address:

- **Alignment with Common Core State Standards (CCSS) and/or WA State Essential Academic Learning Requirements (EALRs)**
  - The NGSS standards that will be covered are listed above in the course description. Additionally, the following learning goals as outlined by OSPI will be addressed:
    1. Read with comprehension, write effectively, and communicate successfully in a variety of ways and settings and with a variety of audiences
    2. Know and apply the core concepts and principles of life sciences
    3. Think analytically, logically and creatively, to integrate technology literacy and fluency as well as different experiences and knowledge to form reasoned judgments and solve problems

- **Integration of technology**
  - Students will be using a variety of lab equipment and technology in this course. There is substantial amount of Vernier Probe-ware and sensors at Lindbergh that will be utilized along with other scientific materials, equipment and supplies. These may include grow-chambers, electrophoresis and transformation materials, incubators, and so on.

- **Infusion of diversity/multicultural perspectives**
  - Throughout the class there will be global problems and issues used as well as anchoring phenomenon for contextual connections to real world and/or career topics. Students will have the opportunity to

- **Integration with other subject areas**
  - There will be integration with statistics in order to investigate distribution and variation in populations and genetics. Algebraic thinking will be used to evaluate and understand different models and data related to pieces such as linear vs exponential growth. Engineering components will be utilized when developing solutions to real world problems. Concepts related to environmental science and chemistry will be used during different units of study.

- **Provision of appropriate experiences for learners of varying abilities**
  - Differentiation will happen in multiple manners depending on the individual lessons and students. Certain assignments and projects will include multiple pathways to showcase student understanding and push them to tackle more difficult phenomena.

- **Development of higher level thinking and processing skills**
  - There will be a significant amount of higher-level thinking, discussions and group work in this course. Students will be able to efficiently break down complex scenarios and problems using learned curriculum and present their work in a way that highlights their understanding and mastery.

- **Articulation of scope and sequences across grades K-12. Will this course replace an existing curriculum? If so, which course?**
  - This course will be replacing the current AP Biology course, although it is functionally the same including the scope and sequence.

Statement of impact:

- The Bellevue College description of this class is below. I would expect that this class at LHS would have the same overall goal. We would describe this class to students interested in post-secondary learning in STEM fields. The LHS class would be preparing our students for science and engineering majors who will be continuing to learn about biological topics in college.
- From the Bellevue College web site: Introduces major concepts of cell biology, including cell physiology and structure, molecular biology, genetics, and evolution. Course is a prerequisite for professional health-science programs. Note: Fulfills laboratory science course requirement at BC.

Instructional materials and cost (include titles, names of publishers and copyright).

- Biology – The Unity and Diversity of Life 14th Edition (Starr, Taggart, Evers, Starr) through Cengage Learning.(c)2016, 2013 Cengage Learning. Already stocked. Checked out to students free of cost.

SIGN-OFF FOR PILOT COURSE RECOMMENDATION

	Signature **Date**
1. Department Head (Secondary) **Accepts ☐ Rejects ☐**	______________________________
2. Principal **Accepts ☐ Rejects ☐**	______________________________
3. District Content Facilitator **Accepts ☐ Rejects ☐**	______________________________
4. Curriculum Director **Accepts ☐ Rejects ☐**	______________________________

Return original to the Director of Curriculum and Instruction. Copies to Principal and Course Originator.