



Project Lead The Way [PLTW] Biomedical Innovation

PEIMS Code: N1302095

Abbreviation: BIOINN

Grade Level(s): 11-12

Award of Credit: 1.0

Approved Innovative Course

Districts must have local board approval to implement innovative courses.

In accordance with Texas Administrative Code (TAC) §74.27, school districts must provide instruction in all essential knowledge and skills identified in this innovative course.

Innovative courses may only satisfy elective credit toward graduation requirements.

Please refer to TAC §74.13 for guidance on endorsements.

Course Description:

In Biomedical Innovation, students design innovative solutions for health challenges of the 21st century working through challenging open-ended problems, addressing topics such as clinical medicine, physiology, biomedical engineering, and public health. Students are presented with each problem in a mission file, a case brief, a list of completion tasks, links to resources, and a reflection section. This provides skills-based instruction in research and experimentation and tools students use to design innovative solutions to real-world problems. The student uses what they learn in these missions as they develop and implement their independent project at the

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- (3) Students use what they learn in these missions as they develop and implement their independent project at the end of the year, culminating in the creation of a project portfolio. Students are encouraged to work with a mentor from the biomedical industry and present their work to an audience from the health care community.
 - (4) Students are encouraged to participate in extended learning experiences, such as career and technical student organizations, leadership or extracurricular organizations, and work-based experiences.
 - (5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.
- (c) Knowledge and Skills.
- (1) Experimental Design. The student independently designs an experiment which investigates a unique research question and analyzes self-collected data to draw a conclusion. The student is expected to:
 - (a) develop an experimental protocol that includes a testable hypothesis;
 - (b) distinguish between the independent and dependent variables within the experimental design;
 - (c) identify and explain the purpose and importance of experimental controls;
 - (d) maintain a detailed repeatable account of the experiment in a physical or digital laboratory notebook;
 - (e) conduct background research using credible sources to support /TT3 1 Tf0 Tc 0 Tw 1.13 0 Td (i)-3.3 (b

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- (a) describe the impact of various medical innovations on human health; and
 - (b) explain the process of inventing and improving medical innovations.
- (6) Statistics. The student uses statistics to solve biomedical science problems. The student is expected to:
- (a) analyze data from two sample t-tests;
 - (b) explain how data can be manipulated in scientific studies;
 - (c) describe how scientific data is presented in the media and in scientific journals; and
 - (d) describe how statistics can be used inappropriately to manipulate data and/or mislead readers.
- (7) Environmental Health and Safety. The student evaluates the impact of environmental factors on human health. The student is expected to:
- (a) identify environmental concerns that are potentially harmful to health;
 - (b) explain how a range of factors affect how individuals respond to a given toxin;
 - (c) design and conduct water quality monitoring projects.

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(e) write a mini grant to fund a proposal using a specified format such as the format utilized by National Institutes of Health;

(f) explain the advantages and disadvantages of using online resources; and

(g) prepare and present a poster displaying B m p

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Recommended Course Activities:

Students design an emergency department that takes efficient patient care to the next level.

Students will work in teams to design, conduct, and analyze an experimental study to answer a question relating to one or multiple body systems that will potentially provide information to further advance the medical community.

Students will work through the design process to design a biomedical innovation that can help improve or save lives and present a plan for how the product will be marketed.

Students will work in teams to determine what is causing the symptoms and illness in the case study, perform water tests, explore the dose-response relationship of a toxin, investigate hazards in your local environment, create an environmental health profile of your community, and outline a plan to solve a local environmental health problem.

Students take on the role of an epidemiologist from the state's health department to investigate a cluster of cases of unknown illness. Students must evaluate patient diagnostic test results to identify the mystery illness, assess evidence to deduce the source of the illness, design and analyze an epidemiological study to test the proposed source, and plan control and prevention efforts to limit future cases of the mystery illness. Students will then identify a local, national, or global public health crisis and write a mini-grant proposal, outlining an intervention plan.

Students will design and work through a protocol to construct and clone recombinant DNA. Students will perform DNA ligation, linking DNA from two sources, and facilitate transformation of this recombinant DNA into bacterial cells, be responsible for gauging the success of your ligation through growth of bacteria containing the recombinant DNA and through restriction analysis of the completed plasmid. Students can then purify the plasmid, sequence, and analyze gene data, and submit their work to GenBank, the NIH genetic sequence database, for publication.

In the role of forensic pathologist, students will examine a fetal pig using the same protocol as a human autopsy, including examination of the tissues, organs, systems, and body fluids, and to note any abnormalities. Students will then design a fictional death and highlight the clues left behind in the body to tell the story of how the person died with an autopsy report, medical history forms, and other documents of their choosing. Other student groups from within the BI classroom will be tasked with solving the mystery their peers create.

Students will make a product, write a report, and make a formal oral presentation to an adult audience. The product may be the results and conclusion from a series of experiments, a prototype of a medical device, a multimedia diary of an internship experience, a school or community event that is a fundraiser or public service to raise awareness of a health issue.

