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| **Teacher Name** | William Thielke | **School Year** | 2017-2018 |
| **Office** | 216/649/STEM | **Website** | [biologymrt.weebly.com](http://mrsriterssciencewebsite.weebly.com/) |
| **Phone** | 720-972-4600 | **Email** | william.j.thielke@adams12.org |
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| **Course Name** | | Biomedical Innovation (BI) | | |
| **Course Description** | | In this capstone course, students apply their knowledge and skills to answer questions or solve problems related to the biomedical sciences. Students design innovative solutions for the health challenges of the 21st century as they work through progressively challenging open-ended problems, addressing topics such as clinical medicine, physiology, biomedical engineering, and public health. They have the opportunity to work on an independent project and may work with a mentor or advisor from a university, hospital, physician’s office, or industry. Throughout the course, students are expected to present their work to an adult audience that may include representatives from the local business and healthcare community. NexGen standards include: (LS1-1,LS1-2,LS1-3,LS1-4, LS1-6,LS3-1,LS3-2LS3-3,LS4-3,ETS1-1,ETS1-2,ETS1-3, ETS1-4,PS3-3) | | |
| **Unit of Study** | **Grade Level Expectations/Content Standards** | | **Approximate Time Spent** | **Targeted Date of Assessment** |
| **Problem One: Design of an Effective Emergency Room** | In this problem, students apply their knowledge of emergency medical careers, diagnostic testing and patient evaluation, human body systems, and medical interventions to analyze the workings of an emergency room and discuss inefficiencies that may hinder appropriate clinical care. Student teams will work collaboratively to design a more efficient emergency medicine delivery system. As students work through their designs, they will review research methods, practice effective presentation skills, and learn project management techniques.(LS1-1,LS1-2,LS1-3,LS1-4, LS1-6,LS3-1,LS3-2LS3-3,LS4-3,ETS1-1,ETS1-2,ETS1-3, ETS1-4,PS3-3) | | 4 weeks | September 15h |
| **Problem Two: Exploring Human Physiology** | In this problem, students build upon what they know about the research process in order to design, conduct, and analyze an experimental study. Students will choose a question relating to one or more body systems that they are interested in studying and will work with a team to investigate and answer that question. As students work through the experimental process, they will review and expand what they know about experimental design, collection of data, statistical analysis of data, and the presentation of data.(LS1-1,LS1-2,LS1-3,LS1-4, LS1-6,LS3-1,LS3-2LS3-3,LS4-3,ETS1-1,ETS1-2,ETS1-3, ETS1-4,PS3-3) | | 4 weeks | October 12th |
| **Problem Three: Design of a Medical Innovation** | In this problem, students review the diseases and disorders as well as the corresponding medical interventions they have investigated in the previous courses and propose a new or better medical device, pharmaceutical, surgical procedure, or genetic intervention. Students will work with a team to build a prototype, model, or schematic of the intervention as well as develop a marketing plan for the product. As students work through this problem, they will review the design process, complete a literature review, and further practice effective presentation skills.(LS1-1,LS1-2,LS1-3,LS1-4, LS1-6,LS3-1,LS3-2LS3-3,LS4-3,ETS1-1,ETS1-2,ETS1-3, ETS1-4,PS3-3) | | 4 weeks | November 10th |
| **Problem Four: Environmental Health** | In this problem, students will explore how substances or chemicals in the environment impact human health. Students will investigate a disease cluster in a fictional family and assess the activities of the individuals for environmental risks. Students will test water samples for the presence of contaminants that could be detrimental to human health and use molecular biology techniques to identify specific microorganisms. Students will also design an experiment to test the effects of a particular chemical and doses of that chemical on plant growth. Students will then compile a comprehensive environmental health profile for their local area. They will use publicly available databases, as well as personal contacts and visits, to uncover possible sources of environmental contamination in the community and to assess risk and level of exposure to people, wildlife, and environmental resources. Students will use their compiled information to design an action plan to increase awareness, monitor resources or individuals in the community, improve conditions, and ensure a clean and safe environment.(LS1-1,LS1-2,LS1-3,LS1-4, LS1-6,LS3-1,LS3-2LS3-3,LS4-3,ETS1-1,ETS1-2,ETS1-3, ETS1-4,PS3-3) | | 4 weeks | December 15th |
| **Problem Five: Combating a Public Health Issue** | In this problem, students draw on information they have learned in the previous courses about public health, epidemiology, and disease diagnosis to work through one of two epidemiology studies. In each study, students will analyze data to define the outbreak, generate a hypothesis by diagnosing the patients’ symptoms and identifying the disease pathogen, design and analyze an epidemiological study to test the hypothesis, and outline a plan for initiating control and prevention measures. Students will then identify a local, national, or global public health crisis and write a mini-grant proposal, based on the National Institutes of Health grant structure, outlining a plan with intervention strategies. As students work through this problem, they will review evidence analysis, the design process, methodology, and analyze study data to evaluate risk.(LS1-1,LS1-2,LS1-3,LS1-4, LS1-6,LS3-1,LS3-2LS3-3,LS4-3,ETS1-1,ETS1-2,ETS1-3, ETS1-4,PS3-3) | | 4 weeks | February 2 |
| **Problem Six: Molecular Biology in Action** | In this problem, students will complete a multi-step, long-term molecular biology experiment. Students will design and work through a protocol to construct and clone recombinant DNA. They will perform DNA ligation and transformation, as well as restriction analysis of the completed plasmid. Alternatively, students will work through a more in-depth DNA cloning and sequencing project. This laboratory investigation provides students with the opportunity to isolate plant DNA, perform a ligation and transformation, purify a plasmid, submit DNA for sequencing, and present all work to GenBank, the NIH genetic sequence database, for publication. As students work through either of these problems, they will learn new laboratory skills, practice laboratory troubleshooting techniques, as well as review proper protocol for research notebook documentation. (LS1-1,LS1-2,LS1-3,LS1-4, LS1-6,LS3-1,LS3-2LS3-3,LS4-3,ETS1-1,ETS1-2,ETS1-3, ETS1-4,PS3-3) | | 6 weeks | March 10th |
| **Problem Eight: Independent Project** | In this problem, students will work independently to determine an area of interest in the biomedical sciences and outline milestones in a long-term open-ended problem. Students will use skills learned in the previous courses as well as the previous problems to help them complete their project. Student work will include completing a literature review, writing and carrying out the methodology for their project, analyzing the results, making adjustments as needed, and finally presenting the results of their work to an authentic audience. Students will work with mentors or advisors from a university, hospital, physician’s office, or industry partner to help guide them as they complete their work.(LS1-1,LS1-2,LS1-3,LS1-4, LS1-6,LS3-1,LS3-2LS3-3,LS4-3,ETS1-1,ETS1-2,ETS1-3, ETS1-4,PS3-3) | | Year long project | May 10th |
| NGSS Crosscutting Concepts | Cause and Effect/ Systems and System Models/ Energy and Matter/ Patterns/ Stability and Change/ Scale, proportion and quantity/ Structure and function | |  |  |
| Common Core reading, writing and communicating standards | Key ideas and details / Craft and structure / Integration of knowledge and ideas / Range of reading and level of text complexity / Text type and purposes / Production and distribution of writing / Research to build and present knowledge / Range of writing / Comprehension and collaboration / Presentation of knowledge and ideas / Conventions of standard English / Knowledge of language / Vocabulary acquisition and use. | |

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| **Grading Scale** | | **Grade Percentages/Weights** | |
| **A** | 90-100 | **Summative Assessments & Projects** | **80%** |
| **B** | 80-89 | **Formative Assessments & Projects** | **20%** |
| **C** | 70-79 | **\*Weekly progress grades are posted at https://ic.adams12.org/campus/portal/adams12.isp** | |
| **D** | 60-69 |
| **F** | 59 or below |

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| General Expectations |
| * Grades are based upon the demonstration of proficiency on units associated with a standard given during each summative assessment. Formative assessments grades are based on participation and are used to give feedback to students and to readjust lessons. Summative unit assessments will be used to measure proficiency in the Next Generation Science Standards * **Summative: 80%** Summative measures of achievement are taken when unit mastery is expected. (i.e., unit tests, culmination of a project, embedded assessments, etc.)   + Unit Tests=100 pts; PBL Presentation=100 pts or more; Quiz every Friday 10 or less points * **Formative: 20%** Formative assessments measure the scaffolding skills and/or content embedded in the unit. Formative assessments are taken frequently, after a student has practiced a skill or become familiar with content. Examples of formative assessments include but are not limited to exit tickets, paragraphs, oral check for understanding, warm-ups, stages in a large project, etc.. Formative assessment grades are based on participation and are used to adjust lesson plans and give students feedback. Unexcused absences, disruptive behavior and excessive tardiness will negatively affect the participation grade. * A penalty of 10% will be accrued for each day an assignment is late. After an assignment is 5 days late the highest score you can receive is 50%. Late work will not be accepted after a unit test. * Revisions will be allowed on tests for half credit and must be done in one week. * Students have one week to take a missed test or quiz after an excused absence. * Assessments will be graded based on teacher/district/state rubrics. * On group projects, students will receive a grade for individual work and a group grade. * Grades are based on achievement of Content Standards and Grade Level Expectations. * Missing or incomplete assignments/assessments for this course will follow Superintendent Policies 6280 Homework and 6281 Make-Up work |