

ENG Course Content and Curriculum

| Topic | Lesson Objectives (LOs) |
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| Lesson 1: Workplace Etiquette & Professionalism | LO1: Students will be able to give examples of expectations of workplace etiquette and email etiquette that they will follow. |
| | LO2: Students will practice composing a professional email. |
| | LO3: Students will be able to identify do's and don'ts about the professional workplace habits. |
| | LO4: Students will clarify any questions or concerns they may have regarding expectations for professionalism and behavior during summer sessions. |
| Lesson 2: What is Scientific Research? | LO1: Students will be able to give an example of how scientific research has evolved over time to produce what we know today. |
| | LO2: Students will be able to describe the difference between engineering and science. |
| | LO3: Students will be able to describe how scientific research is communicated and shared. |
| Lesson 3: Lab Culture & Keeping a Lab Notebook | LO1: Students should be able to identify the various positions and hierarchy in a laboratory setting, and understand that each lab is unique. |
| | LO2: Students will be able to delineate how and when to approach different members of the laboratory group. |
| | LO3: Students should be able to identify appropriate and inappropriate behavior inside the lab. |
| | LO4: Students will be able to list multiple reasons for documenting scientific processes, even those that are unsuccessful, and list at least three methods to document. |
| Lesson 4: Scientific Method | LO1: Students should be able to identify the various steps in the scientific method and the order in which they operate. |
| | LO2: Students will be able to explain the difference between observation and inference. |
| | LO3: Students will be able to give examples factors that may affect human observation and ways in which we can control for human error. |
| Lesson 5A: Experimental Design 1 | LO1: Students will be able to point out tenets of sound experimental design and basic concepts of variables. |
| | LO2: Students will practice using the scientific method to create an experiment inside the Research Lab. |
| Lesson 5B: Experimental Design 2 | LO1: Students will be able to outline methods of navigating and learning difficult jargon found in primary research articles. |
| | LO2: Students will practice using these methods to navigate and learn difficult jargon found in primary research articles. |
| Lesson 6A: Using Excel 1 | LO1: Students should identify and recognize the basic elements of Excel, e.g. cell, formula, functions, etc. |
| | LO2: Students should explain different skills needed manage a database in Excel, e.g. create tables, format, use filters, sort, etc. |
| Lesson 6B: Using Excel 2 | LO1: Students will practice managing a data set in Excel, i.e. set up a workbook, input data, input formulas, produce answers. |
| | LO2: Students should apply time-saving techniques that will optimize their efficiency and effectiveness with Excel. |
| Lesson 7A: Statistics 1 | LO1: Students will be able to explain why statistics are necessary in scientific research and in reporting findings. |
| | LO2: Students will practice calculating a p-value and will be able to describe how sample size affects statistical findings. |

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| | LO3: Students will be able to identify conditional probabilities and other situations where simple probabilities cannot be calculated. |
| Lesson 7B: Statistics 2 | LO1: Students will be able to use normal distributions to identify means and standard deviations. |
| | LO2: Students will be able to describe how different types of distributions will affect standard deviation or mean values. |
| | LO3: Students will be able to define what confidence intervals are and describe how CIs are related to distribution plots. |
| Lesson 8: Ethics in Research | LO1: Students will be able to give examples of how science research impacts non-science fields, such as the economy or politics. |
| | LO2: Students will discuss how ethics in research are not always simple, and that many ethics issues are complex. |
| | LO3: Students will share their ideas on what it means to be an ethical researcher. |
| Lesson 9: Primary Research | LO1: Students will be able to identify a primary research article and distinguish primary research from other publications. |
| | LO2: Students should be able to identify the important sections of an article and describe what information is included in each section. |
| | LO3: Students review strategies for navigating and learning difficult jargon found in primary research articles. |
| Lesson 10: Types of graphs and when to use them (quantitative analysis) | LO1: Students will be able to describe when a bar graph is more appropriate than a line graph, or when to use a certain statistical graph such as a box plot or a distribution curve. |
| | LO2: Students will discuss the importance of accurate graphical representation when presenting their findings or looking for significant findings. |
| | LO3: Students will be reminded about the importance of adding labels, keys, units, etc. to graphs and diagrams, and practice identifying graphs with missing labels, if possible. |
| Lesson 11: Science/STEM Communication | LO1: Students will be able to list key tenets of science communication (e.g. clarity, adjusting content to fit audiences, etc.) |
| | LO2: Students will practice summarizing then verbally communicating complex scientific ideas to different audience levels. |
| | LO3: Students will apply strategies for audience engagement and public speaking (e.g. audience-appropriate examples, anecdotes, etc.) |
| Lesson 12: Presentation Skills: Poster Presentations | LO1: Students will discuss the purpose of having a poster and when poster presentations are used. |
| | LO2: Students will draft a poster, with all the relevant information about their research project, summarizing the results, and presenting the findings. |
| | LO3: Students will practice presenting their entire poster, including a brief introduction, content explanation, and conclusion. |
| Lesson 13: Presentation Skills: PowerPoint (ppt) Presentations | LO1: Students will be able to identify the key differences between a poster and a powerpoint presentation and the advantages and disadvantages of each. |
| | LO2: Students will discuss the best practices of creating powerpoint slides and understand what information should and should not be included. |
| | LO3: Students will be able to identify key strategies for presenting their powerpoint including body language, eye contact, vocal projection, content, and confidence. |
| Lesson 14: Pathways to careers in science | LO1: Students will review details and ask questions about the different pathways to professional careers in STEM. |

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| | <p>LO2: Students should be able to identify important skills gained from studying STEM fields that can be applied to any career.</p> <p>LO3: Students will create a Professional Development Plan for their careers in Science.</p> |
| Lesson 15: Writing an abstract | <p>LO1: Students will be able to describe the typical format and purpose of an abstract.</p> <p>LO2: Students will practice summarizing their research in a condensed format.</p> |
| Lesson 16A: Turning your research into articles: Methods and Results | <p>LO1: Students will be able to describe how the methods and results sections are related.</p> <p>LO2: Students will be able to distinguish the difference between the results and conclusions section and know what information is appropriate for each section</p> <p>LO3: Students will discuss the importance of providing precise and reproducible instructions in the methods section.</p> |
| Lesson 16B: Turning your research into articles: Introductions and Conclusions | <p>LO1: Students should be able to communicate how their specific research project relates to larger, more general scientific goals.</p> <p>LO2: Students will receive information about the funnel structure for introductions and conclusions and will discuss why the funnel structure works.</p> <p>LO3: Students will be able to give reasons why publications are important to both the scientific community and to careers in science.</p> |