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# Scientific Communication & Foundational Data Analysis Tools

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**MODULES FOR THE  
LIFE SCIENCES**

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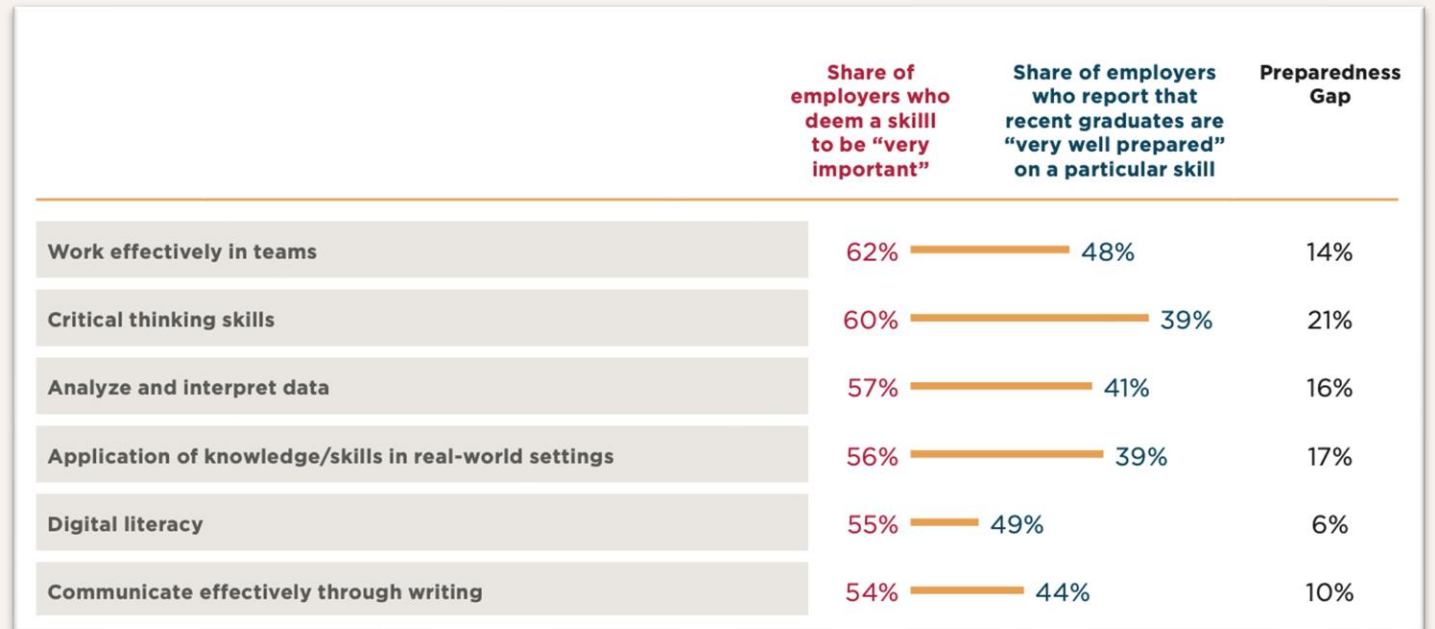
agenda

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# Problem, Broadly across STEM

Scientific and data communication skills are becoming increasingly important in all STEM fields. <sup>1, 2</sup>

A 2021 American Association of Colleges and Universities (AAC&U) employers survey highlights **data analysis, presentation skills, and statistical proficiency** as essential for workforce readiness. However, students often have deficits in these areas when they begin employment. <sup>3</sup>



This gap increases student frustration and gives a lack of preparedness for utilizing these tools in their future careers. <sup>4,5</sup>

1. Jones, J., et al., Call to Action: Data, Diversity, and STEM Education. Change: The Magazine of Higher Learning, 2018. 50(2): p. 40-47.  
2. Lewis, K.P., E. Vander Wal, and D.A. Fifield, Wildlife biology, big data, and reproducible research. Wildlife Society Bulletin, 2018. 42(1): p. 172-179.  
3. Finley, A., How College Contributes to Workforce Success: Employer Views on What Matters Most. 2021, Association of American Colleges and Universities.  
4. Guzman, L.M., et al., Successful Integration of Data Science in Undergraduate Biostatistics Courses Using Cognitive Load Theory. CBE—Life Sciences Education, 2019. 18(4): p. ar49.  
5. Shao, G., et al., Exploring potential roles of academic libraries in undergraduate data science education curriculum development. The Journal of Academic Librarianship, 2021. 47(2): p. 102320.

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# Problem, Specifically for the Life Sciences

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- Students in molecular sciences often lack adequate preparation in using **Microsoft Excel for data analysis and visualization**, which hinders their ability to manage and interpret experimental data.<sup>6,7</sup>
- Despite the availability of numerous resources for using scientific analysis and communication tools (e.g., Microsoft Excel, PowerPoint, RStudio), **few are tailored to contexts familiar to students**, and often, they are not guided in developing skills in these programs.<sup>8</sup>
- Implementing structured training modules that **emphasize the practical application of these tools** can significantly enhance students' competency and confidence, ultimately **better preparing them for professional success in STEM fields**.

*Particularly in the molecular sciences, there is often an uneven distribution of training and lack of clarity on students' proficiency in using these tools.<sup>8</sup>*

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# Project Aims & Impact

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**Aim 1** – Develop Canvas Training Modules Focused on Science and Data Dissemination Skills Including Efficient Use of Microsoft PowerPoint and Excel and Data Analysis

- Provide standardized additional training for mastering scientific presentation skills and data analysis using Microsoft PowerPoint and Excel in contexts familiar to students.
- Facilitate the seamless integration of these essential tools into laboratory courses, enabling students to acquire critical workforce skills with minimal additional instructor resources.

**Aim 2** – Evaluate the Efficacy of the Training Modules in Teaching Science and Data Dissemination Including Data Analysis and Presentation Tools to Molecular Sciences Students.

- Provides essential feedback for iterative refinement of module content before widespread implementation.
  - Addresses existing gaps in student learning by enhancing their ability to use Microsoft PowerPoint and Excel for scientific communication, thereby improving their performance in laboratory coursework and undergraduate research.
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# Team

## *Library*

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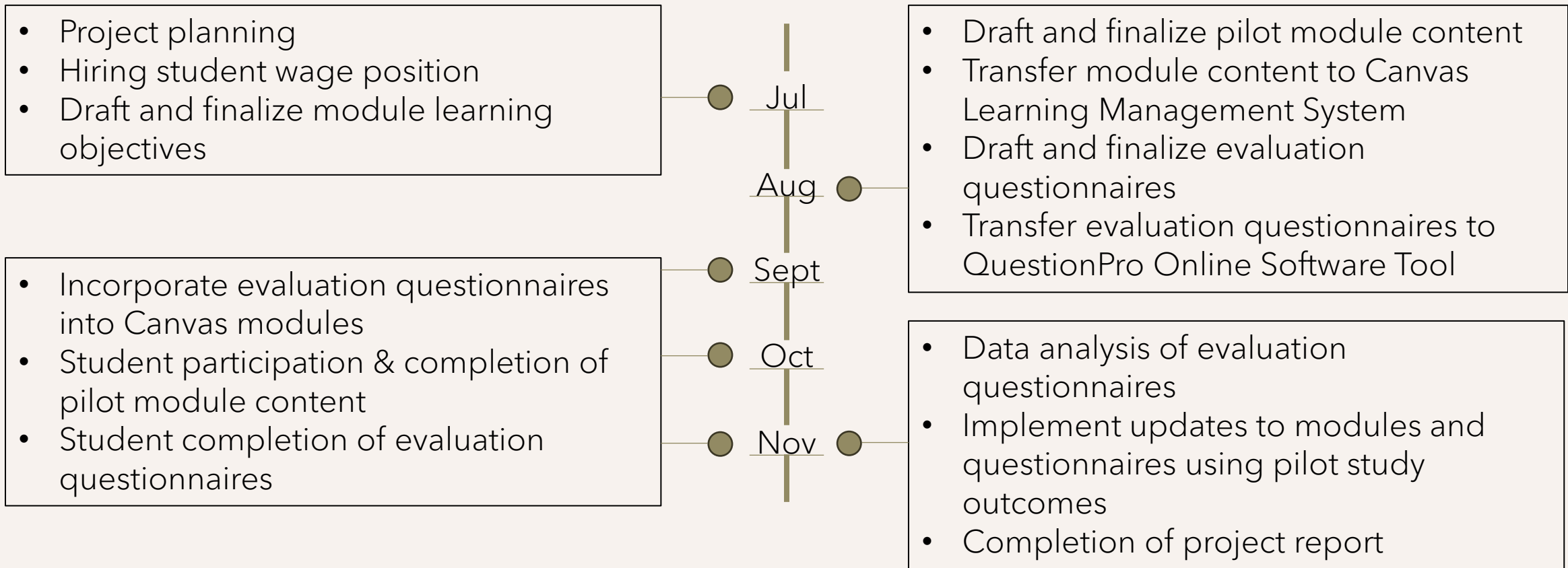
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# Library Resources

- Ensuring content accessibility
- Creating broadly used modular content
- Consulting on the molecular sciences curriculum
- Creating open-access materials
- Publishing through the VTechWorks repository

# Timeline, Budget

Student Wages	\$5,000.00
Total Spent on Wages	\$5,000.00
Remaining Funds	\$0.00



# Deliverables

*Modules Created, by Title*

1. Using PowerPoint for Scientific Communication
2. Using Excel for Data Cleaning & Analysis in Life Sciences
3. Using Excel for Life Science Data Visualization
4. Molecular Visualization Using PyMOL

# Module at a Glance

*These pages are at the beginning of each module, providing a consistent structure and organization for learners.*

## **Module at a Glance**

In a computational lab, it is essential to be able to navigate and control your work through your command line. In this module, we will discuss the basic level of navigation and working with your files through your command line or terminal. By the end of this module, you should be able to navigate, modify, and access files all through your command line!

*There are 4 total pages for this module.*

## **Module Learning Objectives**

- Demonstrate computer navigation using the terminal/command line
- Create or edit files using a command-line interface
- Basics and importance of Bash Scripting
- Utilize Visual Studio Code for viewing files or creating scripts

## **Assignments**

**Assignment 1:** Linux/UNIX and Bash Quiz

**Assignment 2:** Reflection on Linux and Bash

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# A Closer Look at Module at a Glance

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## 1. Framing

1. A “follow along” to creating a slide deck discussing acid-base buffers

## 2. Learning Objectives

1. Describe audience and purpose of a presentation
2. Create and iterate aesthetic mapping to data visualizations

## 3. Resources

1. Microsoft PowerPoint Help Page
2. YouTube playlist of “how-to’s”

## Assignment

Present on a titration project. Choose one of the following audiences and create a short (10 slides) presentation to discuss the following research project. The research project is on measuring the amount of carbonic acid found in rainwater

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# Outcomes & Future Work

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## **Outcomes**

- Three modules that can be used in teaching scientific presentation skills and common data analysis tools
- A plan for future assessment of the modules within laboratory courses at Virginia Tech

## **Future Work**

- With future assessment, we aim to show how the modules enhance students' readiness for the workforce.
    - Students equipped with these competencies will be better prepared for careers that require strong data analysis and presentation skills, addressing a critical gap in current STEM education.
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