Infusion of data science and computation into engineering curricula

Rebecca Napolitano*1 and Wesley Reinhart*2 The Pennsylvania State University

- 1 Architectural Engineering Department
- 2 Materials Science and Engineering Department
- * Institute for Computational and Data Sciences

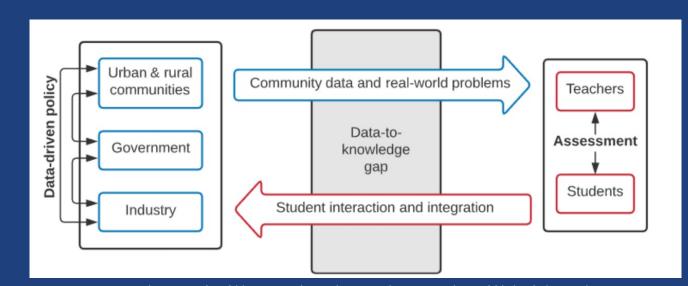


Figure 1: Schematic illustrating how the work will bridge the gap between data and knowledge. By teaching students to interact with real-world data, those students will bring transferrable knowledge to communities they eventually join.



The goal of this project is to develop a curricular framework for data science education and workforce development that is **transferable** between diverse institutions.



The idea is that then, STEM-related programs can "plug and play" data science lessons in existing curricula with minimal effort.



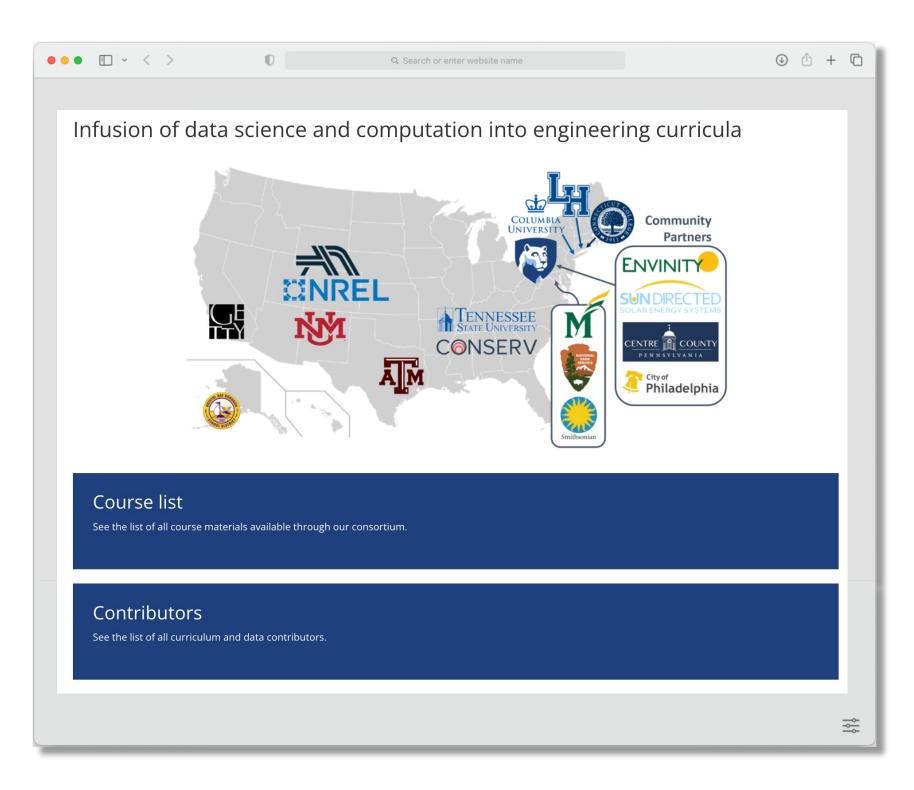
These lessons will be created in conjunction with community stakeholders and industry partners to ensure a focus on real-world problem solving.

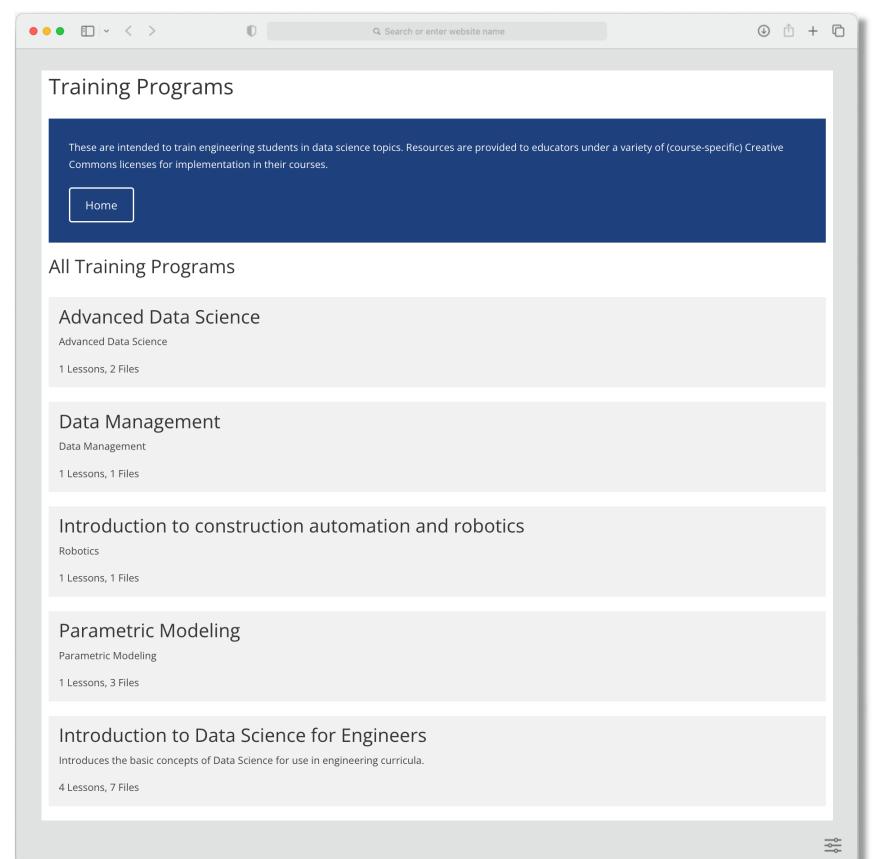


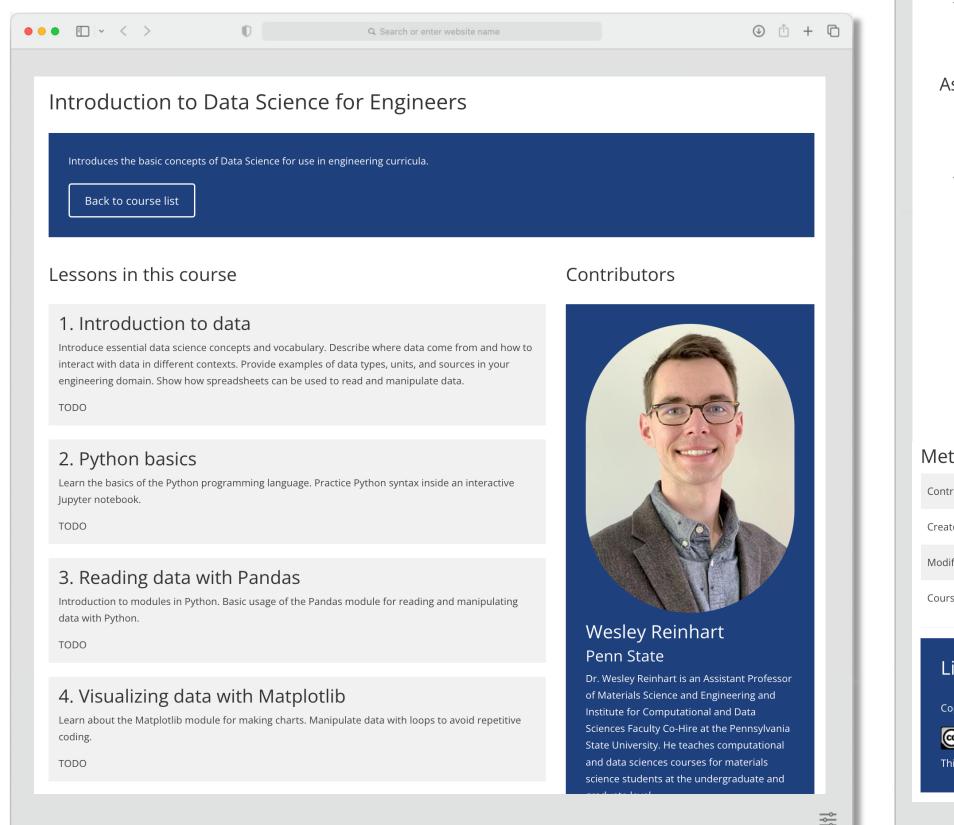
Additionally, they will include student organizations in course development to promote flexible learning pathways.

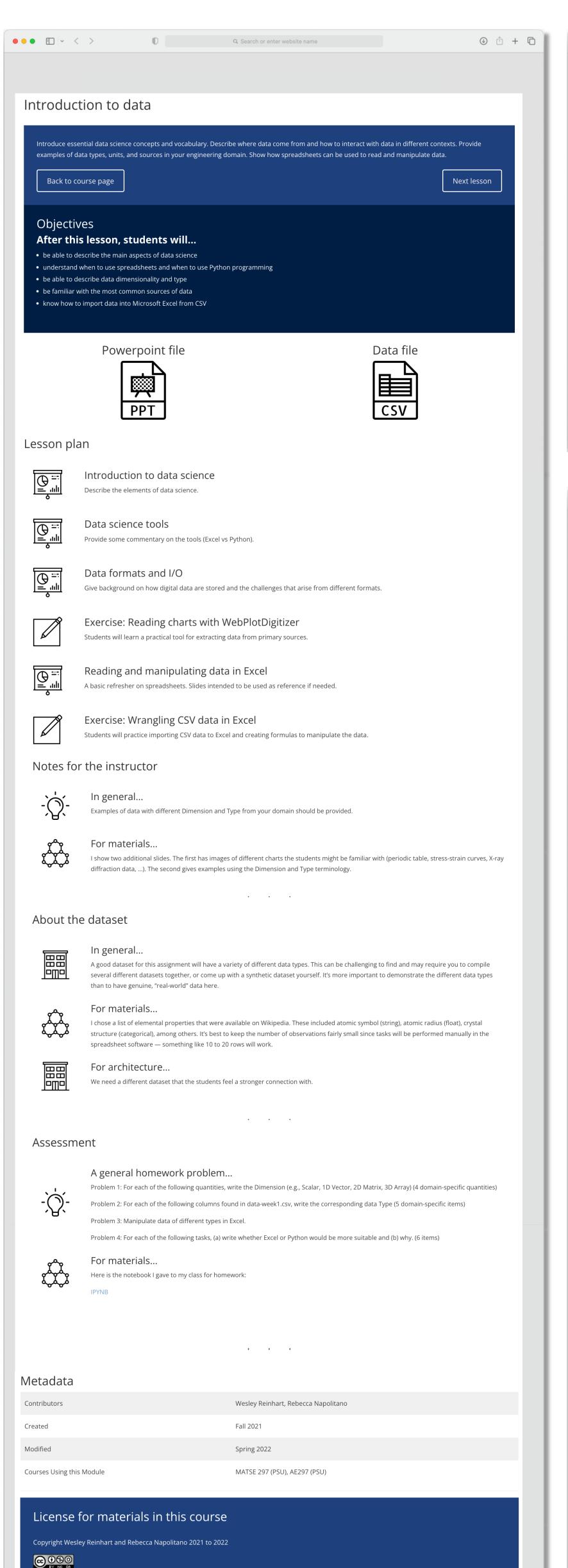
Professors Data licensing issues & lack of time to handle logistics Community Data & Action Course Lessons Outside scope of class Lack of existing network	Student initiative Student organizations	Course or extracurricular activity Professors Responsible Communication Documents & Lessons Lessons Data analysis Community Data & Action Course or extracurricular activity Lessons / discourse Data / extra-Internship curricular informal workshops Student Initiative Lessons Student Initiative Community Documents Student organizations
Traditional knowledge pathways		Proposed mechanisms

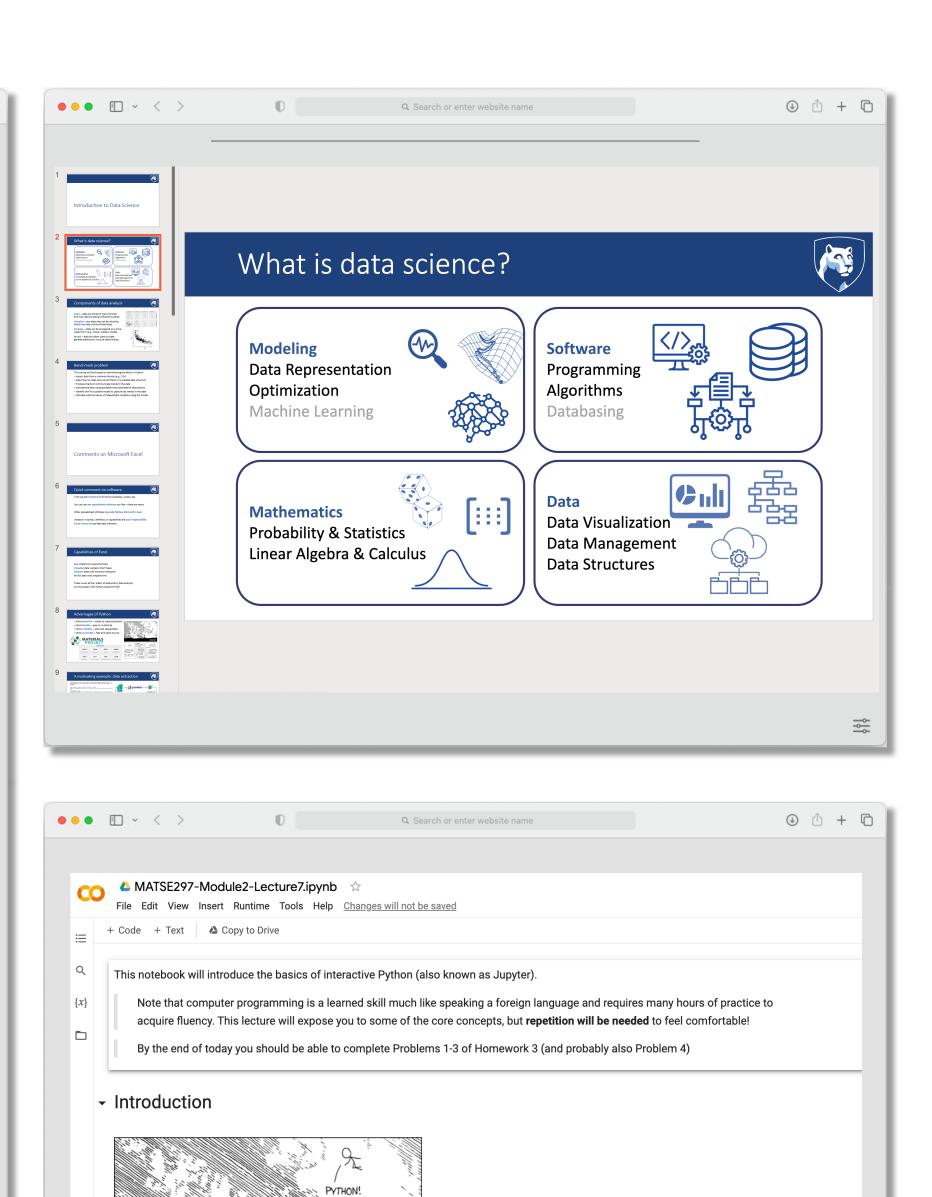
Figure 2: Schematic illustration of the highly interconnected ecosystem developed

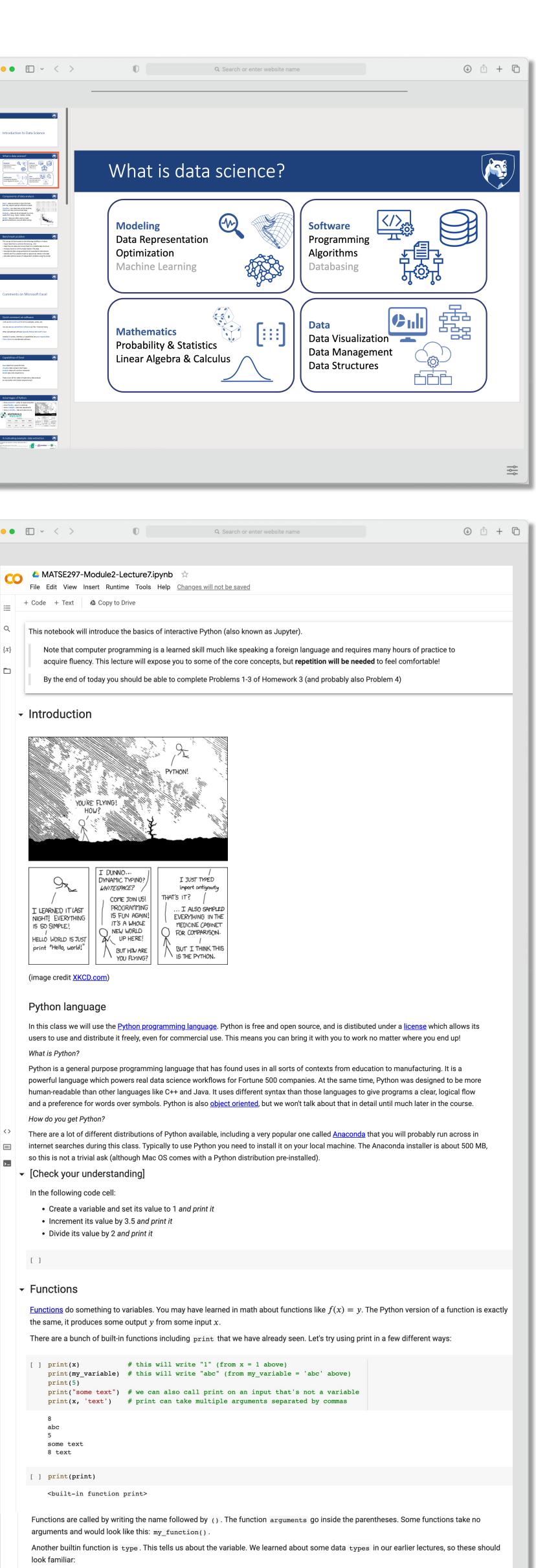












[] type(x) # x should be of type "integer," or "int" for short

Note that x is an integer because its assigned value did not include a decimal point. If we use a decimal point, it will become a floating point

Methods

The aim is that the overall framework used to infuse existing courses with data science is transferrable to other institutions and that the framework enables assessment of student learning and program evaluation.

Contributors fill out a Microsoft Excel template

in Python to convert text and filenames into

curricular network.

Why am I asking you to do this?

formatted HTML. This keeps the site dynamic.

with their lesson details. The template is parsed

3. The site for your Program is generated.

This project consists of developing

digital infrastructure and a diverse

integrates flexible learning pathways

with community engagement can be

Introduction to Data Science

Data science curriculum which

integrated into existing courses.

Parametric Modeling

Advanced Data Science

• Ethics of Data Science in

• Data Management

Machine Learning

Engineering

Robotics

Course topics include:



Initially gathered curriculum will be infused into AE and MATSE at PSU and, subsequently, the materials will be infused into courses at our other partner institutions.

These resources are intended to reduce barrier to entry for faculty seeking to incorporate data science into their instruction, as recruiting and retaining faculty to create and teach integrated introductory courses in data science has been recognized as a significant hurdle by the National Academies.



mpacts

This material is based upon work supported by the National Science Foundation under Grant IIS-2123343.

Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

