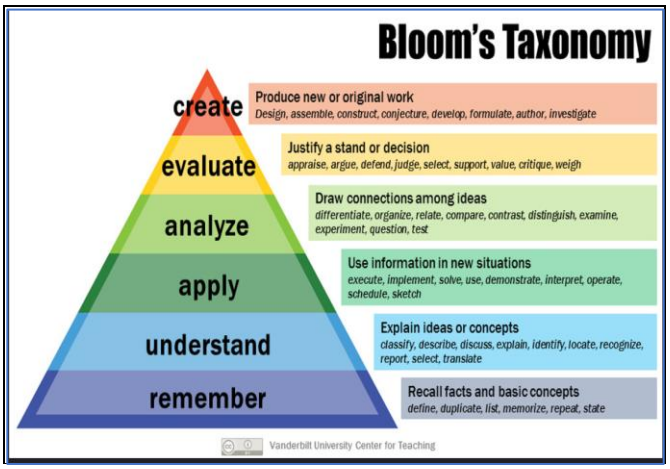
Addressing concerns from Ms. Smith about the syllabus for MAT-115

1. Regarding the course background, it is indicated that this course will teach basics of...and will acquire basic skills. Some of the action verbs in the learning outcomes indicate higher level verbs (per Bloom's taxonomy; e.g., code, test). Is this course intended as an introduction to acquiring these higher-level skills?

   Bloom's Taxonomy educational framework describes very well the way a student's ability advances when learning any specific topic. Higher level actions like organize, code, judge, and design are more advanced than lower-level actions like recall and explain. However, many studies show that education in broad, application-heavy fields like Statistics, Computer Science and Data Science build up not just within each topic, but from topic to topic. This creates limitations when mapping their CSLOs with Bloom's Hierarchical Taxonomy at a course-wide level, leading to the development of other recommendations for modeling the way these fields are taught effectively. One such example is Bloom's Spiral Taxonomy, where all levels of Bloom's Taxonomy are introduced piece by piece in a spiral manner, with increasing depth and complexity as the spiral grows outward. In the first "loop" of the cycle, students follow the entirety of Bloom's Taxonomy, but limited to a simple example that is easy to grasp. Students then advance their understanding in each taxonomy level to grasp applications of increasing complexity and detail, with each individual "loop" still following Bloom's Taxonomy for the particular application level at hand. A comparison of these mappings can be seen in the diagram below.



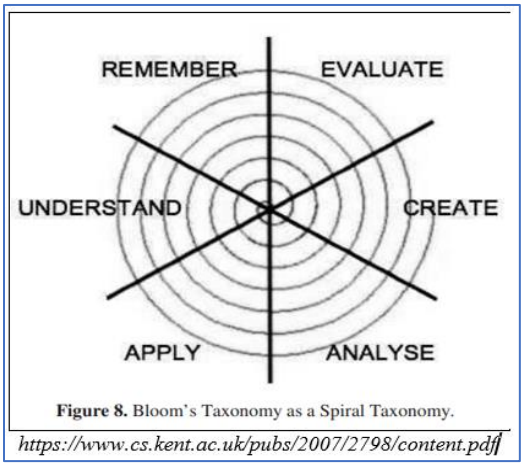


Figure 8. Bloom's Taxonomy as a Spiral Taxonomy.

https://www.cs.kent.ac.uk/pubs/2007/2798/content.pdf

It is for this reason that the Data Science syllabus includes action words at a variety of levels in Bloom's Taxonomy. Data Science is an interdisciplinary field blending subjects in Mathematics, Statistics and Computer Science. Actions like testing, modeling and analysis are what we normally teach and do with students starting from the first course in these fields. For example, students learn and do data modeling and testing in Elementary Statistics (MAT 114). Similarly, the prerequisite course, Computer Applications (CSC-151) already teaches students program design and coding in Python before they register for this course. In all of these examples, students first learn to perform these high-level actions with simple applications before progressing to broader and/or more complicated applications.

- We replaced "teaches basics…" with "teaches foundations …" in the course description in the syllabus.

2. The assessment chart indicates:

    a) The PSLOs are listed correctly for the Math Program and alignment with CSLOs are indicated.
    b) PSLO 2 alignment with ILO 7; in Taskstream, PSLO 2 is also aligned with ILO 1 and ILO 8
    c) PLSO 3 indicates alignment with ILO 7; in Taskstream, PSLO 2 is also aligned with ILO 5
    d) Is this intended as one of the required math electives for the math program? If so, do you intend to add this course to your curriculum map (attached)?
    e) If you are considering this an elective for any/other majors, ILO 7 is the primary ILO? Have you identified a secondary ILO?

While some of the listed PSLOs align with other ILOs beyond #7, we do not believe that the specific topics covered in this course map that way (other topics within those PSLOs, of course, do). The exception is that CSL0 #1 and #3 both map well to ILO#2. We have added this mapping a secondary ILO on the syllabus. We have also added language in the course description to clearly communicate that this course is an elective that may be of particular interest to students in any field who intend to pursue careers or graduate programs in a data-driven field.

The course will not be required for any of our three current math tracks. It is an elective course designed to help students prepare to enter the growing field of data science after graduation. Other departments may recommend or require this course for their students, particularly those on track to enter a data-driven fields upon graduation. It will be open to any Lincoln student who has passed the prerequisite courses MAT-110 and CSC-151 (which are already common requirements for other majors).

3. Not sure if you have had these conversations with your collaborators. Regarding the assessment measures, suggestion to consider how you will be assessing the assignments and student projects. Rubric?
    a. If using a rubric and working collaboratively with other institutions, I would suggest a collaborative development of a rubric or other scoring system, so that it is clear to all how the student work will be assessed.
    b. It would also be good to clarify a benchmark or proficiency level with collaborators, so that it is clear what is level of student work is considered meeting benchmark or proficient and what level of student work in not meeting the benchmark or not proficient.
    c. When developing the rubric consider the learning outcomes (what you have indicated students will be able to know, think, or do) in the development of the criteria
    d. Will you be considering signature assignments with the collaborating institutions?

Our understanding is that a rubric is not normally included in the course syllabus. That said, these are very good questions that we are still discussing with our partner institutions. In the meantime, we have included below the standard rubrics used by DMS. We are using these rubrics as a starting point on Lincoln's perspective when discussing the topic with our partners.

Rubric used in MAT PSLOs Assessment

Final Grading Average	Letter Grade	Overall Rating	Student Status
92-100%	A	4 – **Excellent**- work demonstrates a complete understanding of underlying data Science and machine learning principles and appropriate processes leading to a correct solution.	Proficient
82-91%	B to A-	3. **Satisfactory**- work demonstrates an understanding of underlying data Science and machine learning principles and appropriate processes with only technical errors in application.	
72-81%	C to B-	2 – **Needs Improvement**- work demonstrates a partial understanding of underlying data Science and machine learning principles and appropriate processes but application has substantial errors or omissions	
58-71%	D to C-	1 – **Unsatisfactory** – work demonstrates a fundamental misunderstanding of underlying data Science and machine learning principles and/or use of an inappropriate process)	Not Proficient
0-57%	F	0 – **Unacceptable**- work is unrelated to the problem or is left blank)	

General Rubric for Foundations of Data Science Course
(Work is in progress to match rubrics from the three participating institutions)

1. Excellent (4): Content is well written and well organized. Writing shows the student's clear understanding of data Science and machine learning principles and processes and correct and complete use of statistical and machine learning tools.
2. Satisfactory (3): Content is clearly understandable, but writing may show some lack of clarity or disorganization in ideas. Writing is understandable to the reader and shows student use of data science and machine learning principles and tools with some errors and/or omissions.
3. Needs improvement/ revision (2): The main idea is understandable but writing is muddled or rambling and needs revision to be clear. Much of the data science and machine learning principles and tools used is confused, incorrect or absent and needs clarification and correction.
4. Unsatisfactory (1): Difficult to understand due to many serious errors or omissions in the use of data science principles and/or tools.