

Year 0 Assessment Plan

Academic Year of Year 0 Plan: 2025-2026

College: Norm Asbjornson College of Engineering

Department: Gianforte School of Computing

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Program(s) to be Assessed. List all majors, minors, certificates and/or options that are included in this new Assessment Plan

Majors/Minors/Certificate	Options
Bachelor of Science in Data Science (DSCI-BS)	

Is this a new program? YES

Are you keeping existing outcomes? YES

If no, please identify all that apply:

Consolidating PLOs _____

Rewriting PLOs to be more assessable _____

Rewriting PLOs to be more aligned with program objectives _____

Other:

Part 1: Program Learning Outcomes (PLOs).

List the Program Learning Outcomes.

PLO#	PLO Description
1	Articulate key elements of the data science cycle (data acquisition, data storage, data cleaning, exploration, visualization, modeling, and communication).
2	Use computational thinking skills to design and implement programs that solve non-trivial data science problems.
3	Use a data visualization programming library effectively to produce meaningful and interpretable data visualizations.
4	Utilize basic mathematical (e.g. linear algebra) and statistical (e.g. statistical models and/or statistical tests) concepts to understand or model data.

Part 2: Development of Assessment Plan.

- a) **Threshold Values.** Discuss your threshold values and how you will determine them for your courses and PLOs.

For each PLO, at least 50% of students must demonstrate performance at Level 3 or higher on a rubric with four levels. Appendix A shows the levels.

b) **Methods of Assessment & Data Source.** Discuss methods and potential data sources of student work.

- **Direct Measures:** All PLOs will be assessed from the capstone project that students submit at the end of our Data Science B.S. capstone course - CSCI 487: Data Science in Practice. The capstone course serves as the culminating experience, providing integrative evidence of student proficiency across all PLOs. Appendix A contains the assessment rubric.
- **Indirect Measures:**
 - End of semester CSCI 487 student course evaluations
 - Enrollment and completion metrics
 - Instructor reflection
 - Informal student feedback

c) **Timeframe for Collecting and Analyzing Data.** Develop a multi-year assessment schedule that will show when all program learning outcomes will be assessed.

Data collection will occur each academic year, with analysis and reporting every two years following the initial cycle. The first full assessment report for the DSCI-BS program is due by October 15, 2026.

d) **Curriculum Map & Assessment Planning Chart.** Using the chart below, fill in the map. This table can be recreated to make more room for PLOs and/or change the layout. Mapping should also occur in the Courseleaf CIM system.

Program Learning Outcomes	Course Alignments: Include rubric, number, and course title	Identification of Assessment Artifact	Year to be assessed		
<i>PLO 1 – Articulate key elements of the data science cycle (acquisition, cleaning, exploration, modeling, communication).</i>	CSCI 252 Intro to DS CSCI 347 Data Mining CSCI 487 DS in Practice	Capstone portfolio indicators 1, 2	2025-2026	2027-2028	2029-2030
<i>PLO 2 – Use computational thinking skills to design and implement programs that solve non-trivial data science problems.</i>	CSCI 127 Joy & Beauty Data CSCI 252 Intro to DS CSCI 347 Data Mining CSCI 487 DS in Practice	Capstone portfolio indicator 3	2025-2026	2027-2028	2029-2030
<i>PLO 3 – Use a data visualization programming library effectively to produce meaningful and interpretable data visualizations.</i>	CSCI 252 Intro to DS CSCI 444 Data Visualization CSCI 487 DS in Practice	Capstone portfolio indicator 4	2025-2026	2027-2028	2029-2030
<i>PLO 4 – Utilize basic mathematical (e.g. linear algebra) and statistical (e.g. statistical models and/or statistical tests) concepts to understand or model data.</i>	STAT 337 Intermediate Stat with Intro to Stat Computing CSCI 347 Data Mining CSCI 487 DS in Practice	Capstone portfolio indicators 5, 6	2025-2026	2027-2028	2029-2030

Part 3: What Will be Done.

Explain how assessment will be conducted, who receives the analyzed assessment data, and how it will be used by program faculty for program improvement(s).

- a) How will assessment artifacts be identified?

The primary assessment artifacts will consist of student projects and written reports from the Data Science Capstone course: CSCI 487. The capstone portfolios from this course will be supplemented to include reflection and evidence addressing each Program Learning Outcome.

- b) How will they be collected (and by whom)?

Capstone portfolios are developed as part of the requirements for CSCI 487: Data Science in Practice. The course instructor is responsible for collecting the completed portfolios and associated project materials at the end of each semester. All collected artifacts will be stored in a departmental repository for assessment purposes.

- c) Who will be assessing the artifacts?

Each year, two faculty members will independently evaluate a random sample of capstone projects and portfolios using the assessment rubrics found in Appendix A. Scorers will calibrate their evaluations through an initial norming session to ensure consistency.

Part 4: Assessment-Specific Rubrics.

All plans must include program-specific assessment rubrics (the methodology of how student artifacts are to be assessed).

See Appendix A.

Part 5: Program Assessment Planning & Report Communication

- a) How will annual assessment be communicated to faculty within the department? How will faculty participating in the collecting of assessment data (student work/artifacts) be notified?

The assessment results are communicated to the GSoC faculty in advance of our annual August retreat so that changes to address weaknesses can be discussed. The instructor of CSCI 487 is responsible for collecting the capstone portfolios and making them available for assessment. First-time instructors of CSCI 487 will be reminded of the artifacts that must be collected.

- b) When will the data be collected and reviewed, and by whom?

Capstone artifacts are collected at the end of each CSCI 487 offering. The artifacts will be reviewed every second summer by the two-person assessment committee – currently Neda Nazemi and Ann Marie Reinhold.

- c) Who will be responsible for the writing of the report?

The report will be spearheaded by the assessment committee with input from the director.

- d) How, when, and by whom, will the report be shared?

After the report is written and before the October 15th deadline, the director will post the report on our website, share the website link with faculty and e-mail the report to programassessment@montana.edu.

Part 6: Closing the Loop(s).

“Closing the Loop” is the self-reflective portion of the assessment where faculty have an opportunity to evaluate how a PLO(s) was assessed previously compared to the findings in the current report. The goal of program assessment is continual student learning improvement even if thresholds have been met. Please explain plans for how Closing the Loop will be documented going forward.

At our annual August retreat, we will discuss the assessment data and findings to discuss potential changes to courses and/or curriculum. The changes that are made will be documented in future assessment reports and these reports will be shared with GSoC faculty. Extra attention will be given to these changes in future assessment cycles to evaluate whether they are having the desired impact.

Appendix A- Data Science Portfolio Criteria and Evaluation Rubric

Section I. Grading Rubrics

Indicator 1: Data Science Pipeline Implementation

Include a link to a code repository (GitHub) that contains data processing scripts and documentation that describes your project’s full data science pipeline (acquisition → cleaning → analysis → visualization → modeling → communication).

Evaluation:

1. No pipeline documentation or code submitted.
2. Incomplete or non-reproducible pipeline; missing steps or unclear documentation.
3. Pipeline functional but lacks transparency or reproducibility (e.g., undocumented cleaning or transformations).
4. Full, reproducible pipeline clearly documented and implemented

Indicator 2 – Integration of Data Lifecycle Concepts

Explain how you addressed data ethics, storage, documentation, and management practices throughout your project. Include any steps you took to make your data findable, accessible, interoperable, and reusable.

Evaluation:

1. No discussion of data lifecycle or ethics.
2. Mentions steps superficially without justification.
3. Addresses most lifecycle stages but lacks depth.
4. Comprehensive discussion of lifecycle, reproducibility, and ethical considerations.

Indicator 3 – Computational Design and Implementation

Describe how your team designed and implemented the computational aspects of your project. Explain the overall structure, logic, and rationale behind your analysis methods, including how your approach addresses the project's objectives.

Evaluation:

1. Analysis methods are unclear, unjustified, or disconnected from project goals.
2. Analysis methods are partially logical or justified but lack comprehensive explanation or implementation detail.
3. Analysis methods are logical and mostly justified, with a clear link between rationale and implementation.
4. Analysis methods are fully logical, well-justified, comprehensive, and clearly aligned with project objectives, demonstrating sound computational design.

Indicator 4 – Visualization Design and Interpretation

Include at least **two key figures** from your project that best represent your work. For each figure, provide a short interpretation explaining what it shows, why it was chosen, and how it communicates the complexity of the problem, and your key findings.

Evaluation:

1. No visualization included.
2. Visuals poorly designed or misleading; unclear labeling or interpretation.
3. Visuals convey information but lack depth or design quality.
4. Visuals are elegant, accurate, and effectively communicate key insights to technical and non-technical audiences.

Indicator 5 – Statistical and Computational Modeling

Describe the model(s) you used, why you selected them, and how you evaluated their performance. Explain how your modeling supported your project's goals.

Evaluation:

1. No model described.
2. Model misapplied or unjustified.
3. Appropriate model with partial evaluation or limited reasoning.
4. Well-justified model with rigorous evaluation and clear interpretation.

Indicator 6 – Mathematical and Statistical Reasoning

Explain how you used mathematical or statistical reasoning to understand relationships in your data (e.g., hypothesis testing, correlations, linear algebraic transformations, uncertainty analysis).

Evaluation:

1. No quantitative reasoning described.

2. Basic analysis without conceptual understanding.
3. Correct but limited application of statistical or mathematical methods.
4. Comprehensive application with clear understanding and interpretation.

Section II. Desired Performance Level

The desired performance level on each indicator is achieved if at least 50% of the students earn a score of 3 or higher.

Section III. Evaluation Methodology

Two assessment committee members will independently review each portfolio using the assessment rubric above. Indicators not meeting the desired performance level will be identified. If significant discrepancies occur between assessors, a third assessor will arbitrate.