

## Stroud Scholars – Quantitative Reasoning Outcomes

**Quantitative Reasoning – QR – is a "habit-of-mind," or competency in working with numerical data.** Students can learn how to do this. Quantitative Reasoning improves students' ability to think about and engage with data across academic or real-world settings to address key, relevant, interesting questions. Students developing their skills in quantitative reasoning are competent in, and getting comfortable with, addressing important, engaging questions ranging from everyday situations to more complex contexts. These students can work with data at levels ranging from describing and applying, to then developing their own quantitative inferences and explanations.

Students with strong quantitative reasoning skills also learn how to take agency – they can communicate the tools they are using, as well as their findings, implications across contexts and levels of learning.

As such, the Quantitative Reasoning Committee recommends course outcomes that are aligned with select state core standards that we have identified, and that develop quantitative literacy through:

- Engaging, introducing students to quantitative concepts and tools for quantitative analysis;
- Providing practice in working with various types of data in various contexts;
- Enabling students to carry-out quantitative work, analyses at different learning levels (e.g., description, explanation, application, evaluation, synthesis, development of original work); and
- Communicating quantitative concepts and findings.

In the Stroud Scholars program, students will demonstrate their quantitative literacy through course activities, both in classroom and lab, with the outcomes below.

### Developmental Trajectory

The following page outlines learning goals for the 3-year quantitative reasoning sequences for Stroud Scholars. The curriculum committee is in the process of breaking learning goals out per year, but has decided on an overarching framework (below). Keep this in mind as you read the goals on the following page and consider whether "summer one" is a good fit for you:

Stroud Scholars QR Developmental Trajectory	
Summer One	Focus on DATA INTERPRETATION
Summer Two	Focus on MODELING
Summer Three	Focus on ABSTRACTION

## Stroud Scholars Program Outcomes - Quantitative Reasoning

**By the end of the three-year Stroud Scholars Program, students will be able to:**

Engage, Involve	<ul style="list-style-type: none"> <li>● Investigate phenomena or engaging topics of interest to students, and articulate important questions from authentic, real-world contexts, settings</li> </ul>
Explore, Analyze	<ul style="list-style-type: none"> <li>● Use logic, reasoning, and quantitative techniques to explore data, and estimate or calculate results                             <ul style="list-style-type: none"> <li>○ Basic techniques of data, file organizing</li> <li>○ Introductory software and coding techniques</li> </ul> </li> <li>● Model data, phenomena as appropriate using mathematical and logical reasoning</li> </ul>
Interpret, Represent, Explain	<ul style="list-style-type: none"> <li>● Represent quantitative information in different forms (e.g., equations, graphs, diagrams, tables, text)</li> <li>● Describe numerical data presented in different manners (e.g., equations, graphs, diagrams, tables, words)</li> <li>● Develop appropriate inferences, interpretations, and conclusions from numerical data.</li> </ul>
Apply, Elaborate	<ul style="list-style-type: none"> <li>● Step-back to consider, reflect on how interpretations, conclusions apply more broadly</li> <li>● What would you recommend, or want to find out more about, in a similar setting to address the issue of interest, concern?</li> </ul>
Critically Evaluate	<ul style="list-style-type: none"> <li>● Critically review, analyze, and evaluate key assumptions and limitations of student's own work in estimation, modeling, analysis, and inference.</li> <li>● Develop ability to thoughtfully, critically evaluate key assumptions, limitations, and findings of others in estimation, modeling, analysis, and inference.</li> <li>● What are the next critical questions?</li> </ul>
Communicate	<ul style="list-style-type: none"> <li>● Use varied, important forms of communication to express a quantitative argument, inference, or conclusion, such as through materials that are                             <ul style="list-style-type: none"> <li>○ Written (short analytical paper, white paper summary)</li> <li>○ Visual (poster, powerpoint, webpages, video)</li> <li>○ Oral (presentation, debate)</li> </ul> </li> </ul>