Committee for Undergraduate Education
GUR Literacies Learning Objectives: QSRs

Quantitative & Symbolic Reasoning Description

GURs in Quantitative and Symbolic Reasoning (QSR) help you improve your ability to critically evaluate and effectively communicate numerical and symbolic information. You will gain skill in understanding the logic and validity of an argument by analyzing numerical and causal relationships. As an accomplished quantitative and symbolic reasoner, you will develop a sense of the relative size of numbers, be able to read and present graphs and charts, feel confident determining whether a conclusion involving data is sound, and understand how to model situations in order to make decisions and predictions. You should note that symbolic reasoning and numerical "know how" are required skills in a range of academic disciplines, not just math, and critically important in many professions. (WWU General University Requirements)

Proposed QSR Learning Objectives

Learning Objective	Affiliated GUR Literacy Cluster	Assessment Outcome
Demonstrate understanding of key quantitative and symbolic reasoning principles.	*Core Knowledge Literacy: Quantitative, Scientific, & Technological Literacy*	*Students can articulate core concepts (e.g. functions, models, logical structures) and their applications across various contexts.*
Communicate quantitative reasoning and problem-solving processes.	*Core Knowledge Literacy: Quantitative, Scientific, & Technological Literacy*	*Students will effectively communicate their thinking using appropriate and accurate terminology, representations, and logical arguments.*
Articulate theories, concepts, and/or strategies applicable to developing one's understanding of select quantitative methods.	*Core Knowledge Literacy: Social, Cultural, & Historical Literacy*	*Students can identify appropriate problem-solving techniques based on developmental learning, equity-centered practices, or quantitative techniques.*
Apply appropriate mathematical, logical, or computational methods to solve problems.	*Core Practices Literacy Cluster: Creative & Problem-Solving Literacy*	*Students will use appropriate strategies to compute, model, analyze, or solve quantitative or symbolic reasoning problems.*
Describe data to draw conclusions.	*Core Practices Literacy Cluster: Communicative & Interpretive Literacy*	*Students will demonstrate understanding of graphs, data sets, formulas, and symbolic models to inform decisions or conclusions.*
Use technologies and tools that are relevant to quantitative methods and/or symbolic reasoning.	*Core Practices Literacy Cluster: Communicative & Interpretive Literacies*	*Students will demonstrate their ability to use software , programming languages, or symbolic systems as needed to support analysis and computation.*

Assessment Example

The above learning objectives are affiliated with a wide range of QSRs offered throughout the years at Western. Thus, each QSR course should be affiliated with at least one learning objective, but may also be applicable to 2-3 other learning objectives. After reviewing the above GUR Literacies Learning Objectives affiliated with the QSRs, how did your course(s) advance specific learning objectives?

Please use the below to share what metrics you used to assess achievement of the aligned outcome(s) and results. To demonstrate impact, consider including the following within the "Results & Evidence" section:

- **Formative Assessment**
  - Synchronous discussion participation; summary of themes in relationship to outcomes.
  - Reflection assignments or discussion posts; summary of themes in relationship to outcomes.
  - Observations; this can relate to engagement with labs, problem-solving activities, service-learning opportunities.

- **Summative Assessment**
  - Final project/paper grade and/or qualitative themes related to the final assignment.
  - Final exam grade and/or qualitative themes related to the final exam responses.
  - Overall final grade (if the majority of the course related to specific learning objectives)

Learning Objective	Assessment Outcome
Articulate theories, concepts, and/or strategies applicable to developing one's understanding of select quantitative methods.	*Students can identify appropriate problem-solving techniques based on developmental learning, equity-centered practices, or quantitative techniques.*

Results & Evidence

Several of the course learning outcomes for MATH 371: Teaching P-3 Mathematics I and MATH 381: Teaching K-8 Mathematics I advance this overarching learning objective.

Regarding MATH 371, students complete a midterm exam to demonstrate their understanding of the course material which relates to teaching mathematics. This includes being able to examine and explain why a child may have difficulty with one mathematical concept versus another concept, and thereafter articulating strategies useful in aiding that child's learning progression. Thus, select questions on the midterm exam demonstrate students' ability to identify techniques based on developmental learning and equity-centered practices. During the 2024-2025 academic year, X percent of students scored 80% or higher on this midterm exam.

Within MATH 381, there are many formative assessment opportunities that provide insight to this learning objective. For example, students work in small groups to tackle unfamiliar problems. From there, they share problem-solving strategies with the whole group, and we discuss the solutions and how they might be generalized to specific mathematical rules or properties. Based on the faculty members observations, theme X and theme Y arise as students work to address challenges. One of the summative assessments used to measure students' ability to "identify appropriate problem-solving techniques based on developmental learning" are their final lesson plans. Lesson plans are graded considering that students demonstrate an understanding of X and Y. During the 2024-2025 academic year, X percent of students scored 80% or higher on their final lesson plans.