Quantitative Reasoning

Summary of Task Force findings on Quantitative Reasoning:

In a world where popular, political, and scientific arguments increasingly come to rest on quantitative data, the Task Force was persuaded by the argument that UND graduates need to be able to use and to interpret these data. Quantitative Reasoning (also known as Quantitative Literacy) is a set of abilities for recognizing, evaluating, and using forms of quantitative information in order to support a position or argument. It includes the ability to express quantitative information mathematically, graphically, orally, and in writing (though a Quantitative Reasoning class does not need to do ALL of these). It involves problem solving, especially with problems derived from actual data. Although it is not the same as mathematics or statistics, it may include aspects of both, as well as aspects of information literacy.

The Task Force decided that students should take one (3 credit) special emphasis course in Quantitative Reasoning. The Subcommittee on QR developed the following recommendations:

Pedagogy: These courses are by their nature centered on making sense of and communicating about quantitative ideas, which means that students need opportunities for first-hand experience with data. Courses qualifying as QR are expected to include appropriate practice, for individual students and for groups of students, in finding and using quantitative information in context. Quantitative data and conclusions should be communicated mathematically, visually, orally, and in writing, and students should be able to translate from one form to another. Students are expected to use basic computational skills, but the focus of a QR course is on thinking about using quantitative information in context rather than on the computation itself.

Designation as a QR Course: Courses must be approved by the General Education Requirements Committee for designation as a QR course. In order to receive that designation, an application must be submitted which demonstrates that the course meets stipulations related to content, methods, and assessment/grading. The stipulations are summarized below:

1. The course provides practice, for individual students and groups of students, in finding and using quantitative information in context.

2. The course includes practice with communicating quantitative data. Data may be communicated mathematically, visually, orally, and in writing, as well as translated among the various forms (though a Quantitative Reasoning class does not need to do ALL of these).

3. The course includes content related to reasoning, chance, arithmetic/basic algebra, and data analysis/interpretation. The course may contain other

elements, including but not limited to modeling, statistical interpretation, and use of computers as a quantitative reasoning tool.

4. The importance of quantitative reasoning within the course should be reflected in the grade; it should contribute to 30% or more of the grade for the course. In addition, the teacher regularly analyzes student learning related to quantitative reasoning as part of his/her assessment of the course for Gen Ed revalidation and as part of a process for improving teaching and learning.

During validation or revalidation of a QR course, a copy of the course syllabus should be submitted to document these requirements. Where the syllabus does not fully demonstrate satisfaction of the criterion, the teacher should submit explanatory notes.

New Essential Studies Goal for QR:

Thinking and Reasoning: *You should be able to use a variety of thinking and reasoning skills, apply these skills as appropriate in various situations, and move among them depending on purpose.*

Rationale: The ability to call on a variety of thinking and reasoning skills and choose among them in order to accomplish a range of civic, professional, and personal tasks is a core hallmark of an educated person. By the time you complete your ES courses, you will have encountered opportunities to practice various kinds of thinking and reasoning skills, including as least critical thinking, quantitative reasoning, and creative thinking.

You will improve your ***quantitative reasoning*** skills when your ES courses ask you to do the following:

- Apply empirical data to a special problem or issue.
- Draw conclusions based on quantitative information.
- Analyze graphical information and use it to solve problems.

The following criteria are meant to help faculty members, from a variety of disciplines, design a Quantitative Reasoning Course ("Q") course. These criteria will also give the GER committee a set of standards for the purposes of validation and revalidation.

1. The course must contain material addressing at least three of the following five elements of quantitative reasoning.*

- *Confidence with Mathematics.* Being comfortable with quantitative ideas and at ease in applying quantitative methods. Individuals who are quantitatively confident routinely use mental estimates to quantify, interpret, and check other information. Confidence is the opposite of "math anxiety"; it makes numeracy as natural as ordinary language.
- *Interpreting Data.* Reasoning with data, reading graphs or maps, drawing inferences, and recognizing sources of error. This perspective differs from

traditional mathematics in that data (rather than formulas or relationships) are at the center.

- *Making Decisions.* Using mathematics to make decisions and solve problems in everyday life. For individuals who have acquired this habit, mathematics is not something done only in mathematics class but a powerful tool for living, as useful and ingrained as reading and speaking.
- *Mathematics in Academic and Practical Contexts.* Using mathematical or numerical tools in specific settings where the context provides meaning. Notation, problem-solving strategies, and performance standards all depend on the specific context. Knowing how to solve quantitative problems that a person is likely to encounter in a civic, professional, or personal environment.
- *Number Sense.* Having accurate intuition about the meaning of numbers, confidence in estimation, and common sense in employing numbers as a measure of things.

2. The quantitative reasoning material must comprise 30% or more of the course.

Courses with other special emphasis designations (O, U, G, A, and C) may not qualify as Quantitative Reasoning special emphasis courses.

Students must take 3 credit hours of Q.

* The above has been adapted from: *Mathematics and Democracy: The Case for Quantitative Literacy* prepared by The National Council on Education and the Disciplines. The chapter entitled 'The Case for Quantitative Literacy' written by The Quantitative Literacy Design Team, page 8, NCED, 2001.

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