

Liberal Studies Program

Learning Outcomes and Writing Expectations

QUANTITATIVE REASONING AND TECHNOLOGICAL LITERACY

Approved by the Liberal Studies Council, Spring 2006

The fundamental learning goals of the Quantitative Reasoning and Technological Literacy Requirement are primarily both mathematical and technological.

Mathematical Goals:

1. **Arithmetical Reasoning:** Students will be able to make estimations; use proportional reasoning; use percentage change.
2. **Data Analysis:** Students will be able to use information conveyed as data, graphs, and charts; draw inferences from data; aggregate data with pivot tables; recognize disaggregation as a factor in interpreting data.
3. **Modeling:** Students will be able to formulate applied problems mathematically, seek patterns, and draw conclusions; recognize interactions in complex systems; use linear, exponential, and simulation models; recognize the impact of different rates of growth.
4. **Statistics:** Students will be able to make and interpret frequency distributions; summarize data with measures of center and dispersion; measure and interpret the association between variables; recognize the difference between correlation and causation; solve applied problems involving the normal distribution and z-scores.
5. **Probability and Chance:** Students will be able to recognize that seemingly improbable coincidences are not uncommon; evaluate risk from available evidence; and calculate basic, common probabilities.
6. **Algorithms and reasoning:** Students will be able to use sequential, logical thinking; develop algorithms to solve problems; use Boolean conditionals and repetition structures to create simple computer programs.

Technology Goals:

1. Spreadsheets: Students will be able to make algebraic calculations within a spreadsheet using cell addresses and formulas; format the layout of a spreadsheet; use statistical, logical, and financial functions; use and create macros to automate repetitious tasks.
2. Graphing tools: Students will be able to make appropriate and effective graphs to communicate and visualize quantitative information.
3. Presentation tools: Students will be able to use a presentation software package to create, format, and edit an electronic presentation; insert graphics and web links into a presentation; use transitions, animations, and other tools effectively to enhance electronic presentations.
4. Database tools: Students will be able to enter data into a pre-existing database; import data from a text file or spreadsheet file into a database; filter records based on a single parameter and on multiple parameters; sort records with multiple sort keys; formulate and conduct queries; generate a report from a database; recognize the difference between a flat file and a relational database; create a relational database using two or more tables; construct a query for a relational database using joins; design and implement forms for data entry.
5. Professional Statistical Package: Students will be able to import data from a spreadsheet or database into a statistics package; use graphical tools in a statistical package to make specialized statistics plots such as box plots and normal probability plots; calculate descriptive summary statistics using a statistical package.
6. Programming tools: Students will be able to construct the concept of algorithm through experimentation and reflection on everyday activities; articulate an accurate definition of an algorithm; recognize algorithms fitting the definition; construct the notion of a control structure and a repetition structure; acquire the ability to trace simple program listings using control and repetition structures; use control and repetition structures to write simple computer programs to effect a task.

In addition to these fundamental learning goals, however the program also has goals related to the qualities of reflectiveness, value-consciousness, multicultural perspective, and critical and creative thinking that are at the heart of the Liberal Studies Program. Such additional goals include:

1. Students will be able to analyze and discuss the impact of information technology on society and their own lives.

2. Students will be able to discuss the implications of the fact that information and decision making are increasingly quantitative.
3. Students will be able to critically assess the sources, importance and factual accuracy of digital information.

Writing Expectations:

The Mathematical and Technological Literacy (MTL) courses are strongly committed to developing students' writing skills. The effective use of quantitative information requires excellent written communication skills, and writing and quantitative analysis are inextricably linked. Furthermore as part of the Liberal Studies Program, the MTL courses provide students the unique opportunity to develop skills in writing analytical papers that include numbers, tables, and graphs. The minimal expectations for writing in a section of an MTL course are:

1. Five computer activities each of which has a final product in the form of a Word document with five to ten short paragraph responses (each 2 pages on average).
2. Five out of class assignments with approximately 10 short paragraph responses (4 pages on average).
3. An 8 page written report analyzing data related to a public policy issue. Many sections of the first MTL course include a reflective essay (1.5 to 2 pages) toward the beginning of the course.