Quantitative Literacy Guidelines

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The Mathematical Sciences Department has achieved a high degree of consensus on the goals for courses satisfying the quantitative literacy requirements of the new general education curriculum. We further note that our views are consistent with those expressed in the final report of the General Education Task Force. As much of this material does not appear in the documentation of the curriculum as approved by the Academic Policies and Procedures Committee, we feel it might be helpful to record a synopsis of our viewpoint together with a few supporting and elaborating sources.

In particular, the Mathematical Sciences Department supports the following summary of objectives for a quantitative literacy program outlined in part II of the Mathematical Association of America report *From Quantitative Reasoning for College Graduates: A Complement to the Standards* [2]:

> In short, every college graduate should be able to apply simple mathematical methods to the solution of real-world problems. A quantitatively literate college graduate should be able to:
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> 1. Interpret mathematical models such as formulas, graphs, tables, and schematics, and draw inferences from them.
> 2. Represent mathematical information symbolically, visually, numerically, and verbally.
> 3. Use arithmetical, algebraic, geometric and statistical methods to solve problems.
> 4. Estimate and check answers to mathematical problems in order to determine reasonableness, identify alternatives, and select optimal results.

5. Recognize that mathematical and statistical methods have limits.

The MAA report goes on to recommend a "foundation experience" focused on achieving the student outcomes listed above, presented in a general setting and emphasizing the applicability of this material across disciplines. Ideally, the foundation experience is followed by "extension experiences," activities in a variety of disciplines with sufficient quantitative content to warrant requiring a foundation course as a prerequisite. Both the goals of the foundation experience and the call for extension experiences are consistent with the following recommendations of the Appalachian State University General Education Taskforce [1]:

> The general education of all students should include four hours of content developing reasoning and numerical skills related to quantitative literacy. Courses that satisfy quantitative literacy should not be remedial, and their level of content should exceed the requirements for admission to the university.
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> All courses in quantitative literacy must provide students opportunities to develop these skills:
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> 1. Recognize situations where quantitative methods can be used to model and solve problems, and employ appropriate tools (specifically technology) in formulating, analyzing and solving those problems
> 2. Communicate quantitative ideas and concepts using a variety of representations, including numerical, graphical, and algebraic
> 3. Recognize and draw upon connections between the mathematical sciences and other disciplines, and between the mathematical sciences and life experiences
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> Quantitative literacy is best developed in stages with increasing levels of complexity and culminating with specific applications across disciplines and in the major discipline. Thus, second and subsequent levels, if appropriate, should require application, refinement, and reflection upon the quantitative skills and methods developed in the initial content.

We believe that the intent of General Education Task Force is for students' foundation experience in quantitative literacy to incorporate a variety of mathematical sciences topics applicable across many disciplines. Ideally, the implementation of the new general education curriculum should lead to a raising of expectations for mathematical achievement by Appalachian State University graduates. Indeed, the UNC Tomorrow Commission [3] has asserted that "graduates must possess the 'hard skills' that are relevant to the global economy and to dynamic business needs, such as expertise in science, mathematics, and technology." More information on the nature and significance of quantitative skills can be found in the additional references below.

References

[1] Appalachian State University General Education Task Force, *Final report* (May 2007), available at `http://www1.appstate.edu/orgs/gen_ed/PDF/Final_Report_5-9-07.pdf`.

[2] Mathematical Association of America C.U.P.M. Subcommittee on Quantitative Literacy, *From quantitative reasoning for college graduates: A complement to the standards* (1998), available at `http://www.maa.org/past/ql/ql_toc.html`.

[3] University of North Carolina Tomorrow Commission, *Final report* (December 2007), available at `http://www.nctomorrow.org/content.php/reports_documents/commission/Final_Report.pdf`.

Additional References

[1] Appalachian State University Mathematical Sciences Department, *Memo: The impact and role of mathematical sciences in the general education* (March 2006), available at `http://www.mathsci.appstate.edu/~jlh/pdf/memo.pdf`.

[2] L.A. Steen (ed.), *Mathematics and democracy: The case for quantitative literacy* (2001), available at `http://www.maa.org/ql/mathanddemocracy.html`.

[3] B.L. Madison and L.A. Steen (eds.), *Quantitative literacy: Why numeracy matters for schools and colleges* (2003), available at `http://www.maa.org/ql/qltoc.html`. Proceedings of the National Forum on Quantitative Literacy held at the National Academy of Sciences on December 1-2, 2001.