

Institutional Audit Questions

One anticipated outcome of the Wingspread conference Quantitative Literacy and Its Implications for Teacher Education was a list of questions that could help schools and colleges evaluate their programs in QL and teacher education. Questions for this “institutional audit” were solicited from conference participants in advance of the conference, and an edited list was distributed and discussed at the conference. Questions address both the nature of QL and two types of institutions: schools and school districts where teachers teach, and colleges and universities where teachers are prepared.

The following is this list of institutional audit questions interspersed with observations from conference participants offered in reaction to the discussions.

General questions:

- What are the basic quantitative requirements for all future teachers? Is there a common core of basic QL that applies to all subjects and all grades, and thus to all teachers?

On QL and Social Science . . .

QL, especially as it concerns informed citizenship, can be centered in the social sciences or social studies at the post-secondary and secondary levels. If we are concerned for the contextual validity and meaning of numerical challenges, why not teach QR in those contexts in which it naturally falls rather than in the form of problems to which context is appended?

Relatedly, the reporter advanced the provocative claim that mathematics is as important to QR as informational literacy. In the contemporary web-based world, arguably, the greatest QL challenge isn't generating and evaluating numbers mathematically, it's finding existing numbers and thinking about presented numbers knowledgeably and critically.

— Neil Lutsky, reporter

- Is it desirable (or even possible) to make a clear distinction between basic quantitative literacy appropriate for all teachers and higher order thinking that may be more appropriate for some grades or subjects than for others?
- Is a teacher's mastery of QL adequate preparation for teaching quantitative skills essential for the life and work of students?
- What proportion of K–12 teachers believe that some form of QL is relevant to their teaching in that it complements rather than competes with existing content?
- To what extent do national documents that provide curricular guidelines support the role of QL in different subjects? Can you give examples where this is done well (or poorly)?
- Do you know of any exemplary materials suitable for helping teachers learn how to prepare students to be quantitatively literate?
- Is there conflict between traditional school mathematics and the mathematics needed for QR/QL in contemporary society?
- What are the special QL requirements for teachers of mathematics, science and social science?

On QL and Teacher Education . . .

From the teacher education perspective, experienced teachers are more likely to be able to handle the classroom instructional and assessment demands of QL instruction which will often go beyond single class periods or even units.

It is possible that the processes sought in QL tasks can be highlighted within a "senior level" mathematics course for all students, and in particular for those not aggressively pursuing the calculus sequence.

— Henry S. Kepner, Jr.
NCTM President-Elect

On Numeracy and Statistics . . .

I am convinced that numeracy has a rather large overlap with statistics education, especially as the latter is being defined and developed for the K–12 mathematics curriculum.

A project that would look at constructive and practical ways to combine the statistics education goals and the QL education goals, and to embed them into teacher education programs, could go a long way toward establishing QL as an integral part of the school curriculum. The current academic year (2007–08) would be a great time to start, as the NCTM professional development focus of the year is "Becoming Certain about Uncertainty: Data Analysis and Probability."

— Richard Scheaffer
Former President, ASA

- Is it possible to develop consensus of performance competence in QL appropriate to different educational levels (e.g., high school graduation, college graduation, teacher preparation)?

Institutional questions:

- Is QL/QR (e.g., the ability to use mathematics in everyday life) included in the learning goals for students at your institution? If so, how do you assess this goal?
- Does your district or college explicitly recognize QL as an area of professional preparation and development for teachers in all subjects and all grades? If so, how is this preparation and development carried out?
- Have the distinctions between mathematics and QL/QR been addressed in your required studies for future teachers?

K–12 questions:

- What resources (e.g., experienced staff) does your school make available to assist teachers seeking to expand assignments and course modules in QL directions?
- In what ways do your hiring and new-teacher orientation encourage faculty in teaching QL and other cross-disciplinary goals (as opposed to seeing themselves as responsible only for a particular subject or grade)?
- Do your classroom materials (textbooks and supplements) support QL in the curriculum? Does your district provide supplementary materials that encourage QL-type problem solving? Are these materials easy for teachers to use? Do your teachers use them?
- Many QL problems invite creativity on the part of students, e.g., in questions they propose, in assumptions they make, or their approach to a solution. What kind of training experiences do you provide to help teachers who are more comfortable with a chalk/talk approach to explore these types of problems?
- How do your teachers assess the QL skills of their students?

On Institutional Audits . . .

Experience has shown that when asked (during the course of an audit) some faculty may not know if the courses that they teach have a quantitative component. This seems to be the case in statistics where faculty in the past have said they ‘don’t know’ if what they are teaching has a QL component of not.

— Kenneth C. Carr, reporter

Reporting on Institutional Audit Panel

Higher education questions:

- How are your learning goals for future teachers influenced by the need for them to teach quantitative literacy?
- Do your continuing education courses for teachers have any QL content?
- Where in your teacher preparation program do prospective teachers learn to tackle non-routine tasks that require QL thinking? (“Non-routine” refers to tasks for which nothing closely similar has been taught.)
- Are such non-routine QL-like tasks routinely included in tests and other course assessments?
- Where in your teacher preparation program do prospective teachers learn how to teach students to tackle non-routine tasks that require QL thinking?
- How can an undergraduate institution gain commitment from faculty across disciplines to take QL seriously as part of most regular liberal arts courses?

On Fractions I ...

We need to ensure that students recognize that there are many ways of conceiving of fractions and precisely because fractions (and ratios, decimals, and percentages) require shifting view points, they make excellent quantitative literacy (QL) tools.

On Fractions II ...

While fractions are critical in cooking, for most real-world applications and representations of quantitative evidence in the media, percentages are the key. Representing parts of a whole, comparing values to one another, measuring changes over time, scaling, and computing weighted averages all require a strong understanding of percentages.

— Corrine Taylor

- How can teacher preparation programs develop effective opportunities for future teachers to purposefully teach for QL outcomes?
- Do courses for future teachers in education, social sciences and humanities include quantitative reasoning tasks? How are these tasks connected to tasks in mathematics or science classes for these same students?
- Where in your curricula do students (especially future teachers) learn to (a) use of numbers in argument, (b) visually display quantitative information, and (c) write with precision, especially in the use of quantitative expressions? What evidence do you have that your graduates are achieving these goals?

- Do quantitative courses for future teachers include contemporary quantitative issues such as economic indices?
- Do your quantitative courses teach methods and algorithms or reasoning and problem solving? How do you know?
- What steps have been taken to coordinate cross curricular studies that support habits of mind such as quantitative literacy?
- Are the mathematics and statistics courses required of future teachers different from (a) those required of science and engineering students, or (b) those required for general education? If so, in what ways do they differ? How are these differences related to achieving or teaching QL?
- How can we assess QL competence in ways that both signal to students what is expected and provide useful formative feedback?
- Is it possible to add QL to an already over-prescribed context of teacher preparation?