

Assessment of Courses in General Education Category 4: Mathematical/Logical Reasoning for Fall Term 2007.

Methodology

Three sections of Philosophy 110: Introduction to Logic and Critical Thinking from Fall Term 2007 were assessed according to the rubrics for General Education Category 4: Mathematical/Logical Reasoning. Using the arbitrarily chosen criteria of student tech IDs ending in '5' yielded a total of 9 students. Since each student took three exams during the semester, the number of tests examined was 27. The assessment was completed by Professor John Humphrey, a member of the philosophy department at MSU. As with a previous assessment, we are still unclear as to the role of the rubrics. In particular, it is still unclear to us whether the rubrics are to be understood as providing guidelines for course content. If they are, this is news to us. As such, it is possible that some of the course material may not be pertinent to the rubrics and vice-versa. In the case of our department's logic courses however, it seems as if the course content does address the goals of the rubrics fairly well.

As with our department's previous assessment, we did not assume a yes/no interpretation of the rubrics. Rather, we made assessments of levels of mastery in much the same way that professors grade examinations. That is, we assessed how well and often students were able to identify, describe, explain and apply the concepts most closely related to the particular rubrics in question.

We considered three different tests that were administered during the semester. As just noted, selected portions of the exams were used to assess levels of mastery in different rubrics. Students/tests were grouped by success rates. Because of the small number of students/tests sampled, we will report our findings as number of students/tests whose rate of success were in the respective ranges offered in our analysis.

Assessment Review and Results: Category 4/General Education

The work of nine students from three different sections of Philosophy 110, Introduction to Logic and Critical Thinking was assessed using the four assessment rubrics for category 4 courses. Our assessment consisted of examining three different tests taken by each student. Test 1 examined students on matters dealing with standard distinctions between terms and statements, including the denotation/connotation distinction, assessments of truth-status of statements, and basic distinctions between propositions, including causal, hypothetical, analogical, etc. Test 2 examined student understanding of informal fallacies, different modes of language use (informative, evaluative, directive, expressive), and basic logical forms

(categorical syllogisms, hypothetical syllogisms, statistical syllogism, Venn diagrams, etc.). Test 3 tested students' ability to assess statements and arguments for basic logical properties like consistency, logical truth and validity, by using formal techniques of proof (i.e., propositional calculus).

Results

Each of the 4 rubrics contains at least two, and as many as four, levels of comprehension. Our assessment began with identifying which of the three tests, and what parts of each test, were most relevant to which of the 4 rubrics. (See discussion section for more on this matter). This was not easy to determine and our choices are not, we believe, the only way of connecting tests with rubrics and vice-versa. Following this, we assessed the level of mastery of each student by using a system utilizing a +, 0, and - system. The '+' was used to designate superior mastery of the particular assessment rubric, the '0' for adequate mastery, and the '-' in cases where the rubric was not adequately mastered. All told, there were 12 different levels of mastery within the four separate rubrics to assess. An appropriate symbol was given for each of these 12 levels. Results are recorded and analyzed on a separate sheet.

Discussion of Assessment Procedure and Results

The single most difficult problem with our assessment was determining what components of the exams to hook up with which parts of the assessment rubric. A very close second most difficult problem was deciding what counted as mastery of particular rubrics. For example, rubric 1 speaks of identifying and describing applications of math/logical systems. One question raised here is what to count as satisfying or not satisfying this rubric on the student's part. If a single case of identification or description was taken to constitute mastery (i.e., taking a yes/no interpretation of the rubric) then the level of mastery would, it seems, be quite high. For it is difficult for a student to take three exams in a critical thinking course and to not have demonstrated ability to identify or describe an application of a logical system on at least one occasion. Simply being able to understand the exercises on the exams requires, we would contend, the ability to identify and describe logical systems, and logical principles, an ability, we assumed, that was gained through taking the course.

As such, only students who failed the course could be said not to have demonstrated an ability to identify or describe a logical system. We decided to interpret the rubrics so as to allow for the possibility of grading levels of mastery, although it was difficult to render such an assessment in precise terms. We looked over the various exams and made assessments of levels of mastery in the particular rubrics in much the same way that one does so generally in grading exams. We basically considered things like how well and how often students were able to identify, describe, explain, etc., logical concepts and principles.

We are not certain that our approach is in line with the original intentions of those who created the rubrics. As such, we are not certain that our approach is going to

answer the sorts of questions to which those who requested a general education assessment are trying to find answers.

Ultimately, I think our approach could be regarded as something of a compromise, a *via media*, between these two different courses of interpretation. We did not, for example, see any way in which we could connect each problem on each exam with particular rubrics. However, some portions of the particular tests were more readily connected with particular rubrics and in such cases, the question of a student's satisfying a rubric or not was largely a matter of how well s/he performed on that portion of the exam. However, even in such cases, the determination of a student's level of success at meeting a particular rubric was not determined simply by echoing the original test score which a student received on that portion of the exam. And that is because the particular questions on the exam in these various sections were often designed to test skills and understanding that were not identical to the abilities connected to particular rubrics.

We are not certain if this is a problem with the exams or the rubrics. Be this as it may, it is clear that the tests we examined were designed to test a student's ability to do logic and critical thinking rather than to test student's abilities to talk about what they were doing. But many of the rubrics seemed designed to determine the extent to which students had or had not required a certain kind of meta-level competence, as opposed to the ability to perform various logical tasks. Once again, we are unclear as to the whether this is a failing of the tests or the rubrics. In order to make the assessment matter, we assumed, wherever possible, that a student's proficiency (or lack thereof) in the logical exercises on the exams was a proper metric of the student's possession of the meta-level abilities contained in the various rubrics. To assume otherwise, we felt, would render our assessment rather trivial.

As noted above, it was clear to us that every test-taker could be said on at least one occasion or another in the exams to have successfully identified, explained or described the basic logical notions mentioned in the rubrics. In some sense, simply being able to take the exams, that is, to understand the problems and to offer answers to them, is evidence of *some* ability to identify, describe or explain basic logical concepts that the student likely did not possess prior to taking the course. Thus, we felt it best to tie (at least in part) a student's success or failure at meeting the various rubrics to his/her level of performance on the particular exams.

Outcomes

The following chart indicates the number of students within certain ranges of proficiency for each rubric, 1 through 5 in order.

Rubric 1: Illustrate historical and contemporary applications of mathematical/logical systems

Rubric 2: Clearly express mathematical/logical ideas in writing

Rubric 3: Explain what constitutes a valid mathematical/logical argument

Rubric 4: Apply higher-order problem-solving or modeling strategies

Mastery below 70%	Mastery between 70 and 85%	Mastery above 85%
1 student	4 students	4 students
1 student	5 students	3 students
0 students	6 students	3 students
2 students	5 students	2 students

From these results, we draw the following conclusions. The majority of our students successfully master the rubrics 1-4. Rubrics 1-3 set out fairly straightforward abilities and we would expect everyone who successfully passes our Phil. 110 course to acquire the abilities associated with them to some degree, and certainly to be better able to satisfy them than when they entered the course. And this does seem to be the case. As far as rubric 4 is concerned, higher-order problem-solving abilities are often very difficult for some students to develop/master in the course of a semester. However, we believe that exposure to such problem-solving problems does serve as a helpful beginning for acquiring such an ability. If greater mastery is desired, the student who completes our 110 course may very well find such mastery to be within his/her grasp with a bit more exposure to the material in the future.