

Comprehension as an assessment tool for mathematics

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How should we assess our students? An end of semester exam can disadvantage students who are slow or easily stressed by the conditions, take-home assignments invite collaboration and other methods have other problems. I have been teaching third year units in introductory algebra and analysis. Our students do a lot of applied mathematics, statistics and operations research but my courses are as near as we get to pure mathematics. I guess the situation is similar at other universities of technology. For this course part of the assessment comes from a comprehension test. It works like this. The students are given a short mathematical paper to take home and read carefully. They can discuss it with each other, refer to books and consult other people. Generally I give them little or no assistance in understanding it. Two weeks later they are given a set of questions about the paper which are to be done under examination conditions, but with plenty of time. Students can bring the paper to the test but nothing else. I try to arrange things so that the questions take about two hours, but allow the students up to three hours to do them. Setting such a test requires finding a suitable paper and composing some questions. For undergraduate students the paper needs to be short and fairly easy. An excellent source is the Mathematics Magazine which publishes many 3 or 4 page articles involving elementary group theory, number theory and occasionally analysis. Inventing a set of around 10 questions is remarkably easy. Papers are full of phrases like “it follows that...”, “it is easily shown that...”, and the ubiquitous “clearly”. Students can be

asked to show exactly how it follows easily. If a theorem says “there exists x such that...” then they can be asked to give an example of x , or they can be asked to show how a theorem applies to a specified group or function. One needs to make sure that some of the questions are easy. The first time I used this method I had marks ranging from close to zero to nearly 100%. One also needs to stress that students put a lot of effort into studying the paper. Students who spend little or no time on preparation do not do well. After returning the students’ work last time I asked them how they felt about this means of assessing them. The responses were largely positive: fairly typical was the following. *“I feel that the comprehension test was better than traditional assignment, primarily because it took up less time! (2 weeks instead of 6.) It probably took more effort than assignments usually take. It wasn’t too hard, it was just necessary to do a sizable amount of preparation, which could have been more strenuously emphasised. Overall a definite improvement.”* In 2001 I used an article by Bruce Christianson (*Condensing a slowly convergent series*, Mathematics Magazine **68**(1995), 298-300.) After the test I sent him a copy of my questions and explained what I had done. He replied that he was pleased I’d used his article and wrote *“I had decided that something was going on, because I had a (perfectly sensible) query about a point of detail in the paper in my e-mail out of the blue from someone whom I now suspect to be one of your students.”*

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