CONCEPTUAL COMPLEXITY AND ITS QUANTITATIVE ASSESSMENT WITHIN A PHYSICS SERVICE TEACHING ENVIRONMENT

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SUBTHEME: Assessment

AIMS

We describe an introductory physics course for non-physics majors in which we emphasise the importance of concepts and conceptual understanding. We outline the principles that underlie our course, explore what is meant by conceptual understanding in this context and how this informs our assessment design, with consideration of cognitive load.

MAIN ARGUMENT

We have developed a technique to assess the cognitive load of assessments by identifying the number of concepts required to successfully answer individual questions. In an evaluation of our course's tests and examinations conducted over three years, we have found a linear decrease in students' performance in individual questions as the number of physics concepts, and the cognitive load, increases. Our concept tallying technique has been further developed into a "conceptual index" which is a weighted mean of the concepts across all questions in a test or examination. Mapping overall student performance in tests against the conceptual index once again supports the finding that as conceptual complexity increases, performance decreases.

CONCLUSIONS

Our findings support the notion that student performance is sensitive to the number of concepts under consideration. Thus, when designing assessment tasks, it is important to keep an inventory of concepts we require students to deal with at any given time. Our conceptual index tool can be used strategically during the preparation of tests and examinations as it allows assessment of the cognitive demands that will be placed on students.

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