The Impact of Using Formula Sheets for Physics Examinations

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Physics is usually regarded as a tough subject. Many students may concur that it is the complexity and abstraction of physics formulas which make the subject so challenging. However, physics teachers often criticize that, while learning physics, students tend to recite formulas without clarifying their meanings. In order to improve students' performance in examinations and to encourage meaningful learning, the author adopted the strategy of using a formula sheet in exams. The rationale of this study is mediated and distributed cognition. Providing formulas is not merely for facilitating cognition, but also serving as the essential "vehicle of thought" to illustrate the meanings of physics concepts.

The context is a tertiary introductory physics course for engineering students, and two years implementation and evaluation of the strategy had been undertaken. The instructor (author) provided the students with a blank table to fill in, then allowed them to bring this formula sheet to their physics examinations. Thus, the students were required to review the teaching content and select the important formulas to put in the table.

The purpose of this study is to investigate the benefits and drawbacks of adopting formula sheets in physics examinations. Four classes consisting of 216 students filled in a questionnaire which included both closed and open-form questions. The results showed that over 80% of the students agreed with the formula-sheet policy, in contrast to about 2% who disagreed.

On the other hand, the majority of the students actively acknowledged the benefits of using a formula-sheet from cognitive, affective, and even meta-cognitive aspects. The benefits include 1) the reinforcement of learning commitment and the facilitation of understanding of the meanings of the formulas as a result of preparing the formula sheet, 2) highlighting the demand of logical reasoning and conceptual clarification by reducing memorization, 3) easing the stress of sitting examinations, and 4) appreciating their role as students to understand the physics formulas comprehensively and to be able to adopt the tools effectively and properly, rather than merely rote learning. Besides, the strategy allows the instructor to include more challenging questions in the examinations. In sum, the teaching strategy may appear to cut down the commitment of memorizing formulas, but it actually promotes the cognitive demands of the examinations, and reinforces the students' more meaningful learning of physics.