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Are we stressing our students?

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Abstract

This paper compares the cognitive workload stress levels of students sitting taking a lesson on micro-level writing skills on line and on paper. The key finding of this paper is that students who studied the lesson on paper achieved significantly higher levels of mastery than those studying on line. Analysis showed that this difference could not be attributed to levels of stress or to prior attitudes or confidence regarding the subject matter of the lesson. We speculate that the differences may be attributed to speed of interactivity in online lessons which may deter reflective learning. Further research is needed.

Introduction

Both on-campus and off-campus (distance) learning has been transformed over the last decade as tertiary institutions have shifted from paper-based teaching to online teaching and resourcing. Web technology is generally seen as offering unique opportunities to provide interactive material that encourages active, deep, and reflective learning. Yet, the impact of this shift on students' experiences of learning has not been fully investigated or measured. Our 2005 pilot study[1], which compared students' experiences of using a web-based and paper-based lesson on micro-level writing skills, suggested that students using the web-based lesson were more stressed than those using the paper-based lesson. This paper refines and extends our earlier study.

Specific questions were:

- Was there a relationship between cognitive stress levels and attainment of mastery?
- Was there a difference in mastery attainment between on-campus and off-campus students to the online or paper based lesson?
- Did on-campus or off-campus students experience different levels of cognitive stress in response to the two lesson modes?

Method

The initial lesson we developed, *Interactive grammar!*[2] was an online tool for teaching micro-level writing skills. The lesson was based on the model of interactivity developed by Chou[3]. For the purposes of this research, we transferred this online lesson into paper form, retaining as high a level of interactivity as possible within the paper-based medium. The lessons, therefore, contained the same content and structure with a simple change of medium.

Thirty-nine on-campus and twenty off-campus students volunteered to participate in this study. The majority (85%) of the students were female between 18-26 years old (63%). The students were randomly allocated a paper-based or online lesson on micro-level writing skills. Prior to the lesson, they filled in a pre-test questionnaire, and at the completion of the lesson they recorded their mastery score, and completed a post-test and the NASA-TLX, a measure of subjective cognitive workload stress.

The pre-test and post-test questionnaires elicited both quantitative and qualitative responses from students.

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Results and discussion

High levels of stress (>12) resulted in lower test scores for all groups (Fig. 1).
For students doing the paper-based lessons, low to moderate levels of stress had negligible impact on test score. Over the same range, increasing stress levels were associated with lower test scores for students allocated to the web based lesson. However, the reduction in test score (~3) was small.

No significant differences were detected between on-campus and off-campus students in terms of workload stress or mastery attainment. Instead, the key finding of the study is that the average test score of students who completed the paper-based lesson was significantly higher than for those who completed the online lesson, irrespective of the level of perceived workload stress.

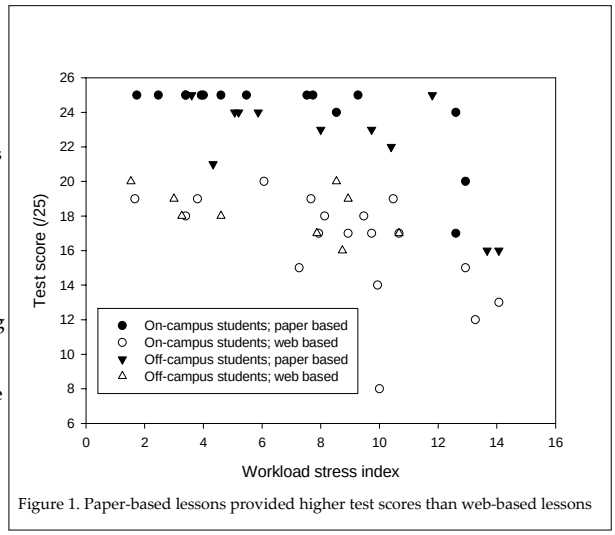

Figure 1. Paper-based lessons provided higher test scores than web-based lessons

The negative impact of the web-based lesson on student mastery of the lesson material was not related to differences in prior learning or confidence between the groups. For example, when test scores were plotted against the mean Likert scores of four pre-test questions about personal confidence in grammar, punctuation and spelling skills, students of similar levels of confidence performed better if they completed the paper-based lesson rather than the web-based lesson (Fig 2).

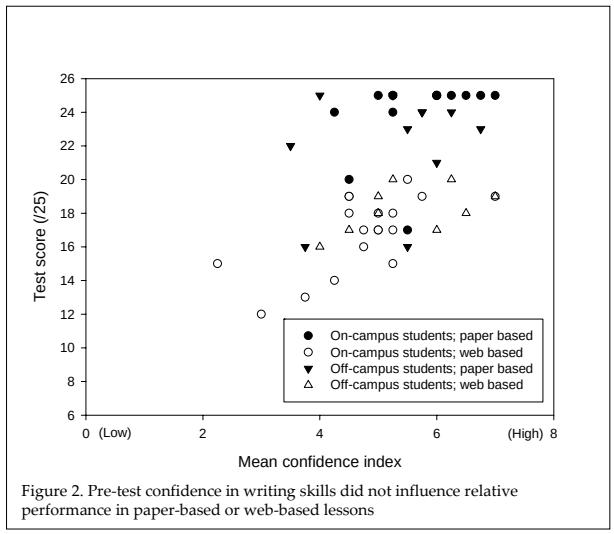

Figure 2. Pre-test confidence in writing skills did not influence relative performance in paper-based or web-based lessons

If low to moderate levels of stress are not responsible for the poorer test performance of students taking an online version of the lesson, what is?

Because both lessons (paper-based and online) had the same content and structure, we cannot attribute this finding to poorer lesson quality for the online lesson. Additionally, although both online and paper-based groups commented favourably on the structure of the lesson, those who sat the test online were more likely to see the lessons as fun. Ironically, although students taking the paper-based test attained a higher level of mastery, several commented that the lesson would be even better if it was put online, because this would allow for a more immediate form of interactivity.

And it is here that we may have an answer to our question. Mehlenbacher et al[4] and Rose[5] caution against developing interactive learning methods which do not give students time to reflect and consider their mistakes; the online lesson in this study provided a much quicker form of interactivity than the paper-based lesson. It is possible, too, that the medium itself, which is often associated with recreational activities, works in favour of quick responsiveness and against reflective learning.

Further research is clearly needed. However the study should at least sound a note of caution: while there are many advantages to online learning, and students may enjoy the medium more than traditional modes of instruction, it is possible that the medium may be inhibiting the deep, reflective learning which is required for mastery of material.

References

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