INTEGRATING STATISTICS AND BIOLOGY TO TEACH STATISTICS TO A DISPARATE COHORT USING TECHNOLOGY

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Background

Teaching statistics to non-mathematical students with mixed statistical background has always been a challenge for tertiary educators. More specifically, integrating biology discipline with statistics in a blended environment encounters the challenge of delivering a complete introductory statistics subject in a half-semester window. Many groups have attempted to teach tertiary students using blended learning approach (Lopez-Perez, Perez-Lopez, Rodriguez-Ariza, 2011; Holley, Olive, 2010; Ginns, Ellis, 2007 ; Bliuc, Goodyear, Ellis, 2007). In this study in order to enhance students' learning experience, we provided a series of 5-15 minute lecture videos on various statistical concepts (i.e., conceptual videos) on weekly basis. Each topic was linked to a set of quiz questions to monitor students' engagements, knowledge retention.

Method

The statistics component of the subject was delivered over a six-week period, one in the beginning; and five towards the end of the semester. To ensure that all students are proficient with the relevant, fundamental concepts, videos on statistical basics were made available to students a week prior to the start, and remained accessible throughout the semester. These videos were accompanied by the first quiz, which focused on descriptive statistics, and was due a week prior to the introduction of more advanced topics, e.g., statistical inference. Over the last five weeks of the semester, five advanced topics on parametric tests (e.g., *t* tests, ANOVA) and their non-parametric counter-parts (e.g., Mann-Whitney *U* test, Kruskal-Wallis test) were introduced along with the relevant quizzes. To integrate the two topics of biology and statistics, five published biological experiments by researchers from La Trobe University were described in the face-to-face lectures as case studies. These experiments set the basis (or background) for the five practical worksheets. These required students to decide upon and conduct the most appropriate statistical analyses based on data characteristics and the design of the experiments described in the face-to-face lectures. For these worksheets the students were required to import and reformat raw data from *Excel* to *SPSS* and perform the appropriate analyses after checking the required assumptions and conditions; and finally, interpret and report the results as if they were part of the research team.

Our on-going research program on blended learning focuses the extent to which our practical worksheets and e-learning components improve students' conceptual understanding of the relevant topics and promote (1) knowledge retention, and (2) their ability to exercise them for practical problem solving. Due to the fundamental structure of the worksheets building on previous work of experienced researchers, replication of the researchers' steps to produce already published results together with some more results, contribute to the students' ability to apply the relevant problem solving skills in their future workplace.

In 2016, we focus primarily on the effects of blended learning on knowledge retention for teaching statistics and research methods to second-year biology students. For this presentation, we will provide a detailed outline of our blended subject—practice of science (BIO2POS)—and examples of how the e-learning components were implemented to enhance conceptual understanding and knowledge retention. In addition, our presentation will include both quantitative summaries and qualitative case studies of students' response to our blended learning components, in terms of their academic records (or outcomes) as measured by their semester results, and their written feedback and evaluation towards the subject in general. All analyses will be performed separately, and compared across the active students—those that actively participated in our practical worksheet

activities—and the control students (i.e., students who failed to participate in the tutorial / discussion sessions and submit worksheets). Overall, it was found that active students showed a higher level of knowledge retention, and claimed to have benefited more from the blended e-learning experience than the control students in terms of self-report efficacy and confidence towards performing statistical analyses in the future.

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