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Investigating Grade 12 probability online learning resources for multiple representations

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Abstract

This research explores multiple representations of Grade 12 probability in online teaching and learning resources. The research is motivated by the observation that probability is poorly performed in Grade 12, with education authorities proposing multiple strategies, including the use of representational tools, as possible solutions to the problem of poor performance. Due to the closure of schools in 2020 as a result of the Covid-19 pandemic, the study relied entirely on online videos and electronic textbooks and study guides as sources of data. Data for the research are obtained from three open-source online YouTube video channels, two of which are South African video channels and one is an international channel. Other data are gathered from online learning materials, consisting of an electronic textbook (e-textbook) and two online study guides (e-study guides). Data from video channels were captured using the Mathematical Classroom Observation Protocol for Practice ($MCOP^2$) instrument and data from online learning materials were captured using the Mathematical Task Framework (MTF) instrument. Numerical data obtained through the use of the above mentioned instruments were entered into Microsoft Excel software to obtain descriptive statistics as well as to enable me to carry out hypothesis tests. The hypothesis tests to assess whether there is a difference in the means of the video channels based on the $MCOP^2$ item scores, and whether there is a difference in the means of cognitive demand levels based on MTF scores, were performed using the analysis of variance (ANOVA) test statistic.

Findings from the data suggest that there was no statistical significant mean difference in the $MCOP^2$ item scores for the three video channels. However, when the three video channels were analysed individually in terms of the $MCOP^2$ instrument that promote multiple representations of probability, the data revealed that only one episode from each of the two South African video channels promoted multiple representations of probability, while all episodes from the international video channel promoted multiple representations of probability. In terms of the online learning materials, only the e-textbook and one e-study guide promoted multiple representation of probability as the means of cognitive demand levels for these two e-learning sources were statistically different from the mean of the other e-study guides. The results from the video instructions suggest that currently few lessons from South African video learning channels promote multiple representations of counting and probability compared to the international learning channel. The result from online learning materials implies that two out of three e-learning text materials have reasonable quantity and

quality of tasks that promote multiple representations of counting and probability. These results confirm that there are gaps between what the department of education recommends in its yearly Grade 12 diagnostic reports and the instructional reality in the classroom. As such, this study recommends that in-service teachers undergo regular professional development training that are initiated and organised by the schools themselves but facilitated by universities that train secondary mathematics teachers. The training should be inclusive, irrespective of whether a teacher will deliver instructions through the online platforms or through the traditional classrooms. Moreover, pre-service teachers should also be conversant with multiple representations of probability concepts before they graduate from teacher training universities.