

CHARACTERIZATION OF THE LEVEL OF DEVELOPMENT OF REASONING AND STATISTICAL THINKING IN STUDENTS WITH ADVANCED MATH BACKGROUND: THE CASE OF HYPOTHESIS TESTING

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INTRODUCTION

The main objective of this study was to investigate the level of statistical reasoning and thinking about hypothesis testing developed by college students who have advanced statistical background, such as advanced math students. The reason for the study is because we conjecture that having a good knowledge of the mathematical foundations of statistics does not necessarily provide a proper statistical reasoning and thinking, very important cognitive processes at the current statistical education.

METHODOLOGY

Two questionnaires were developed to assess statistical reasoning and thinking on the topic of hypothesis testing. To characterize the statistical reasoning and thinking of the students, we rely on the Structure of Observed Learning Outcomes (SOLO) model, proposed by Biggs and Collis (1982). The questionnaires were applied to 11 students at the last level of the undergraduate Mathematics program at the University of Sinaloa (Universidad Autónoma de Sinaloa).

RESULTS

According to the proposed taxonomic levels, most students showed a single structural degree of statistical reasoning and a multi-structural degree of statistical thinking. In the questionnaire on statistical reasoning, most students had difficulties to describe the meaning of a hypothesis test, showed shortcomings in understanding the significance level, had problems in deciding on the type of sampling distribution to use, as well as in differentiating between a statistics and a parameter. With respect to the results of the questionnaire on statistical thinking, most students showed no ability to translate the statistical results into the contextual setting, which is essential to develop statistical thinking (Wild and Pfannkuch, 1999), and some of them did not show the capacity to correctly define the hypotheses.

CONCLUSIONS

These results show that although students have taken formal courses in statistics they do not necessarily have adequate statistical reasoning and thinking, nor the ability to translate the statistical results into the contextual setting when solving problems on hypothesis testing. They find difficulties in solving problems on hypothesis testing in which a statistical decision need to be put into a contextual setting. According to the student's solutions to the problems, everyone of them used the Newman-Pearson approach to hypothesis testing, none used the rejection and acceptance regions approach to make a decision about reject or not the null hypothesis, and also no one used Fisher's approach.

REFERENCES

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