

## DOES THE UNDERGRADUATE STUDENT REALLY UNDESTAND BAYESIAN STATISTICS?

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### PURPOSE

We investigate the answer to the following question: Is the undergraduate student who majors in mathematical statistics ready for Bayesian Statistics? We address the deeper meaning to the question in this paper.

### DESIGN

To investigate how students experience an undergraduate Bayesian course and how these students really understood what they have learnt, the focus point will be on how the students (after completing the Bayesian course) understand and interpret the difference between a confidence interval and a credibility interval. Students (after the completion of their first undergraduate Bayesian course) were given a scenario in which the two different methods resulted in the same interval. They were asked to state what the difference between the two methods was, and to interpret the two different intervals. Students who completed the Bayes third-year course in 2020, 2021, and 2022 completed this assignment.

### RESULTS

At the end of their third year, our undergraduate students usually tell us that the Bayesian statistics module was their favourite module. We investigate why students found the Bayesian module to be their favourite and what they generally enjoy about this module, but we really are asking and investigating what students really understand. Although it is clear that students enjoy the mathematics and algebra in the course, they do not really grasp the deeper understanding that the parameter is random, and the data are fixed and known. After completing an introductory course, the top students in the class (those who go on to the fourth year of statistics) struggled to interpret a Bayesian credibility interval versus a frequentist confidence interval. Students generally struggled to identify and distinguish between the two methods and overcomplicated their answers. For example, a student would say a conjugate prior was used rather than the frequentist method was used. On the other hand, some students managed to identify the two methods and interpret the two different intervals correctly.

### IMPLICATIONS

The implications of this study are for us as Bayesian lecturers to maybe rethink and re-imagine how we should teach an introductory Bayesian course, and what the focus of such a course really should be. We ask: On what should an introductory Bayesian statistics course focus? Should the focus be mainly on all theory and mathematics, or should the focus be on how we should use and interpret Bayesian methods?