

158 Love at the first sight? Students' attitudes towards statistics and R

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Research Domains

Learning, teaching and assessment (LTA)

Abstract

Statistics courses are not the most popular. Knowing students' attitudes would allow to address their concerns in an appropriate way. To research students' attitudes towards statistics and R, we used the Q-methodology (N = 33). Three attitudes emerge. (1) "Statistics for career" represents students who are interested in understanding statistical concepts and show a greater affinity with R than other students. (2) "Statistics is hard work" represents students that do not enjoy the course and do not see statistics and R as a career advantage. (3) "R is the problem" represents students (n=5) who understand the material but the application in R causes them problems. By contrasting the three attitudes (factors), it was possible to identify the areas where students had the most difficulty or enjoyed the most. In general, students are determined to understand the material and see statistics as relevant.

Full paper

Statistics courses are not the most popular. As previous research has shown, attitudes towards statistics play a role in how engaged and successful students will be in the course (de Oliveira Júnior et al., 2018; Griffith et al., 2012; Prayoga & Abraham, 2017; Ramirez et al., 2012).

As instructors of an introductory statistics course, we want to create an engaging learning experience and make the course as accessible as possible. Knowing students' attitudes would allow us to respond to their needs and/or address their concerns in an appropriate way. Besides these aims, we'd like to add to the research on attitudes towards statistics. One of the core parts of our course is that students analyse real data using the software R from the beginning. However, this can become an additional burden for students. Some previous studies have focused on attitudes towards statistics with R, but only covered R in one or a few items (Counsell & Cribbie, 2020; Tucker et al., 2022). From our perspective, this coverage is not sufficient, as it is a substantial part of our (and many other) courses.

Our research question: What are students' attitudes towards statistics taught using the software R?

To answer our research question, we used the Q-methodology (Brown, 1980). The students (P-set, N=33) were asked to sort 34 items (Q-set) between two poles '+4: I most agree with...' and '-4: I most disagree with...'. 16 items related to the theoretical understanding of statistics, 12 to the application of statistics in R and 6 statements to the relationship between theory and application. The items were based on the Scale to measure attitudes towards statistics (Schau et al., 1995) and covered six areas: affect (feelings), cognitive competence, value, difficulty, effort, interest. The sorting took place online (EQ Web Sort, Shawn Banasick) and was accompanied by additional questions on e.g. statistical / mathematical pre-knowledge, workload. Students were asked to comment on items placed at the two extreme poles of the sorting (+4 and -4). The responses were analysed using the R package qmethod (Zabala, 2014).

The preliminary interpretation of the three factors extracted in the Q-analysis (Varimax, PCA, 64% of the variance explained, 32 of the participants loaded on one of the three factors), complemented by the students' statements on the most extreme items, leads to the following results. The first factor "Statistics for career" represents students (n=16) who are interested in understanding statistical concepts and show a greater affinity with R than other students. At the same time, they admit that statistics and R are demanding. They believe that statistical skills will make them more employable. The second factor "Statistics is hard work" represents students (n=11) who are more afraid of

statistics than the others. They do not enjoy the course and do not see statistics and R as a career advantage. However, they put in a lot of effort and time to master the material. The third factor "R is the problem" represents students ($n=5$) who understand the material but the application in R causes them problems. They do not believe that they can perform analyses in R as well as their peers. They prefer not to attend R sessions. At the same time, they see some potential in statistics and R skills for their future careers. Affiliation to any of the factors is only significantly correlated with self-reported workload in the programme; suggesting that less workload may change attitudes towards statistics in a positive way.

The three factors are moderately correlated with each other (r between 0.29 and 0.36), meaning that there are not only differences but also some similarities. In all three factors, the items 'I tried to attend every statistics lecture' and 'Learning statistics requires a lot of discipline' ranked high, indicating students' determination to understand the material. All students negated the item 'Statistics is worthless' - from the instructors' point of view a solid base to build on. However, the students' comments showed that although the students do not consider statistics to be worthless, they do not see any direct relevance for a civic, personal and professional life.

This Q-study helped to understand the attitudes towards statistics and R as a total product, as the items were ranked globally. In addition, by contrasting the three attitudes (factors), it was possible to identify the areas where students had the most difficulty or enjoyed the most. We conclude that although statistics and R are not love at first sight for most students, it is the second time they reveal their importance.

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