

Developing an introductory statistics course for engineering students at NTNU

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Recently, the Norwegian University of Science and Technology (NTNU) merged with three Norwegian colleges. As a consequence, the statistics group at the Department of Mathematical Sciences is now offering a new undergraduate statistics course for 900 engineering students in 11 different disciplines, spread across three cities. Our aim is to develop a statistics course that is relevant for all students and tailored to meet the needs of the various engineering programs. This includes statistical analysis and computations in Python, using Jupyter Notebooks as a tool to activate and guide students through coding and statistics in Python. We intent to develop an integrated curriculum as well as contextualized learning activities, resources and assessment. In this talk I will discuss experiences from our first semester of teaching this course (digitally under Covid-19 restrictions), what we have learned from reaching out to engineering programs, and our plans for further developments and hybrid teaching.

Project-based learning for statistics in practice – collaboration, computation, communication

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Project-based learning provides an opportunity for students to experience group work that mimics professional practice but tasks must be authentic, provide a sense of ownership, and be structured appropriately [1]. Here we describe a constructivist approach to learning statistics and statistical practice [2] implemented in a compulsory unit in the first year of an undergraduate BSc [3] and a second term unit in a year-long MSc of Health Data Science (conducted remotely). Students were asked to self-organise into groups, choose a topic where data was readily available, and collaboratively write a scientific report using the R software for all data preparation, statistical modelling and visualisation tasks.

Problem solving task assessments in the BSc unit were structured to prepare students for the group project, gradually giving students responsibility for identifying which aspects of the problem and solution require discussion.

MSc students undertook a work-integrated learning project on behalf of an industry client. The students were required to meet with their client to scope out the project, identify key questions and methods, and plan and execute the work under the supervision of a faculty member. Students provided their client with a written report, executive summary, and code, as well as performing a 15 minute presentation to the client, teaching team, and all other students in the unit.

Both units required students to fill in a self- and peer-assessment survey. MSc students additionally completed a reflective essay inviting them to reflect on their prior experience and what they had learned about themselves and professional work during the unit. Students reported high levels of satisfaction with the project task and the structured team environment. Clients for the MSc unit rated the students' work and client engagement skills very highly. Higher scoring reflective essays indicated students' growing awareness of their own skill set and how they can contribute to a team while also learning new skills.

References

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The art and science of teaching data science

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Modern statistics is fundamentally a computational discipline, but too often this fact is not reflected in our statistics curricula. With the rise of data science it has become increasingly clear that students want, expect, and need explicit training in this area of the discipline. Additionally, recent curricular guidelines clearly state that working with data requires extensive computing skills and that statistics students should be fluent in accessing, manipulating, analyzing, and modeling with professional statistical analysis software. In this talk, we introduce the design philosophy behind an introductory data science course, discuss in progress and future research on student learning as well as new directions in assessment and tooling as we scale up the course.

About the speaker: Mine Çetinkaya-Rundel is Senior Lecturer in Statistics and Data Science, University of Edinburgh, School of Mathematics, and Data Scientist & Professional Educator, RStudio, and Associate Professor of the Practice, Duke University