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Enhancing students' data literacy. When learners evaluate their school's sustainable development.

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Introduction

Important decisions in politics, economics, health, and society are based on statistics. In order to participate in society as a responsible citizen, data management is an essential skill (e.g., Nicholson et al., 2018). For students growing up in a data-driven world, it is crucial to not only know how to analyse data, but also to think about how data are generated and what data can or cannot tell us (Wild et al., 2018). The present study follows the work of Andre et al. (2020), aiming to re-design their learning trajectory towards a student-centred approach on data collection and processing of data.

Theoretical background

Wild et al. (2018) list key statistical ideas important to understand at a deeper level including data collection, statistical modeling, covariance, and others. Student-centred methods lead to deeper understanding of concepts and the use of technology when exploring real datasets is crucial therefore (e.g., Wild et al., 2018). The PPDAC-cycle (Wild et al., 2018) describes such statistical investigation processes. Moreover, many studies emphasize that a context meaningful for students contributes to their development of competences (e.g., Makar und Ben-Zvi, 2011). Andre et al. (2020) take sustainability issues as such a context for students' statistical investigations. With the doughnut economy, Raworth (2017) presents an economic model for describing sustainable development (see figure 1), where social thresholds should be fulfilled while ecological boundaries should be obeyed.

Methods and Implementation

Following design-based research approaches (Bakker, 2018), a learning trajectory was generated to guide students of the 'Secondary School Centre' of Vipiteno in the district of South Tyrol through their own statistical research on sustainable development of their school's community. The aim of the study was to identify opportunities and challenges that arise during their statistical investigations.

31 students of two grade 12 classes participated in this study. They completed 12 lessons of 45 minutes each. In the first part, students were asked to identify factors contributing to a good and equitable life in the school community. Based on these results, basic ideas of the doughnut model (Raworth, 2017) were introduced, and a *school doughnut* was assembled containing students' ideas of their schools' sustainable development including issues such as energy consumption, CO₂-emissions on their way to school, political voice, mental health and many more. Subsequently, students were guided in their working processes of collecting and analysing data on these issues. Currently, results of the assignments and video recordings of the lessons are analysed qualitatively.

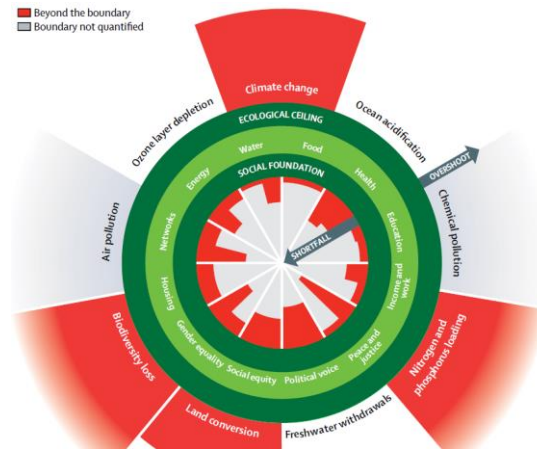


Figure 1: Doughnut Model (Raworth, 2017, p. e48)

First Results

Following the PPDAC-cycle, students managed to generate a doughnut model of their schools' sustainable development integrating several crucial topics. Thus, students could develop a deeper understanding of how to describe a phenomenon with statistical procedures. Two main categories of our data analysis are processes of data collection and generating statistical questions where we found major difficulties. Moreover, a third main category were students' struggles when defining specific boundaries and thresholds to classify the results of their investigations. These results are used to re-implement an improved learning trajectory in order to support students to overcome these difficulties.

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