

Prospective teachers' interdisciplinary learning scenario to promote students' statistical reasoning

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The development of students' ability to reason about data and to use data effectively and critically for prediction and decision-making is a priority in statistics education (Franklin et al., 2007), allowing to prepare 21st century students to succeed in today's society (Watson & Fitzallen, 2010). Statistical reasoning has a clear dependence on adequate data representation to support decision-making and argumentation, a process that has proved to be problematic for the students (Chick, 2004). A successful data analysis depends on students' knowledge on what types of representation are useful and on a set of transnumeration actions that facilitate to transform data in ways that lead to such representations or to alter them, making the representations convincing in terms of the evidence they provide from data claims (Chick, 2004; Wild & Pfannkuch, 1999). Such actions, as proposed by Chick (2004), are: Sorting; Grouping; Calculation of frequency, proportion or statistical measures; and Graphing. A pedagogical possibility to foster students' ability to use the representations fluently and effectively is the use of learning scenarios (Clark, 2009) that promote the integration of science and mathematics with technology. STEM (Science, Technology, Engineering and Mathematics) integration is widely recognized as an important foundation for statistical reasoning, given its potential to deepen students' understanding of the purpose and utility of data in making meaning of the real-world, an aspect suggested in curriculum documents but that has been neglected in statistics education (Fitzallen et al., 2018). Therefore, it is essential to engage prospective teachers (PTs) in activities that provide opportunities to improve their confidence and effectiveness on developing STEM integration activities, in school (Ní Ríordáin, Johnston, & Walshe, 2016). However, research is still needed to document in detail how PTs plan and implement learning scenarios in context of STEM to teach statistics topics and how students benefit from this experience (Huey et al., 2018).

This study is based on a teacher education experience involving 10 PTs of Physics and Chemistry and of Mathematics. The PTs, organized in mixed small groups and in collaboration with the teacher educators (the authors), developed an interdisciplinary learning scenario that includes a sequence of three lessons for the 8th grade, around an inquiry task that integrates Statistics and Physics and requires decision making and argumentation based on data. In this poster, we focus on students' activity regarding Statistics, in this context, aiming to analyse their transnumeration actions when using the software *TinkerPlots*TM (Konold & Miller, 2005), for data handling, in the exploration of the inquiry task.

The study follows a qualitative and interpretative methodology. Data collection methods include the students' written work on the inquiry task, the records of their work in *TinkerPlots* and the video

records of the learning scenario lessons. The results show that students made appropriate choices of graphical representations and intentionally used transnumeration actions, taking advantage of the potential of the *TinkerPlots* to support the interpretation of data and to obtain evidence for their statements. The work carried out around the representations allowed to guide the students to understand how to organize the data and analyze them in order to answer the questions or draw conclusions. These results evidence the benefits of the learning scenario to foster students' ability to reason about data. Nevertheless, it seems that students still need more opportunities to learn how to articulate different representations, either static or dynamically, an issue that demands greater attention from the PTs in the planning and enactment of the learning scenario.

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