

Statistical Literacy and Civic Engagement: Teaching and Learning with Data about Society

1. Introduction

In the era of the extensive availability of Big and Open Data (Ridgway 2016), vibrant democracies need well-informed citizens who can understand and discuss important social issues. The focus of a subfield we call Civic Statistics is to empower people to understand statistics about society on issues like demography, migration, health, poverty, income, education, crime, human rights, etc. (Engel 2017). Citizens need to understand quantitative evidence about these key social phenomena in order to support sound evidence-based decision-making in private and public life. This requires the ability to explore, understand, and reason about complex multivariate data, because social phenomena do not happen in a vacuum, and their understanding requires awareness of how variables co-vary, or affect each other, or are situated in a network of causal factors that may change over time in complex ways. Mathematics education at school is challenged to enable students to understand these types of data in order to get involved in public debate. Besides re-conceptualizing statistics instruction at school (and in teacher education) towards understanding multivariate phenomena, integration of appropriate innovative online tools (CODAP, iNZight, Gapminder) or educational software (TinkerPlots) for visualization and analysis of data (Ridgway, Nicholson, Campos, & Teixeira 2017) are essential ingredients. The ProCivicStat project (see www.procivicstat.org for further information) supported by the Erasmus+ program has the goal to promote understanding of statistics about society as part of the mathematics classroom, and to provide teaching and learning materials, tools, datasets so that Civic Statistics can be implemented in school and university classrooms.

2. Goal of this Minisymposium

The major goal of this minisymposium was to discuss a conceptual framework for *Civic Statistics* (Engel, Gal, & Ridgway 2016), to discuss the critical importance of learning and teaching about data in a social context and to present best practice examples for the implementation of tasks, datasets and digital tools that take students beyond learning procedural aspects of statistics to questions of societal needs for data, issues in the critical interpretation of data and linking results of analysis to real contexts.

3. Realization of this Minisymposium

This minisymposium included six presentations. Four of these presentations provided teaching examples of Civic Statistics for secondary school (Prömmel, Wassner) and preservice teacher education (Podworny et al., Schiller & Engel). In these presentations best practice examples have been discussed and presented to illustrate how to implement meaningful datasets, adequate digital tools and tasks for civic statistics contexts to promote civic engagement at school and university level. Podworny et al. have presented the design, the realization and the evaluation of a civic statistics course for lower secondary school preservice teachers at the University of Paderborn. Schiller and Engel have shared their experiences of a civic statistics course for preservice teachers at the University of Education of Ludwigsburg and have presented design elements of their course and interesting insights in the students' work during the course. Proemmel and Wassner both have presented their experiences of implementing civic statistics in classrooms at secondary schools in Thuringia and Bavaria. Theoretical insights like the introduction of a framework for understanding data about society were introduced and discussed in the presentation of Gal, Ridgway and Nicholson. Finally some concluding remarks to reflect on the role of statistics for civic empowerment were given by Borovcnik.

Presentations of the Minisymposium

Podworny, S., Frischemeier, D., Biehler, R.: Enhancing civic statistical knowledge: A seminar course for secondary preservice teachers for mathematics at the University of Paderborn

Gal, I., Ridgway, J., Nicholson, J.: A Framework for understanding data about society

Proemmel, A.: Civic stats at school – a project of promoting statistical literacy

Wassner, C.: Promoting real data competence in the classroom

Schiller, A., Engel, J.: Civic Statistics in the training of preservice mathematics teachers

Borovcnik, M.: Some Points to Reflect on the Role of Statistics for Civic Empowerment

References

Engel, J. (2017). Statistical Literacy for active Citizenship: A Call for Data Science Education. *Statistics Education Research Journal*, 16(1), 44-49.

Engel, J., Gal, I., & Ridgway, J. (2016). *Mathematical Literacy and Citizen Engagement: The Role of Civic statistics*. Paper presented at the 13th International Congress on Mathematical Education, Hamburg.

Ridgway, J. (2016). Implications of the Data Revolution for Statistics Education. *International Statistical Review*, 84(3), 528-549. doi:10.1111/insr.12110

Ridgway, J., Nicholson, J., Campos, P., & Teixeira, S. (2017). *Tools for visualising data: A review*. Paper presented at the IASE Satellite Conference 2017: Teaching Statistics in a Data Rich World, Rabat, Morocco.