Chapter 8

Teachers Analyzing Sampling With TinkerPlots: Insights for Teacher Education

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ABSTRACT

The teaching of statistics at the secondary level should provide statistical literacy for students who interact with data in several everyday situations. Therefore, it is crucial that the teacher education can provide a wider variety of situations in which teachers can learn how to improve students’ statistical literacy. The conceptualization of sampling is crucial to understand statistical data. However, this topic is not generally emphasized in school curriculum or in teacher education programs. This chapter discusses a study on how primary school teachers understand issues of size and representativeness of samples using TinkerPlots 2.0 software. The participants were four teachers from a public school in Brazil. The research protocol followed three phases: interviews to identify the teacher’s profile and their statistical knowledge; a familiarization session with TinkerPlots; and a session to use the software to solve tasks involving sampling. The results showed that the teachers began to consider aspects of data variation to determine when representative samples were presented using TinkerPlots. The ability to select samples and analyze them seemed to contribute to improve their understanding about sample size and representativeness. Since the purpose of the study was to explore teacher education activities that could support

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development of aspects of statistical literacy, further analysis of findings from the study offered insights into design of tasks to help teachers teach sampling as part of statistical literacy. For example, the analysis suggested that the questions asked during the research sections should not only explore the participants´ knowledge on the sample size or the confidence level, but should also promote reflection on the meanings assigned to tasks, leading to discussion of the skills required for statistical literacy in the Big Data era.

INTRODUCTION

Statistical education is related to the demand to develop capable citizens to interpret and to argue about statistical information presented in daily situations (North, Gal & Zewotir, 2014). People should be able to understand the processing of statistical data and make decisions based on their conscious analysis. Therefore, statistical knowledge is essential for critical reflective and participatory citizenship (Carvalho & Solomon, 2012).

An important area of knowledge that enables citizens to understand statistical data critically is related to conceptualization of samples and sampling. Bolfarine and Bussab (2005) conceptualize a sample as any subset of a given population, and sampling as a technique of selection of such subsets. Innabi (2006) argues that in order to analyze the representativeness of a sample it is necessary to know whether the sample is large enough and has the variety present in the population. In general, larger sample sizes ensure that the variety of the population will be represented in a sample, but with homogenous populations with less variability, smaller samples will be effective.

Crucial in understanding any sampling process is knowledge of how the data were chosen, what methods were employed for the selection of these cases, and what features and prioritized variables, so we can understand other contexts in which the information can be applied (Saldanha & Thompson, 2002; 2007).

Although samples and sampling are fundamental to the practice of statistics, they need to be more emphasized in school curriculum (Watson, 2004). Recently, several studies investigated the conceptualization of samples and sampling among students from different levels (Meletiou-Mavrotheris & Paparistodemou, 2015; Noll & Hancock, 2015; Phannkuch, Arnold & Wild, 2015). However, it is also important to investigate such situations among teachers who are going to approach such curriculum content (Martins, Monteiro & Queiroz, 2013).
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