

Abstract

Pre-Service Mathematics Teachers’ Statistical Knowledge for Teaching to Develop Statistical Literacy : Focusing on the Teaching of Sample

Byungjoo Tak

Department of Mathematics Education

The Graduate School

Seoul National University

Major Advisor: Kyeong-Hwa Lee

Today all citizens should be statistics consumers in our modern society, and statistical literacy is therefore addressed as a goal of statistics education. It is very important to identify proper methods for the teaching and learning of statistics to develop students’ statistical literacy. However, researchers often define statistics literacy dissimilarly, and studies about the theory and practice of statistical literacy in statistics education are rare. The purpose of this study is to identify practical and theoretical perspectives on how to improve the teaching and learning of statistics to develop statistical literacy.

In Chapter II, I analyze the history of statistics education research and domestic research trends. One finding from this chapter is the importance of

discussions with mathematics teachers who practice teaching statistics at schools on how to improve statistics education. In Chapter III, the meaning of statistical literacy is analyzed from various standpoints in order to explore the educational value of statistical literacy. As a result, I suggest statistical problem solving as a learning element and method to be used in statistical literacy education and discuss relevant implications as they pertain to the teaching and learning of statistics. In Chapter IV, teachers' knowledge is analyzed from the perspective of statistical literacy, and I probe the concept of 'statistical knowledge for teaching (SKT) to develop statistical literacy' in light of the four statements below.

- SKT 1. Understand statistical thinking as non-deterministic, context-dependent and data-based.
- SKT 2. Understand the interplay between the context and statistics based on contextual and statistical knowledge.
- SKT 3. Understand statistical justifications in statistical problem solving.
- SKT 4. Understand the usefulness and limits of statistics when attempting to teach students how to form critical stances and beliefs.

In this study, the concept of a sample is evaluated in light of the importance of data collection during statistical problem solving. In Chapter V, a didactical analysis of samples is attempted to determine what mathematics teachers must know. This chapter includes an analysis of how the concept of a sample has developed through time and how it is addressed in mathematics curricula and textbooks with regard to sampling variability and sample representativeness. The findings shed light on 'statistical knowledge for teaching sample (SKT-s)' from SKT.

- SKT-s 1. Recognize sampling variability and sample representativeness as the basis of non-deterministic, context-dependent, data-based

thinking.

- SKT-s 2. Comprehend the relationship between sampling and bias in the interplay between context and statistics.
- SKT-s 3. Understand that both statistical bias and sampling variability must be considered to explain sample representativeness.
- SKT-s 4. Achieve harmony between statistical uncertainty and validity. The concept of a sample validates statistical inference despite any underlying statistical uncertainty.

Chapter VI presents an analysis of how pre-service mathematics teachers plan, implement, and reflect on their classes through the transformative perspective of SKT. Pre-service teachers with SKT recognize the main ideas and modify the contexts of tasks when planning their classes in order to develop statistical literacy in their students. Moreover, they used SKT as pedagogical content knowledge (PCK) to provide certain questions and employ pedagogical strategies for to bolster their students' learning when implementing their classes. By reflecting students' responses in these classes, pre-service teachers can obtain knowledge of the content and students (KCS) to help them anticipate students' answers. As a result, a model is derived that is formed by the pre-service teachers.

This study provides several important implications pertaining to expertise in SKT by statistics teachers when these concepts are transformed and used as PCK during their teaching activities. Lastly, recommendations are presented to improve statistics education for pre-service teachers.

keywords : statistics education, statistical literacy, statistical knowledge for teaching (SKT), statistical problem solving, sample, pre-service mathematics teacher.

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