Introduction to the papers of TWG05: Probability and statistics education

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OVERVIEW

TWG gathered 37 participants from 16 countries. 22 papers and 11 posters were accepted.

We started with two ice-breaker activities. The first one allowed participants to introduce themselves. During the second activity, we collected answers to two questions and organized a debate from their answers. The questions and the main answers are gathered in Figure 1.

The papers were organized into five groups, each of which was managed and chaired by one of the co-leaders.

1) KNOWLEDGE AND ATTITUDES (AISLING LEAVY)

This subtheme explored the nature of the knowledge and understandings of statistics held by *particular groups* (middle grade students, pre-service teachers) when engaged in particular tasks and activities (comparing data sets, examining data displays), or communicated in textbooks.

It identified the attitudes of learners towards statistics and identified and/or categorized knowledge and attitudes using a variety of frameworks, scales and perspectives (qualitative content analysis, procedu-

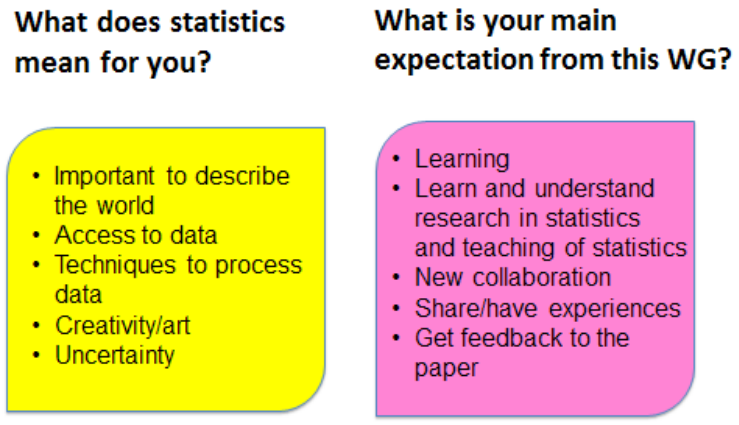

Figure 1: Ice-breaker activity responses

ral vs conceptual distinctions, Vergnaud's Theory of Conceptual Fields, Onto-semiotic approach, SATS).

2) PROBABILITY EDUCATION (CATERINA PRIMI)

This subtheme was about the relation between probability and statistics.

It addressed the questions of probabilistic reasoning and statistical literacy:

- How to integrate the different theoretical perspectives?
- When to start to teach probability?
- Which content is more suitable for different age groups?

A major question was the question of the use of simulation to teach probability and of its strengths and weaknesses.

3) INFORMAL STATISTICAL INFERENCE (SIBEL KAZAK)

The third subtheme was about informal statistical inference.

The discussion of the papers in this session focused on the key elements supporting students'/teachers' reasoning that leads to making informal statistical inferences based on data (cf. Makar, Bakker, & Ben-Zvi, 2011). These included:

- Knowledge of statistics: Statistical concepts, i.e., sampling, sample representativeness, sample size, uncertainty
- Knowledge of context given in the problem/task
- Design of learning environment: Task (i.e., use of physical objects, open-ended investigations), computer tools (i.e., TinkerPlots), students' age/level, teacher-student interaction, student-student interaction
- Transition from informal to formal statistical inference

4) STOCHASTIC THINKING AND TEACHERS (ANDREAS EICHLER)

The perspective of teachers in terms of teachers' knowledge and beliefs was the main topic in the fourth subtheme. This topic is important when researching the daily practice of teaching statistics and probability. Thus, teachers' knowledge and beliefs strongly impact on their instructional planning, their classroom practice and also impact on their students' learning. Not surprisingly, several papers at CERME9 refer to the teachers' knowledge and beliefs. Three papers concern the teachers' knowledge and beliefs before the teachers' classroom practice referring to teachers' knowledge about variability (Jacob, Lee, Tran, & Doerr), simulation approaches for informal inference (Lee, Tran, Nickel, & Doerr), and teachers' strategies for fostering decision making (Gonzales). One paper focuses on the relationship of teachers' espoused beliefs and the teachers' classroom practice (Bakogianni). Many important questions came out from the debates. For example, since research often yield shortcomings in teachers' knowledge, a challenge of research in mathematics education could be to develop a clear concept of what teachers have to know. Based on such a concept it could be possible to describe further the considerable corpus of the teachers' knowledge.

5) STATISTICS, CONTEXT AND REALITY (CORINNE HAHN)

The four papers presented in this group raise the question of the critical dimension of statistics education. These papers explore how we interpret statistical information from authentic contexts (newspaper articles mainly). The research works presented were conducted with a variety of audiences: teachers (Ozen & Cakiroglu), high school students in mathematics classrooms (Sturm & Eichler) or biology (Plicht et al.), tertiary students (Monteiro et al.).

They showed the influence of beliefs and affective aspects in the interpretation of statistical information. They raise the question of what can be considered as statistical as well as the question of the authenticity of the activities.

CONCLUSION

In this working group, we challenged current frameworks and perspectives on statistics education research.

Some important issues emerged from the discussions: The role of technology in statistical teaching and research, the relationship between statistics and probability, the goals for teacher education:

(What are the big ideas in teaching statistics?), the question of attitudes, motivation and efficacy in teaching statistics, the role of context in statistics, the question of methods and approaches to research in teaching statistics ...

We also anticipated directions of change: New role of technology, new topics (e.g., Big data...)