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(R)evolutions in probability theory: students reflecting their own beliefs about mathematics by dealing with original sources from 20th century development of probability theory

Abstract

(i) *Materials:*

- Lime survey for getting to know and prepare the participants of the workshop
- Excerpt from Kolmogorov (1933) (p. 2-3)
- Original data of pre-service teacher students' (PSTs') learning diaries, who attended the described seminar ÜberPro_WR II

(ii) *The age and level of education of students to whom the workshop refers*

Teachers' pre-service education

(iii) *Short Description of the Workshop*

The aim of the workshop is to share ideas of the seminar "Übergangproblematik am Beispiel der Wahrscheinlichkeitsrechnung II" (engl. Transition problems in probability theory, short ÜberPro_WR II) – aiming to supporting students in their transition from school to university. The seminar was developed similarly to a seminar with a focus on the development of Geometry (Witzke, I., Struve H., Clark K., & Stoffels G. 2016) and which was refined at the University of Siegen in 2015-2017. The workshop is divided into seven phases:

1. The participants prepare the workshop by answering three questions and reading a source (7 book pages). It is important for the participants' experience as well as for the whole workshop that the chronologic order is fixed and that the given source remains unknown before answering the questions.
2. We will start discussing the online survey regarding probability theory and beliefs amongst the participants and discuss possible explanation, why it is meaningful to ask these questions. Kolmogorov (1933) claimed also, that "[t]he author set himself the task of putting in their natural place, among the general notions of modern mathematics, the basic concepts of probability theory – concepts which until recently were considered to be quite peculiar". (Kolmogorov, 1933; p. v)
3. The answers given in the survey will be shared with the participants on paper cards, so that we can cluster them in an intuitive way and have the opportunity to talk about the results.
4. A short presentation (<10 min.) will introduce the outline of the seminar ÜberPro_WR II and the didactical decisions that lead to the outline. Another clustering of answers will be presented originating from the described seminar based on a categorization of mathematical world views by Grigutsch et al. (1998). This overview will motivate the next part of the workshop.
5. The participants will get an excerpt of Kolmogorovs "Foundations of Probability Theory". And shall scan this source for surprising and interesting aspects. After reading the excerpt the identified aspects will be discussed.
6. After the participants' own work with the historical sources, excerpts of the participants' diary entries, who attended the seminar ÜberPro_WRII, will be handed out to be discussed in groups of 3 to 4 participants.
7. The workshop finishes with a concluding statement, addressing the importance of students'

reflections about their own beliefs and the benefits from using historical sources to engage them in their own reflections. This statement is planned to be discussed by the participants in the light of their own workshop's experiences.

For workshop participants: If you want to participate please prepare the workshop using the following link: <https://umfragen.uni-siegen.de/index.php/431978/lang-en>

References

- Grigutsch, S., Raatz, U., & Törner, G. (1998). Einstellung gegenüber Mathematik bei Mathematiklehrern. *Journal für Mathematik-Didaktik*, 19, 3–45.
- Kolmogorov, A. N. (1933). *Foundations of the Theory of Probability*. Second English Edition. Translation edited by Nathan Morrison, 1956 : Chelsea Publishing Company, New York.
- Witzke, I., Struve H., Clark K., & Stoffels G. (2016). ÜberPro – A Seminar constructed to confront the transition problem from school to university mathematics based on epistemological and historical ideas of mathematics. *MENON ©online Journal Of Educational Research*,(2nd Thematic Issue), 27.
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