

MATHEMATICAL KNOWLEDGE FOR TEACHING OF PROSPECTIVE PHYSICS TEACHERS: A CASE OF A DECIBEL SOUND LEVEL SCALE

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THEME:

Teacher education and professional learning in STEM

BACKGROUND AND AIMS

This study aims to investigate the mathematical knowledge for teaching of prospective physics teachers (PPTs) in the context of complex mathematical concepts – a logarithmic function and a logarithmic scale. These concepts were chosen as they are usually overlooked and yet they are at the core of many physical quantities, such as the pH scale (acid-base scale) in chemistry, Richter scale for measuring earthquake strength in Earth science, disease spread in medicine (e.g., SARS-CoV-2 spread), and sound level in physics. In this study, we focused on the subject of sound waves, specifically the topics of sound level and sound intensity, as these are fundamental concepts of science and the latter relies on the logarithmic scale. These concepts are included in the secondary physics curricula in many countries. As such, our aim was to investigate how PPTs interpret sound levels and sound intensity for their future teaching.

METHODOLOGY

The data is comprised from PPT's responses to the task in which they had to compose a script for an imaginary dialogue between a teacher and a group of students and provide a commentary elaborating on their instructional choices. The topics selected for the task were chosen intentionally as they provide authentic and rich opportunities to bridge mathematics and science concepts, while challenging PPTs to consider logarithmic measurement scale and its role in science. The task provided the beginning of the dialogue, that featured a student's confusion related to the measurement of the sound level using a decibel scale. Participants were asked to extend this dialogue through describing envisioned instructional interactions that could have ensued.

RESULTS AND CONCLUSIONS

The instructional interchange related to the relationship between sound intensity and sound level, and particular teachers' responses to the student ideas related to the meaning of a decibel sound level scale were categorized as featuring various attributes of knowledge for teaching (superficial or deep, conceptual or procedural). We describe each category using illustrative excerpts from the participants' scripts. We conclude with highlighting the affordances of scriptwriting for teachers, teacher educators, and researchers. Finally, we suggest how scriptwriting can be incorporated in teacher education to support building stronger mathematical knowledge for preparing future teachers or physics.

REFERENCES

- Milner-Bolotin, M., & Zazkis, R. (2021). A study of future physics teachers' knowledge for teaching: A case of a decibel sound level scale. *LUMAT: International Journal on Math, Science and Technology Education*, 9(1), 336-365. <https://doi.org/10.31129/LUMAT.9.1.1519>