ESTA
Educating Science Teachers for All

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Exploring Future Chemistry Teachers' Pedagogical Scientific Language Knowledge

Theoretical Framework

- *Chemish* as a scientific language of chemistry is important for communication in and understanding of chemistry [1] but at the same time it is one of the major difficulties in teaching and learning chemistry in school context [2].
- Thus, pre- and in-service chemistry teachers need adequate preparation to address this issue: they need to posses *Pedagogical Scientific Language Knowledge* (PSLK) which is "*knowledge of scientific language as it is related to teaching and learning science with a focus on different scientific topics and contexts*" [3, p. 181] and a part of teachers' PCK [4].

Research Questions

What extend of PSLK do future chemistry teachers posses during their university teacher training program?

- How is future chemistry teachers' content knowledge of certain scientific terms?
- How do future chemistry teachers define difficulties their future students may have with named scientific terms?
- How do future chemistry teachers explain the named scientific terms to their future students in form of fictitious explanations?

Methodology

- case study based on open questions:
  1. Define the term X.
  2. What difficulties might students have with the term X?
  3. How would you explain the term X to students in grade Y?
- scientific terms: (i) substance, (ii) reaction, (iii) oxidation, (iv) element, (v) neutralization, (vi) air, (vii) particle.
- 41 future primary and secondary chemistry teachers
- data analysis based on qualitative content analysis [5].

Results

Knowledge on Terms

- In general, 49% of the definitions named by the participants are on intermediate level which is described as a knowledge for lower secondary schools. 36% of the definitions are at the advanced level (upper secondary) and 15% the novice level.

Students' Difficulties with Terms

- Polysemy of the scientific terms was the most named difficulty by the participants, especially for the terms *substance* (95%), *reaction* (83%), and *particle* (59%).
- Further difficulties mentioned were *abstractness of the concept* (28%), *complexity of the concept* (16%), and *no conception of the term* (13%).
- 8% of the participants were aware of the misconceptions with the terms *oxidation* and *neutralization*.

Explanations

- Although the future chemistry teachers named difficulties students could have, these difficulties were addressed in only 30% of the explanations.
- In 14% of the explanations, future teachers addressed the polysemy of the scientific term. Interestingly, in two of the answers, the language characteristics of the scientific terms were addressed but were not named as a difficulties beforehand.

Discussion

- The study shows that future chemistry teachers only partially take into consideration the linguistic characteristics of the scientific terms while explaining it to the students.
- Except polysemy, no other characteristics of the scientific language (e.g., usage of symbols) were named.
- Thus, future chemistry teachers' scientific language awareness need to be more in focus of university chemistry teacher education program.
- However, further research is needed focusing on in-service chemistry teachers' PSLK and what PSLK is needed in school context.

References

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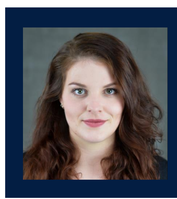

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