

# Verbal Explanatory Competence in Science Education at Primary School

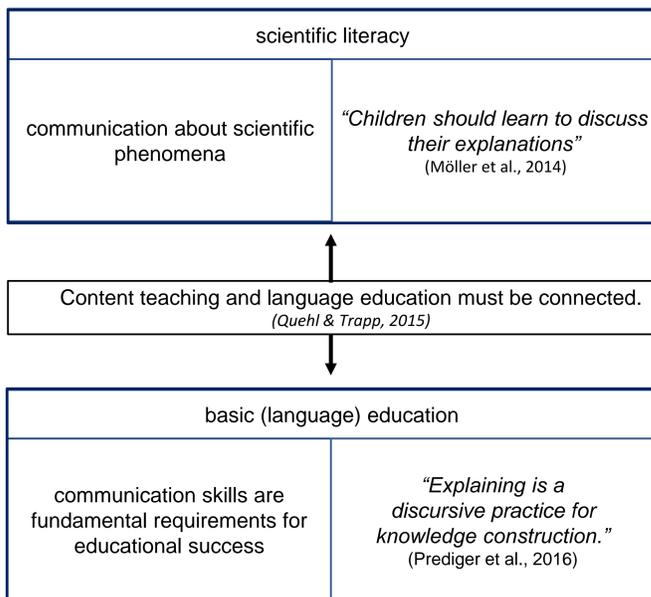
Jennifer Krupinski

## PURPOSE

The purpose of the study is to investigate how primary school students from the grade 1 through 4 explain scientific phenomena and how their explanations are structured.

### Central Aspects of Early Science Education

Supporting the development of . . .



### Theoretical Framework

- linguistic (explanatory) precursor skills are already measurable from the age of two: verbalisation of simple causal connections (Klein, 2017)
- observing discourse skills from grade 1 through 3: improvement of completeness of content and structure of explanations (Röhner, 2009)
- scientific reasoning skills (4<sup>th</sup> grade): to understand a phenomenon does not mean to be able to explain it (Gadow, 2016)

#### → Current Gaps in Research:

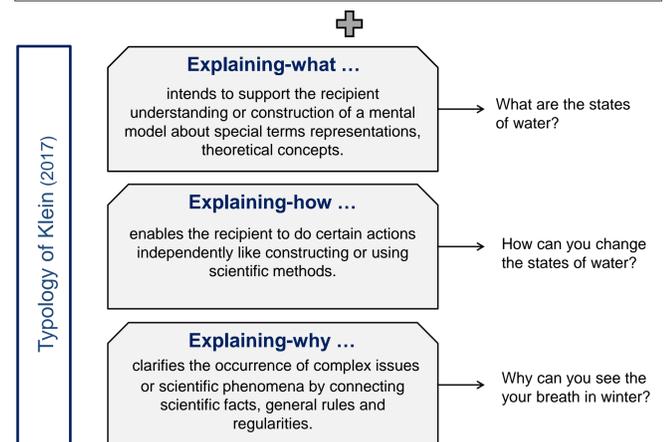
There is a need to know, how primary school students explain scientific phenomena in early science education and how they can be supported to generate adequate explanations.

### Definition of Explanations (in Progress)

An explanation is...

the product of an interactive process of knowledge transfer between two or more actors, using descriptions and combining different parts of knowledge to generate new knowledge.

In this process, it is possible to use argumentative elements.



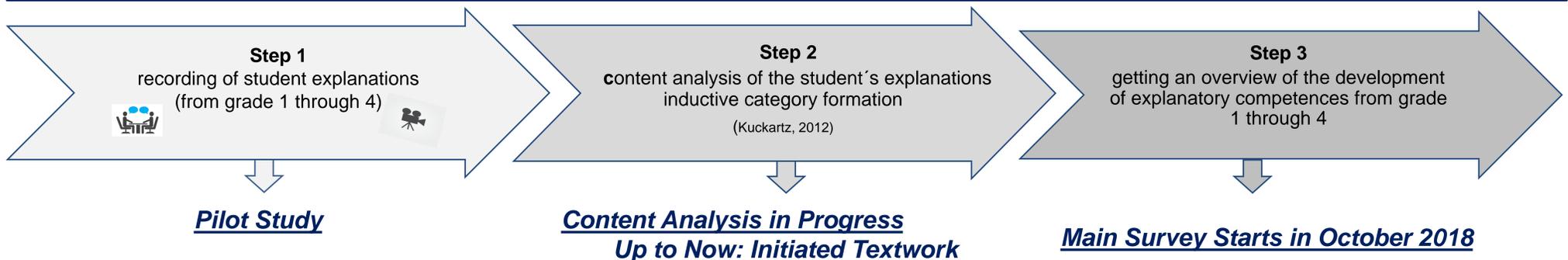
## RESEARCH QUESTIONS

RQ 1: How do primary school students explain scientific phenomena?

- How do primary school students structure their explanations in terms of content adequacy?
- How do primary school students structure their explanations in terms of language adequacy?

RQ 2: What are the differences in the development of the students' explanatory skills from grade 1 through 4?

## DESIGN

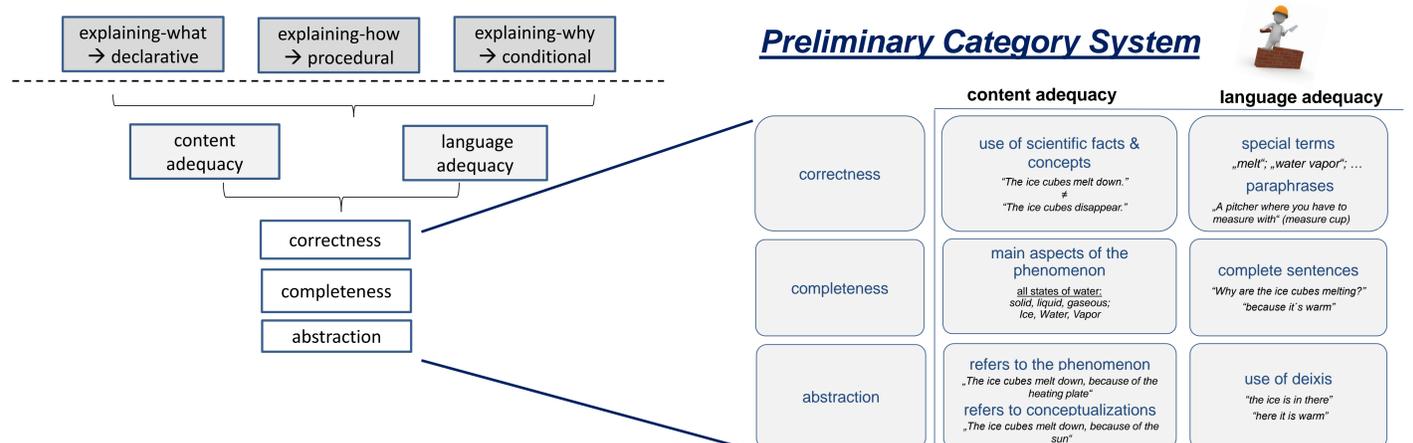


Sample:

- 55 students (from grade 1 through 4)
- 56% female

Content:

- video showing the change of states of water
- evaporation of water on a black board



### Open Questions:

- Is it possible to reduce the difference of authority between student and interviewer by using a hand puppet as a recipient?
- Should the prior knowledge be controlled by using a teaching unit?
- Should further phenomena be considered to control possible content effects?

### Next Steps:

- revision of the interview guideline
- adapt the survey process under consideration of the open questions
- inductive category formation to develop a category system

### References:

Gadow, A. (2016). Bildungssprache in naturwissenschaftlichen Sachunterricht: Beschreiben und Erklären von Kindern mit deutscher und anderer Familiensprache. Studien Deutsch als Fremd- und Zweitsprache: [Educational Language in natural science Sachunterricht: Describing and Explaining with German and other family languages. Study's German as foreign and second language] v.1. Berlin: Erich Schmidt Verlag GmbH & Co.

Gesellschaft für Didaktik des Sachunterrichts (GDSU) (Ed.). (2013). Perspektivrahmen Sachunterricht [Perspectives Framework for General Studies in Primary Education]. Bad Heilbrunn: Klinkhardt.

Klein, J. (2017). Beginnende Argumentier- und Erklär-Kompetenz im Vorschulalter (1,9 - 3,0) Vorformen und Topik. [Initial argumentation and explanatory competence in preschool age (1,9-3,0) Early forms and topics] In Meißner, I., & Wyls, E. L. (Eds.). Stauffenburg Linguistik: Band 93. Begründen - Erklären - Argumentieren. Konzepte und Modellierungen in der Angewandten Linguistik [Justify-Explain-Argue. Concepts and Modellings in Applied Linguistics (pp. 65-88)] Tübingen: Stauffenburg Verlag.

Kuckartz, U. (2012). Qualitative Inhaltsanalyse. Methoden, Praxis, Computerunterstützung [Qualitative Content Analysis. Methods, Practice, Computer support] Weinheim & Basel: Beltz.

Möller, K., Kleickmann, T., & Sodian, B. (2014). Naturwissenschaftlich-technischer Lernbereich [Scientific-technical learning area]. In Einsiedler, W. (Ed.). Handbuch Grundschulpädagogik und Grundschuldidaktik [Handbook primary-school pedagogy and primary-school didactics (pp. 527-535)]. Bad Heilbrunn, Stuttgart: Klinkhardt; UTB.

Röhner, C. (2009). Abschlussbericht: Projekt: Sprachförderung von Migrantenkindern im Kontext frühen naturwissenschaftlich-technischen Lernens [Final report: Project: Language support for migrant children in the context of scientific-technical learning] Available: [https://www.erziehungswissenschaft.uni-wuppertal.de/fileadmin/erziehungswissenschaft/fach\\_paedagogik-der-fruehen-kindheit/Abschlussbericht-Nawiprojekt.pdf](https://www.erziehungswissenschaft.uni-wuppertal.de/fileadmin/erziehungswissenschaft/fach_paedagogik-der-fruehen-kindheit/Abschlussbericht-Nawiprojekt.pdf) [21.6.2018].



Jennifer Krupinski  
University of Duisburg-Essen  
Institut für Sachunterricht  
Schützenbahn 70, 45127 Essen  
E-Mail: jennifer.krupinski@uni-due.de