

Patterns of interaction in classroom dialogues in mathematics class in elementary school

Ann-Christin Beforth, Frank Lipowsky and Elisabeth Rathgeb-Schnierer

University of Kassel, Germany; beforth@uni-kassel.de

Keywords: Classroom dialogue, classroom interaction, interaction patterns, mathematics class, elementary school.

Introduction

Classroom dialogues are fundamental for learning mathematics (Erath et. al, 2021). Warwick and Cook (2019) describe them as multifaceted situations with a wide range of purposes. Depending on the purposes the dialogues can consist of “sharing [...] ideas openly, reasoning using evidence, building on and challenging the ideas of others” (p. 121). Although the manifestations vary due to cultural differences in different countries, consensus emerges on the usefulness of classroom dialogues (Alexander, 2001). This consensus is also reflected in a review paper by Howe and Abedin (2013). Focussing on the interaction patterns in classroom dialogues, they describe the main pattern that has been found in research as a three-step pattern. This pattern of initiation-response-feedback (IRF) is mostly found in plenary situations. Some studies also describe an initiation-response-evaluation (IRE) pattern which can be seen as a subtype of IRF. Often the initiation is started by the teacher by asking a question, then one student answers and the teacher again gives the feedback/evaluation. But there can be diversity in the expression of this implementation. For example, the teacher can open the classroom dialogue by the type of question and allow for different answers from students before feedback follows (Howe & Abedin, 2013). However, actual classroom dialogue, which does not just include IRF/E, “is comparatively rare” (Warwick & Cook, 2019, p. 122).

Although there are already some studies describing the structure of interaction patterns (IRE/IRF) in classroom dialogues, these interaction patterns are often considered separately from the intensity of engagement with the mathematical content. Therefore, describing the structure of these classroom dialogues in plenary situations¹ in elementary school in combination with the intensity of engagement with the mathematical content is a research desideratum that is pursued in this study.

Aim and method of the study

This study aims to approach this desideratum and provides the opportunity to find a link between the interaction patterns in plenary situations and the intensity of engagement with the mathematical content in elementary mathematics class. The data are videos from various elementary school mathematics lessons with arithmetic content from grades one to four in Germany. Each lesson lasts 45 to 60 minutes and includes at least one plenary situation. The data come from a study that has already been completed (18 videos) and one that continues up to this moment (approximately 20 videos).

¹ Plenary situations are settings in which all participants are invited to interact with each other in a classroom dialogue.

In this study, a category system is developed to describe the interaction patterns of classroom dialogues in elementary mathematics class and the mathematical content to be seen in the videos. For the development of the category system, an interplay of a deductive and inductive procedure is used. A few elements from different manuals were used for the deductive base (e.g., Hennessy et al., 2016; Morek et al., 2022). The category system is developed further and supplemented as well as optimized with codes from the coding process of the data from a pilot study. With the detailed category system, coding on different levels is possible. The different levels focus on the teacher's action, the student's action, their interaction, and the mathematical content. The codes can then describe for example the action of asking a question and giving an answer, as well as the way the teacher or the students address one another. Using different sub-codes makes it possible to describe in more detail how the teacher asks the students, and in which way the students react. This system allows then a description of the structure of the classroom dialogue, the mathematical content and how it develops throughout the plenary situation as well as the description of one interaction between for example one student and the teacher. In further data analysis, specific episodes are analysed in more detail to describe the intensity of engagement with the mathematical content and subsequently find correlations between the interaction patterns and the intensity of engagement with the mathematical content.

References

- Alexander, R. J. (2001). Border crossings: Towards a comparative pedagogy. *Comparative Education*, 37(4), 507–523. <https://doi.org/10.1080/03050060120091292>
- Erath, K., Ingram, J., Moschkovich, J., & Prediger, S. (2021). Designing and enacting instruction that enhances language for mathematics learning: a review of the state of development and research. *ZDM Mathematics Education*, 53(2), 245–262. <https://doi.org/10.1007/s11858-020-01213-2>
- Hennessy, S., Rojas-Drummond, S., Higham, R., Torreblanca, O., Barrera, M.J., Marquez, A.M., García Carrión, R., Maine, F., Ríos, R.M. (2016). Developing an analytic coding scheme for classroom dialogue across educational contexts. *Learning, Culture and Social Interaction*, 9, 16–44. <https://doi.org/10.1016/j.lcsi.2015.12.001>
- Howe, C.; Abedin, M. (2013): Classroom dialogue: A systematic review across four decades of research. *Cambridge Journal of Education* 43 (3), 325–356. <https://doi.org/10.1080/0305764X.2013.786024>
- Morek, M., Heller, V., Kinalzik, N., & Schneider, V. (2022). Von der Gesprächsanalyse zur Entwicklung des interaktionssensiblen Kodierinstrumentes ISKODIL. [From conversation analysis to the development of the interaction-sensitive coding instrument ISKODIL.] *Zeitschrift für Sprachlich-Literarisches Lernen und Deutschdidaktik*, 2, 1–29. <https://doi.org/10.46586/SLLD.Z.2022.9608>
- Warwick, P., & Cook, V. (2019). Classroom dialogue. In N. Mercer, R. Wegerif, & L. Major (Eds.), *The Routledge International Handbooks series. The Routledge international handbook of research on dialogic education* (pp. 121–124). Routledge Taylor & Francis Group. <https://doi.org/10.4324/9780429441677>