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Support systems for participation in collective argumentation in inclusive primary mathematics education

Ann-Kristin Tewes¹

¹Leibniz University Hannover, ann-kristin.tewes@ifs.uni-hannover.de

This paper deals with participation in collective argumentation in inclusive mathematics education with a special focus on support systems. Since the ratification of the UN Convention on the Rights of Persons with Disabilities, the diversity of students in German schools is increasing. Different students need different support to participate autonomously in class or in collective argumentations, which can be considered as a prerequisite for mathematical learning. On the basis of an interactionist perspective on learning, the aim is to reconstruct different support systems between students, primary school teachers and special needs education teachers in order to work out the potential effects of these support systems on participation in collective argumentation in everyday inclusive mathematic lessons.

Keywords: inclusion, support systems (MLSS), collective argumentation, participation

Introduction

Inclusion is a central topic in current debates regarding education and school system in Germany. The discussions on inclusion in school have been stimulated by educational policies like the ratification of the UN Convention on the Rights of Persons with Disabilities (in the following CRPD) (UN General Assambly, 2004) and social and demographic changes, e.g. increasing linguistic-cultural differences because of a higher number of children with an immigrant background (Decristan et al., 2017). In addition to the discussions of an inclusive school system the current pedagogical discourse indicates multiple unresolved problems, and there is some criticism of previous approaches dealing with diversity in school, like the homogenisation of learning groups through selection and forms of external differentiation (Trautmann & Wischer, 2011).

In Germany, the school system is characterized by homogenisation. All children from five or six to nine or ten attend primary school after which they are subdivided according to their abilities into an academic high school or middle school. From the middle of the 18th century, a separate school system for children with special educational needs with special needs education teachers has been developed in addition to the regular school system. However, since the ratification of the CRPD, there is a legal right for persons with disabilities of a free choice of school and equal access to an inclusive education system. (CRPD, 2007, article 24 (2)) Countries must ensure that

“Persons with disabilities can access an inclusive, quality and free primary education and secondary education on an equal basis with others in the communities in which they live” (CRPD, 2007, article 24.2).

To realize this right the countries have committed themselves to do everything necessary to ensure that persons with disabilities have equal participation within the regular school system (CRPD, 2007, article 24,2). Specifically, this means that more and more children and young people, who have been taught at special schools so far are enrolled in regular schools (Vock & Gronostaj, 2017). The

fundamental idea of inclusion is that all students can participate equally in school. The diversity of the pupils should be perceived as something positive (Hinz, 2015). The implementation of inclusion requires schools to offer lessons that support and dare all students, regardless of their level of competence (Vock & Gronostaj, 2017). For this to be achieved adequate and new arrangements have to be made within regular schools in order to ensure the educational success of each individual. To comply with the equal participation of each student there is an increasing appointment of special needs education teachers in regular schools.

New discourse on the role of special needs education teachers in Germany

The new field of application of special needs education teachers in regular schools leads to a controversial discourse on the role of special needs education teachers in an inclusive school system in Germany (Lütje-Klose & Neumann, 2015). Are special needs education teachers as well as primary school teachers responsible for all students of the learning group or are they specialists for individual pupils? Through different academic studies special needs education teachers have a different perspective on learning and mathematics education. The training focus of special needs education teachers is more on the individual children, whereas primary school teachers must rather have the entire class in mind. Bock, Siegemund, Nolte, and Ricken (2019) have designed a university course in this context for students of mathematics education and students of special needs education.

“The aim is to sharpen the prospective teacher’s own professional perspective and to learn about the content and perspectives on other disciplines by strengthening and entangling perspectives (Bock et al., 2019).”

The focus of the study is on the differences of *perceptions*, *interpretations*, and *decision-making* of inclusive mathematics learning between the students and how they change during the seminar. The authors found that the students of special needs education focus on the individual child's behavior and needs. The decisions they make relate to the individual. For the students of mathematics education, mathematical content and mathematical thinking are more important, and their decisions are more likely to be made with regard to the entire class. (Bock et al., 2019).

As described above there is an increasing diversity among the students and this leads to a higher variety of professions in the classroom. Due to their different training, the teachers have a different view of learning mathematics, which may also establish different support systems between the pupils, the special education teachers and primary school teachers. The research project presented in this paper aims to provide theoretical considerations for learning mathematics from an interactionist perspective in conjunction with the theory of support systems. The research is guided by the question: *Which support systems develop in the inclusive mathematics classroom between the different teachers and how do they affect the participation possibilities of the students?*

Theoretical background

The theory development of the presented research project is carried out with the help of qualitative research methods. Therefore basic theoretical assumptions about learning in mathematics lessons, which at the same time represent the theoretical framework (Kelle & Kluge, 1999), are presented in the following section. The interactionist view on mathematical learning is based on the idea that the content to be learned or the topic of a lesson is negotiated between the participants of the interaction:

The general assumption of the interaction theory of learning is that learning as a construction of meaning which outlast the situation has its origin within social interaction (Krummheuer, 1992; translated by the author)."

The meaning of things⁶ is thus not derived from the things themselves, but arises from the interaction between persons and is thus a social product. These social and interactive meanings are reinterpreted by each individual and guide the person's actions, but they are also subjects to change in the process itself. From an interactional perspective, learning is thus seen as a social interpretive act in which meanings are constructed through mutual negotiation processes (Blumer, 1969). Miller (1986) also emphasizes the importance of the collective in the learning process. He describes that only in the social group and due to social interaction processes between the individuals of this group, the individual can make fundamental learning steps (Miller, 1986).

One basic idea of the interaction theory of mathematics learning states that the development of topics in the classroom is not predetermined by the teacher, but is negotiated together in an interactive exchange with the children. Based on their experiences and knowledge each individual has its own interpretations of a situation. This leads to a development of preliminary interpretations of the situation which, however, can be rejected or transformed in the process of interaction (Blumer, 1969). The participants attempt to attune these to each other which can lead to a taken-as-shared meaning or working consensus (Goffmann, 1959). The working consensus is a condition, which is created by the members of the interaction and also a basis on which the interaction can be continued. If the taken-as-shared interpretation is repeatedly produced in the interaction, the definitions of the situation can become standardized and routinized, which are then called framings (Krummheuer, 1992; Schütte, Friesen, & Jung, 2019; Jung, 2019). During the interaction the framings between the individuals sometimes do not coincide and thus can often lead to so-called framing differences. Schütte (2014) describes this as the "motor of learning". Through negotiation processes, the individual gains the opportunity to build up new framings and thus gains a new perspective on reality (Schütte, 2014).

Argumentation and participation as substantial concepts for mathematical learning

Collective argumentations are interactive negotiation processes in which, according to Miller (1986), collective solutions for interindividual coordination problems (dissent) are negotiated. However, Krummheuer (1992) describes in this context that for a collective argumentation there has to be no dissent only the common production of a working consensus is important. Collective arguments in the classroom are seen as learning-enabling and learning-conducive interaction processes (Krummheuer, 1992; Miller, 1986; Jung, 2019; Jung & Schütte, 2018). Following this idea, successful mathematical learning processes are manifested in the increasingly autonomous participation in collective argumentations. (Krummheuer, 1992, 2011a).

⁶ "Such things include everything that the human being may note in his world – physical objects, such as trees or chairs; other human beings, such as a mother or a store clerk; categories of human beings, such as friends or enemies; institutions, such as a school or a government; guiding ideals, such as individual independence or honesty; activities of others, such as their commands or requests; and such situations as an individual encounters in his daily life (Blumer, 1969)."

In this regard students have different opportunities for participation in collective argumentations in the mathematics classroom. An individual can assume different status (Fig. 1), like an “author” or a “spokesman”, regarding participation in the interaction which can change frequently. A speaker is called an “author” if he or she is responsible for the content and the formulation of an utterance. If he or she is neither responsible for the content nor for the formulation he or she is called a “relayer”. A Speaker is called a “ghostee” if he or she is responsible for the content of an utterance with using identical formulations of somebody else. If a speaker takes over an idea of somebody else with using his own words, he or she is called a spokesman (Brandt & Höck, 2012; Krummheuer 2011b, 2015). Brandt (2004) describes this as the *swarm of participation* (Brandt, 2004; translated by the author) of an individual. In this context, Brandt (2004) introduces the concept of the *scope for participation*. This term describes under which emergent conditions in the interaction a person can shape their participation in the sense of a participation swarm. Such conditions can be restrictive, so that, for example, a student is offered only certain participation opportunities like a “ghostee”. (Brandt, 2004). Support systems should be seen in this context as a possible condition for improving participation in collective argumentations in inclusive mathematics education. The present study aims to investigate possible effects of support systems on student participation in collective argumentations and therefore the theory of the "Mathematics Learning Support System (MLSS)" (see Krummheuer, 2011a) is to be transferred to inclusive primary school mathematics lessons.

	Responsibility for the content of an utterance	Responsibility for the formulation of an utterance
author	+	+
relayer	-	-
ghostee	+	-
spokesman	-	+

Figure 1- The production design (Krummheuer, 2011b)

Support systems for participation in collective argumentation

To ensure that each individual can participate and becomes more and more autonomous at collective argumentations there are potentially different and variable support systems that emerge within the interaction for each student. According to Bruner (1983) a support system “ [...] frames the interaction of human beings in such a way as to aid the aspirant speaker in mastering the uses of language”. Bruner's research focused on the early language acquisition of children. In this context, he has established the existence of a “Language Acquisition Support System (LASS)” which allows the child to learn how to use the language. The LASS emerges as a format⁷ between a child and his mother. These routine procedures represent the support system through which the child can increasingly participate autonomously in the interaction and become a part of the mother's culture. It can thus be said that a support system structures how the language and interaction affect the child (Bruner, 1983). From an interactionist perspective, support can be located between the participants

⁷ “A format is a standardized, initially microcosmic interaction pattern between an adult and an infant that contains demarcated roles that eventually become reversible.” (Bruner, 1983)

of the interaction. Support is negotiated in the interaction and is not to be seen as an activity of an individual person e.g. the teacher. Utterances and actions are established as a support system, if the child orientate their interpretations on it (Tiedemann, 2012). I follow Bruner and Tiedemann that an increasing autonomy in the interaction within or whereby a support system can be seen as learning. Krummheuer (2011a) dealt with support systems and introduced the term MLSS (Mathematics Learning Support System) into the discussion. The MLSS describes support systems for processes of appropriation of mathematical terms and methods as well as their logical-argumentative anchoring within a mathematical content system. Tiedemann (2012) has transferred the theory of the support systems to early mathematical education, especially to family situations. Subject of the study are mother-child discourses in reading and playing situations in which support systems she called MASS (Mathematics Acquisition Support System) are examined. She reconstructed support systems between mother and child and identified three different types of support: participation, improvement and exploration (Tiedemann, 2013).

Since the establishing and adapting of different support systems could be a high cognitive requirement for students especially for students with special educational needs, the research project would like to examine the support systems in inclusive primary mathematics education and focus on possible differences between primary school- and special needs education teachers. In the following, the planned study design will be presented in order to reconstruct and describe its support systems in inclusive mathematics primary school education.

Methodology and analytical methods

The planned research project can be located in qualitative social research following a reconstructive-interpretative methodology (Bohnsack, 2007). The focus is on everyday teaching situations in inclusive primary school mathematics classroom which will be videotaped and transcribed. The research project follows a broad concept of inclusion: inclusive mathematics education means that all students, with their differences, are recognized and appreciated in the classroom, regardless of whether they need special support or not. To analyze the transcripts concerning the support systems which are developed in the interaction, I follow Tiedemann (2012) in using the (2) support analysis based on the (1) interaction analysis (Schütte, Friesen, & Jung 2019). The interaction analysis was developed in the working group around Bauersfeld and serves the analysis of negotiation processes in mathematics lessons (Bauersfeld, 1995; Krummheuer, 1992; Schütte, 2009; Tiedemann, 2012). After analyzing the data with the interaction analysis, the scenes that prove to be supportive are selected. Then the support systems will be reconstructed which establishes itself between the participants of the interaction. In order to make statements about the increasingly autonomous participation in collective argumentation, the scenes are subjected in a third step to a (3) participation analysis. (Krummheuer & Brandt, 2001). The participation analysis involves two different concepts, the concept of the *recipient design* and the concept of the *production design* (Brandt, 2004 & Krummheuer, 2011b). With the concept of the recipient design the audience and the relationship of different interaction strands in the classroom are worked out. However, the main focus of the study is on the concept of the production design. This concept is related to “[...]any person who is involved in the production of an utterance and that person’s role as he/she participates in this production (Krummheuer, 2011b)”. With the analysis of the production design it is possible to reconstruct the

swarm of participation of a student. The study is applied longitudinally - there are three phases of data collection in which the same students are videotaped over several weeks - so that possible changes can be made visible. By comparing scenes that follow each other in time, a possible increase in autonomy of learners in the participation in collective argumentations through support systems should be reconstructed and described.

With the help of the presented analysis methods the potential effects of the support systems on participation in collective argumentation in everyday inclusive mathematic lessons should be investigated. The project is currently in the process of data collection. At the time of the conference first analysis results can be presented. Based on this empirical data, concepts for primary teacher education and special needs education should be developed as a result of the research project.

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