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ORIGINAL ARTICLE

# Students' and teachers' focus of attention in classroom interaction — subtle sources for the reproduction of social disparities

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**Abstract** Mathematics classroom interaction has often been described as an important context for involving all students. However, this article shows that teacher-student-interaction is still not really in the focus of teachers' attention. Based on classroom video studies, some authors hypothesize that the implicitness of establishing norms and practices is, among others, an obstacle for students with low socio-economic status. The article intends to put this hypothesis into perspective by investigating teachers' and students' focus of attention on classroom interaction in video-stimulated group discussions (six discussions with 5–6 students, four discussions with 5–9 teachers). The data analysis used inductive procedures of category development, frequency analysis, and deeper qualitative analysis of the transcripts. For students' focus of attention, differential patterns could be extrapolated: Whereas students of high socio-economic status seem to be more attentive to teacher's contextual expectations, the students of low socio-economic status seem to be more focused on general norms without taking into

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account contextual expectations. For the teachers, the analysis shows that interactive mechanisms of teacher-student exchanges in classrooms are usually not in the teachers' focus of attention. Additionally, the teachers address, but rarely problematize the implicitness by which norms and practices are established. Together with the differential findings on students' attention, these findings are discussed with respect to equity concerns and consequences for professional development of teachers.

From constructivist and cultural-historical points of view, learning in school context can be conceptualized as "successful" participation in discourses which at best involve mathematically rich processes of negotiation of meaning (Sfard 2008; Krummheuer 2011). However, various recent empirical studies on classroom interaction showed unequal participation and learning opportunities for students of marginalized backgrounds (DIME 2007; Jorgensen 2010; Herbel-Eisenmann et al. 2012; Schütte and Kaiser 2011; Straehler-Pohl et al. 2014). There are several reasons for the unequal participation, including students' diverse discourse competencies (Herbel-Eisenmann et al. 2012), subtle mechanisms of positioning (Tait-McCutcheon and Loveridge 2016) or the lack of adaptivity of teachers' demands to the heterogeneous mathematics competencies (DIME 2007).

Whereas many studies focused on background factors, such as indigenous background, language, and immigrant status (e.g., Jorgenson 2010; Marshman et al. 2015), others studied marginalization by socio-economic background (e.g., DIME 2007; Perry et al. 2000). Especially, studies from sociological perspectives focused on the unequally distributed abilities to recognize and realize the socio-mathematical norms underlying the discourse practices in the classroom (Gellert and Hümmer 2008; Schütte and Kaiser 2011; Straehler-Pohl et al. 2014). In this context, the implicitness of interaction has been hypothesized to be a major source for the reproduction of social disparities in classroom interactions (Morais 2002; Bernstein 2000).

In this article, we intend to put this hypothesis into a wider perspective, not by a further analysis *of* classroom interactions, but by investigating students' and teachers' focus of attention *on* classroom interaction while participating in video-stimulated group discussions. Based on the theoretical construct of teachers' professional vision, we inductively developed categories to trace what teachers and students of different backgrounds consider as relevant while watching selected video clips of mathematics classrooms. A frequency analysis shows interesting matches and mismatches.

The article follows a classical outline, first presenting theoretical and empirical starting points on implicit classroom interaction and the theoretical constructs which orient the research project, then the methods and methodology of the qualitative and quantitative analysis. Selected findings from students' group discussions are presented, followed by corresponding findings from teachers' group discussions, and their precarious complementarity is discussed together with the practical consequences for classrooms and teachers' professional development.

# Theoretical and empirical starting points for problematizing classroom interaction and teachers' and students' focus of attention

## Interactionist perspectives on classroom interaction and implicitness

Interactionist empirical research on classroom interaction that is grounded in socio-constructivist conceptualizations of "leaning as participation" (Sfard 2008) provided empirical insights on how learning opportunities in mathematics classrooms are created or restricted in mathematical discourses (starting with early approaches and findings by Cobb and Bauersfeld 1995; Cobb and Yackel 1998; recently by Krummheuer 2011). According to these studies, learning opportunities are established when students can actively participate in the negotiation of meanings, when for example the teachers offer them slots to express their ideas and support their realization. The best learning opportunities are created by mathematically rich concepts and practices, challenging students according to their capabilities (Boaler 2002). Not excluding any students from this participation in classroom interaction is crucial for achieving equity. Following these considerations, teachers' reflective focus of attention to interaction and their special role within patterns of interaction is discussed as a crucial key for reaching this goal (DIME 2007).

Teachers' special role becomes obvious in empirically identified patterns of whole class interactions like the I-R-E-pattern (Initiation, Response, and Evaluation, Mehan 1979; O'Connor and Michaels 1993). Classically, in the course of such patterns teachers initiate the discourse by questions, students give responses and teachers evaluate the responses according to their match to their expectations in line with classroom norms and practices. Though, on one hand, the teacher "establishes" and "controls" discourse by the initiation and evaluation. On the other hand, the initiation and evaluation allows the students to "classify" their answers and develop their ideas according to the norms of the discourse.

Twenty years ago, conceptually unproductive interaction patterns were identified such as the funnel pattern in which a smooth superficial interaction substitutes deep mathematical discourses (Cobb and Bauersfeld 1995; Voigt 1995). Recent studies show that these patterns are still widespread, and then only a few opportunities for negotiating meanings are provided (e.g., Jablonka 2003; Erath, Prediger, Quasthoff, and Heller: Explaining to learn mathematics and learning to explain. Discourse competence as important part of academic language proficiency in mathematics classrooms, submitted). In other classrooms, however, the often described narrow I-R-E-pattern seems to have been substituted by teachers' more open initiation (I) of questions and more implicit evaluations (E) of the students' responses (R), which many teachers consider as more face-saving (Schütte and Kaiser 2011). These findings made obvious that different grades of explicitness of feedback in the interaction can be reconstructed within classrooms (Morgan et al. 2002; Bourne 2003), and studies stress that different learners show a different readiness to interpret the discursive demands (Gellert and Hümmer 2008).

In order to empower teachers to perceive these facts as a problem for learning and modify these interaction patterns in a fruitful way, the teachers' perspectives on classroom interaction must be understood more deeply (Vogler and Prediger 2017). This article intends to contribute to this program with respect to the equity concerns connected to limited awareness about mechanisms of classroom interaction.

## Accessibility of classroom interaction and students' socio-economic status

Mathematics education researchers have connected the sometimes limited accessibility of classroom interaction to the pertinently observed implicitness of teachers' expectations that are included in moves for initiation (I) and evaluations (E) within the classroom interactions, especially with respect to discourse practices like explaining, arguing etc. (cf. Herbel-Eisenmann et al. 2012). Also, linguistic discourse analytic research on classroom interaction has shown that especially the negotiation of discursive demands and expectations about using specific genres in specific contexts (contextualization) together with specific patterns of presentation (textualization) is complex, subtle, and often stays rather implicit in most classroom interactions (Heller and Morek 2015).

Gellert and Hümmer (2008) as well as Schütte and Kaiser (2011) argue that findings on limited accessibility due to implicitness of norms might be an explanation of inequity and relate it to Bernsteins' (2000) sociological construct of implicit pedagogy. Research in the tradition of Bernstein's (2000) sociological approach assumes that recognition of discursive demands and expectations are connected to the students' socio-economic status: Socially privileged students seem to be more acquainted to "decode" implicit norms and practices according to the recognition and realization rules than underprivileged students. However, most research approaches relying on these theoretically derived categories focus on phenomena other than classroom interaction (Bernstein 2000; Sertl and Leufer 2012), only a few studies focus on classroom interaction (Morais 2002; Straehler-Pohl et al. 2014), and even fewer on students' and teachers' reflection of classroom interaction.

Sociolinguistic studies in a discourse analytic framework found the requirement of contextualization and textualization for successful participation in discourse practices inside and outside classrooms (Heller and Morek 2015). In this framework, students' language proficiency and their abilities to decode the contextual expectations are considered as tightly connected.

All these studies from very different academic traditions give theoretical and empirical indications that the implicitness of classroom norms and practices might create disadvantages especially for socially underprivileged students. However, no empirical evidence exists so far that socially underprivileged students really *perceive* the classroom interactions differently than their socially privileged peers. We, therefore, extend the research on students' perceptions of classrooms (Hunter 2016) and formulate the following first research questions:

Q1 What do students in grade 5 focus on when they observe and discuss mathematics classroom interaction and how do they address norms, expectations, and discourse practices?

Q2 To what extend and along which lines does the focus of attention on classroom interaction differ between socially privileged and underprivileged students?

## Teachers' professional vision of classroom interaction

Whereas no research on *students'* different foci of attention is known to the authors, *teachers'* noticing in classroom interaction has been in the center of

mathematics education research in the past few years (Skilling et al. 2016; Sherin et al. 2011). Whereas the construct of teachers' noticing was first concentrated on student thinking (e.g., Carpenter et al. 1988, Empson and Jacobs 2008), it increasingly covered the whole complexity of classrooms (Sherin et al. 2011), including in principle classroom interaction. *Professional vision* is the theoretical construct which Sherin (2007) introduced into mathematics education research in order to capture what teachers focus on selectively while observing classroom interactions. It grasps teachers' focus of attention and relates it to teachers' actions as knowledge-based consequences of what was perceived:

> "For teachers, professional vision involves the ability to make sense of what is happening in their classrooms. […] As a teacher observes a classroom, he or she is constantly reasoning about what is seen, and this drives where and how the teacher will look in the future. … [I…] describe professional vision as consisting of two distinct subprocesses; (a) selective attention, and (b) knowledge-based reasoning." (Sherin 2007, p. 23)

Video-stimulated group discussions (in so-called video clubs) have been shown to be not only an interesting opportunity for professional development, but also a suitable research approach in order to investigate teachers' professional visions. Interestingly, Sherin reports that during the first two group discussions, the teachers mainly focused on pedagogical issues in the teachers' actions, whereas the students and the interaction with them was only focused from the third meeting on. Leading to the assumption that attention can be shifted by video discussions without stimuli over time.

We follow this line of research and focus on video-stimuli in which the implicitness of norms and expectations in teachers' practices plays a role. In analogy with the students, we ask the following research questions:

Q3   What do teachers focus on when they observe and discuss mathematics classroom interaction, and how do they address norms, expectations and discourse practices in their professional vision?
Q4   To what extent and along which lines does the focus of attention and the topics set as relevant about classroom interaction differ between the students and teachers?
Q5   What kinds of knowledge based reasoning do teachers activate with respect to the implicitness in classroom interaction?

## Methods and methodology

The group discussions were initiated and analyzed within the larger project InterPass* with its three studies, *InterPass-classroom*, *InterPass-student group discussions*, and *InterPass-teacher group discussions*. In the InterPass-classroom-study, 120 h of video in five classrooms were video-recorded in the grade 5 math and German language lessons (Erath, Prediger, Quasthoff, and Heller: Explaining to learn mathematics and learning to explain. Discourse competence as important part of academic language

proficiency in mathematics classrooms, submitted). Here, we present the group discussions which qualitatively investigated with respect to the focus of attention and interpretations of teachers and students when discussing brief video clips on classroom interactions from this data corpus.

## Methodological choices

Teachers' and students' selective focus of attention on complex and subtle phenomena of classroom interaction are not easy to investigate, as participants are only partially aware of them and require adequate social stimuli for expressing them explicitly. That is why data gathering, e.g., in questionnaires would not have been possible. Previous research (reported in Teachers' professional vision of classroom interaction) shows that video-stimulated group discussions are an appropriate method of data gathering, for example in Sherin's (2007) investigation of teachers' professional vision by group discussions. The thorough methodological considerations by Bohnsack (2009) on group discussion as a methodological approach in qualitative social science research confirms that negotiation processes in group discussions can provide insights not only in individual preferences but also in joint relevances, collective orientations in a *professional collective*. Beyond detecting the "selective attention" (Sherin 2007), the collective negotiations in group discussions can also provide insights into the knowledge-based reasoning which is based on these foci (Sherin 2007).

   Following these general methodological lines, we assume that students also have a kind of "professional" collective focus of attention established in 4 years of shared institutional experiences in school, for which Bauersfeld's (1983) construct of "domains of subjective experiences" provides the theoretical base.

## Methods for data gathering

**Overview and data corpus** To gather data about teachers' and students' perspectives on mathematics classroom interaction, we conducted six group discussions with 5–6 students each (in total $n = 34$ students), and four group discussions with 5–9 teachers each (in total $n = 27$ teachers). The video data corpus of 540 min videographed student discussions and 435 min of teacher discussions was completely transcribed.

**Sampling for students' group discussion** The 34 students from grade 5 (10–11 years old) did not participate in the *InterPass-classroom study* in order to avoid too personal an involvement and extract a more general pattern of students' noticing of new situations.

   They were chosen in schools with contrasting catchment areas (cf. Table 1). Four groups were sampled from schools in urban areas of low socio-economic status (abbreviated low SES groups). Some weeks before, the students were tracked to schools with different achievement levels. To represent the nationwide pattern of social selection in achievement levels in the sample, the schools with low SES catchment areas were chosen as comprehensive schools (comprising all achievement levels), whereas the schools in high SES catchment

**Table 1** Sampling of student groups

| Group | School catchment area | Achievement level of school | Students' language background | Number of students |
|---|---|---|---|---|
| HJ1 | high SES | Gymnasium | mono- and multilinguals | 6 |
| HJ2 | high SES | Gymnasium | multilinguals | 6 |
| LJ3 | low SES | Comprehensive school | mono- and multilinguals | 6 |
| LJ4 | low SES | Comprehensive school | multilinguals | 5 |
| LM5 | low SES | Comprehensive school | mono- and multilinguals | 6 |
| LM6 | low SES | Comprehensive school | multilinguals | 5 |

areas were chosen as Gymnasium (i.e., schools for the higher achieving 50% of students).

**Sampling for teachers' group discussions** To avoid too personal an involvement, the 27 teachers also did not participate in the *InterPass-classroom study*, but were selected to have similar professional backgrounds as the teachers in the classroom study with respect to teaching experience in grade 5, subject specialization in German language or mathematics, type and catchment areas of the schools.

**Video-stimuli** The video-stimuli for the group discussions consisted of five video-clips from the InterPass-classroom-study. The video-clips last 1–4 min each and were chosen to show key incidents on interaction. The video-clips were supported by transcripts of the interactions. Beyond the clips, only minimal stimulation was given, and the group discussion was framed an opinion-forming process on classroom interactions.

The three episodes from the group discussions that will be presented in the following section refer to a video clip in which a class of fifth graders and their teacher work on explaining the procedure of rounding, starting from the concrete task of how to round 63 to 60 (more complete transcript and analysis in Prediger and Erath 2014).

**Transcript for the Video Clip of 'Kostas and rounding 63'**

1 Teacher     What is 63 approximately, how can we you round that? [1]
2 Kostas      60
3 Teacher     [*skeptically*] 60?
4 Students     [*shout different answers*]
5 Teacher     [*to the class*] No?
6 Students     [*shouting in parallel*] No! Yes!
7 Teacher     Hm, LOOK. I'm WRITING it down [*completes the blackboard entry "63≈" by "60"*], Kostas, and now YOU convince us, why the 60 can stand there and why this is CORRECT.
8 Kostas      °hhh [*articulated clearing his throat*] Well, if you are rounding DOWN the 63 on TENS; then it comes, it gets, there must be ALWAYS a zero at the end, it MUST be.

...

| 12 Kostas | And then there, if you take AWAY the three and shift the ZERO to it. So, you could DO that, but actually it's WRONG. You just have to round down and nea.. nearest number with a ZERO you have to write there. |
|---|---|
| … | |
| 14 Teacher | KAY, I think I already UNDERSTOOD SOME parts, of what you wanted to explain; so FIRST of all I filtered OUT, you rounded on TENS; what does that mean HERE. If you are rounding on TENS, what ARE the TENS here actually? Can you show that simply once in the front, Kostas? I am not completely sure, if you DID round on tens. |
| 15 Kostas | Well, THIS. [points to the 6 in 63 and 60] |
| 16 Teacher | THESE are the tens; OKAY; OKAY; these are the tens; WELL. […] |
| … | |
| 20 Teacher | […] and you already implied WHY; but do any of you know a RULE, HOW one has to proceed here, and when one here, when the ten stays the SAME? In this case, and the place BEHIND, which is rounded, goes to ZERO? Ha; [4.5 sec. break] Katja. |
| 21 Katja | With zero one two three FOUR you are rounding down and with five six seven eight NINE you are rounding (up). [3.5 sec. break] |
| 22 Teacher | Did EVERYBODY understand that? |

The video-clip is an interesting stimulus because Kostas describes the rounding rule in a conceptual way, referring to the visualization of rounding as going to the next multiple of ten on the number line. However, his style of explanation is full of hesitation phenomena and difficult to understand (#8 to 12). The teacher disapproves of Kostas' utterance as incomplete by calling him to the blackboard without explicitly explaining why (#14). Another student, Katja, gives a purely procedural justification, referring to the procedural rule of rounding according to the last digit (#21). The feedback she gets is still quite implicit: The teacher underlines the relevance of Katja's answer with the phrase "Did everybody understand that?" (#22).

This video clip was chosen as it specifically invites discussing different ways of explaining (e.g., in this classroom, procedural explanations seem to be more valued than conceptual explanations), features of the interactive sequencing as well as the degrees of implicitness in teachers' feedback. However, as the researcher did not influence the dynamics of the group discussions, the students' and teachers' foci of attention are of course much wider.

## Methods for data analysis

The data analysis follows a qualitative interpretative research paradigm that focuses on negotioated themes of interactions within the group discussions to identify themes of the knowledge based reasoning (Cobb and Bauersfeld 1995; Krummheuer 2011). To extrapolate teachers' and students' collective foci of attention when discussing different video stimuli, we additionally applied Mayring's (2015) methods of qualitative content analysis with *inductive category development* for the transcripts of teachers' group

discussions. The categories were then transferred and adapted to students' group discussions and unified in a common frame.

**Step 1 – Reconstructing addressed topics.** This step follows the methodological assumption that the teachers' professional focus of attention can be captured by the negotiated themes, which are implicitly or explicitly addressed in the video-stimulated group discussion (Sherin 2007; Bohnsack 2009). Thus, the qualitative sequential data analysis of the transcripts started with extrapolating the themes discussed by the teachers. For this analysis, the transcripts were segmented into units of interaction where teachers negotiated a thematically coherent theme. For this procedure, we used interactionist approaches (Krummheuer 2011). All these units of interactions were characterized by the addressed *topics set as relevant* by the collective discussion.

**Step 2 – Inductively developing categories for a coding scheme.** By iterative cycles of analysis, the extrapolated topics were repeatedly compared across the four teachers' group discussion in order to systematize the topics into well-defined categories (cf. Table 2). When transferring the categories to the students' group discussions, some additional subcategories were identified and inserted in the common framework so that the categories allowed comparison on the level of main categories.

**Step 3 – Coding all the data.** The coding scheme was applied to the entire data set of 769 pages of transcripts of the teacher and later the student group discussions. The aim of this step was to (1) annotate scenes relevant for a deeper qualitative analysis (in step 5), and (2) prepare the identification of repeating pattern by frequency analysis (in step 4). Interrater reliability was assured by double coding of all material and concerted clarification of all moments of doubt. Independent re-coding of parts of the data achieved interrater reliabilities of $k > 0.75$ for all main categories.

**Step 4 – Frequency analysis for overviews and group comparisons.** To gain an overview on the complete material, the frequencies of addressed topics were counted and put into relation. The frequency analysis is reported based on counting turns in the transcript (note that the counting of alternative units like interaction units or lines in the transcripts provided the same pattern). The groups' *focus of attention was then operationalized by the percentages of turns addressing different topics*. This operationalization allows us to compare teachers and different groups of students. Although the frequencies and percentages must be interpreted cautiously as the focus is partly affected by the choice of video clips, the comparison of different groups on the basis of the same stimuli offers interesting insights.

**Step 5 – Deeper analysis of selected excerpts.** The coding also allowed us to systematically select those parts of the transcripts for which a deeper sequential analysis was conducted. This deeper analysis allowed us to provide a contextual understanding into phenomena underlying the quantitative findings so that we do not only report frequencies but patterns which are crucial in the detailed analysis as well.

References to the categories of the coding scheme in the transcript analysis are marked by ||category||.

**Table 2** Inductively developed categories for addressed topics in the teachers' and students' group discussions (here: simplified scheme)

| Category of addressed topics | Explanation |
| --- | --- |
| Focus on students | |
| Content and style of students' utterances (without interaction context) | Description or evaluation of students' utterances (without taking into account the teachers' question before), e.g., "The student explains rounding by a mental image." |
| Language aspects of students' utterances | Description or evaluation of students' utterances with respect to language, e.g., "Kostas' stammering is not elaborate." |
| Categorization of students or their pm-knowledge | Individual or social categorizations, e.g., "These kids from weak families cannot accept discipline" or assumptions on previously learned topics, e.g. "They have not learnt that in primary school." |
| Focus on teacher | |
| Content and style of teacher's actions and utterances (without interaction context) | Descriptions or evaluation of teachers' utterances without referring to previous students' utterances or reactions, e.g. "Her message corresponds to the gestures." |
| Didactical aspects of teacher's actions and utterances | Descriptions or evaluation of, e.g. "He wants to hear the procedural rule", "the task is underdetermined for his goals" |
| Pedagogical aspects of teacher's actions and utterances | Descriptions or evaluation of pedagogical aspects like classroom management or teachers' professional identity, e.g., "All teachers know that ..." or "This noise is incredible" |
| Focus on interaction | |
| Aspects of interactional relatedness or co-construction | Descriptions or evaluation of the interactional relatedness of students and teachers, e.g., in IRE sequences (item-response-evaluation) or simple feedback, e.g., "He does not mention if this was correct or not", "The student say this because they misunderstood the question" |
| Focus on content | |
| Content-related aspects | Clarification of the mathematical content of a discourse or task |

## Empirical findings on students' perceptions on classroom interaction

The presentation of empirical findings starts with two typical excerpts of student discussions which reveal big differences (in the first subsection). These differences can be embedded in the larger pictures of the frequency analysis (in the second subsection).

### Two typical cases of moments in students' group discussions

*Episode 1 from group discussion HJ1: students with high socio-economic status*

The student group discussion HJ1 is held with six 5th graders from a school in a socially privileged urban area (with high socio-economic status, abbreviated SES). Uli,

Pian, Zeki, Ulf, Markus, und Daniel watch and discuss the video clip of 'Kostas and rounding 63'.

When the video is stopped right after Kostas' contribution, before the teacher's evaluation, the boys comment on Kostas' ideas and his stammering presentation, but label him as successful: "I think, he [Kostas] is really good in math." in #322. This was coded by the category ||Categorization of students||. When the teacher in the video clip marks the answer as incomplete, Ulf and Zeki assume that the teacher also values Kostas' answer, but wants him to explain on the blackboard in order to also include the other children:

| | | |
|---|---|---|
| 332 | Zeki | And he had to show it at the BLACKboard? |
| 333 | | But I BELIEVE (.) the teacher actually knew what he meant. (-) |
| 334 | | He simply wanted that the (.) students ALSO know what that is. |
| 335 | | for that they (.) THUS also learn. (2.0) |

With these contributions, Zeki marks that the teachers' utterances can be interpreted with respect to his didactical considerations to make explicit Kosta's idea for all students (coded as ||Didactical aspects of teacher's utterances||). Thus, it is not only the discursive demand for the boy Kostas that Zeki mentioned, it is also the function of the demanded explanation to include the other learners that he elaborates in his contribution.

In the further discussion, the children start to discuss the teachers' role as moderator and criticize that he does not activate all students to participate:

| | | |
|---|---|---|
| 405 | Zeki | Well, he should give the students an IDEA and say if you can also round up, or something. |
| 406 | Uli | YES, but not only stand AROUND, |
| 407 | | yes. |
| 408 | Zeki | Because, ehm, OUR teachers always say that? |

Zeki compares the teacher in the video clip with his own teachers and criticizes him as being not active enough (#405). But the discussion between Zeki and Uli may not only be understood as a demand for Mr. Maler to be more forthright concerning the negotiated topic. Furthermore, Zeki formulates a device for the teacher to be more active to give a more explicit idea of the problem (#406–407). The negotiation, therefore, can be understood as a didactical recommendation to not only reduce implicitness, but not avoid it. In the later discussion both students refer to their own experiences in classrooms where they know the teachers' expectations to underline the given recommendation.

When Zeki and Uli comment on the teachers' actions (coded by ||Content and style of teacher's utterances||, they refer to their own experiences with their teacher who seems to be more forthright in his expectations, which implies that they consider it as necessary for students to be aware of teachers' expectations and didactical plans (coded by ||Didactical aspects of teacher's actions|| and also ||Interactional aspects||).

The students also put a ||Focus on the students|| in the video and evaluate the 'fitting' of their contribution to the teacher's goals of the lesson: Having watched the video clip

till the end of Katja's positive evaluation, the boys discuss Kostas' answer with respect to the lesson goal:

| | | |
|---|---|---|
| 504 | Zeki | But I find that Kostas' explanation was actually not what the teacher had asked. |
| 505 | | He had not asked whether one can round it up. [*3 sec break*] |
| 506 | | Because it only WAS. |
| 507 | | Kosta believed he shall only say the RESULT. |
| 508 | | [*break*]. |
| 509 | Uli | And, this, ehm, KATJA? |
| 510 | | She has, ehm, also said the WAY of solution. |
| 511 | | Zero, one, two, three, FOUR? |
| 512 | | You round down. |
| 513 | | And for FIVE, six, seven, eight, nine? |
| 514 | | you round UP. |
| 515 | | That is a bit the way of solution. |
| 516 | Zeki | Well, she has explained how to, ehm, how to solve the task quickly. |

When Zeki and Uli compare Kostas' and Katja's answers, they emphasize that Katja also presented the way to reach the solution whereas Kostas presents only one result (in #507, #510, #515). This was coded by ||Content and style of students' utterances||. Disregarding Kostas' further explanations of his way on the number line, they construct this difference to explain why Kostas has not met the teacher's expectations and, hence, refer to ||Interactional aspects||. The additional emphasis on Katja's way being "quick" (#516) allows us to reconstruct two characteristic norms of mathematics classrooms, against which Zeki and Uli evaluate Katja's answer:

- Answers should always be complete and contain the way to reach the solution, not only the result.
- Answers should contain not just any way to reach the solution, but a most direct, "quick" one.

Hence, both students could interpret discursive demands concerning the presentation of topics in Mr. Maler's classroom and compare these requirements with their own experiences and their teachers' actions in the classroom.

*Episode 2 from group discussion LM6: students with low socio-economic status*

Episode 2 on the same video clip offers an interesting and typical contrast. The group discussion with group LM6 was conducted with five girls from a school in a low SES urban area. Canel, Fadwa, Tijen, Pamuk, and Tilbe discuss Kostas' explanation only when prompted to it by the researcher.

| | | |
|---|---|---|
| 397 | Canel | EH? |
| 398 | | That is completely ILLOGICAL. |
| 399-402 | | [... reads from the transcript of the videoclip] |

404 Pamuk   He says it is wrong.
405            but says it NEVERTHELESS.

Canel calls Kostas' answer "not logical" and justifies this evaluation by reading the transcript of the video clip, in which Kostas says first that his ideas are wrong, then corrects himself with a good idea. Pamuk confirms Canel's evaluation (coded by ||Language aspects of students' utterances||) and gives — for the first time — a reason for the missing logic (#404–405). Pamuk's evaluation of Kostas' apparent inconsistency shows that the style and language are taken here as more important than the content.

    The researcher constructs the relation between Kostas' explanation and the teacher's answer by asking how the teacher likes Kostas' answer:

431 Researcher   Yes, how does the teacher like the explanation of Kostas?
432 Tilbe        Bad.
433 Tijen        He
434              no, the teachers has INDEED understood.
435              But he does not know what he meant. [*5 sec. break*]
436 Researcher   [*to Tilbe, silently*] Why is it bad?
437 Tilbe        [*shakes her head*] Just like that.
438 Canel        Actually, all is so much not logical here. [*break*]
439              Can't we watch something else?

Without additional prompting, this group of students did not put any ||focus on the teacher|| nor on any ||interactional aspects||. The girls react in very different ways: Tilbe states a negative evaluation without any justification in #432. Even when the researcher motivates her to explain her interpretation (#436), she does not find language for justifying her interpretation (#437). Tijen gives a contradictory interpretation of the teacher's evaluation (#433–435), perhaps meaning that the teacher understood Kostas acoustically without understanding the content. Canel tries to stop the discussion about Kostas by hinting again to his answer being "illogical" (#438–439) without explicit reference to norms which underlie "logical".

*Comparing the episodes*

These two episodes exemplify students' diverse perspectives: Group HJ1 in episode 1 from a Gymnasium in a high SES urban area focuses on the teacher and his expectations. They evaluate Kostas' and Katja's answer against the background of assumed norms, prioritizing the so-called explanation of a way of solution against the so-called simple result. This group succeeds in making sense of the teacher's reactions by their interpretation. In this way, they evaluate students' answers against the background of assumed teacher's intentions and norms, contextualize the interactions in relation to typical patterns of the classroom culture, and even evaluate the teacher's actions with reference to their perspectives on good teaching. Summing up, these students

- interpret the teacher's didactical intentions
- evaluate students' utterances in their interactional context in relation to the teacher's questions

- evaluate the teacher's practices by comparing it to their own experiences with teachers

In these considerations, they rarely question implicitness as such, but ask for more thematic 'tips' for helping all learners to participate. The group engages in a joint process of interpreting the implicitly coded demands and to speculate about the intentions of the teacher.

Group LM6 in episode 2 from a low SES urban area intensively engages in making sense of the videotaped classroom phenomena. They have a very clear view on Kostas' discursive weaknesses ("illogical" explanation). However, their focus of attention is strikingly different to the first group: They mainly focus on the ‖students' utterances‖, largely without taking into account the interplay of student and teacher. The interactive mechanisms as such and the implicitness of the discourse is — as opposed to the HJ1 group — not a topic for that discussion group. Even after being prompted with respect to the teacher's evaluation, they do not really refer to ‖teacher's didactical intentions‖ or ‖interactive mechanisms‖ but evaluate more against general, not context-specific norms such as discursive failure.

Even if we cannot be sure to which degree the discussion is shaped simply by the students' limited discursive and especially argumentative competence (Heller and Morek 2015), this analysis gives some indications which support the theoretical assumption that the students of group LM6 might have greater difficulties participating in their own classrooms according to the established norms. However, this assumption must be sharpened conceptually: the students of group LM6 mainly have difficulties *when these classroom norms deviate from the everyday norms* (a problem of transition between contexts, cf. Bishop 2002). For example, if they originate from teachers' decisions due to his intended didactical pathways (like asking Kostas to justify), they do not recognize that move as a specific demand of *classroom* discourse. Following that interpretation, these students seem to have less routine in decoding contextual expectations being determined by teachers' steering pathways, even if they are aware of general everyday norms and evaluate students' utterances beyond this background. Instead of noticing the demands for performance of the specific moment, they seem to be focused on general discursive requirements that concern, e.g., the adequacy of vocabulary.

Following the in-depth analysis of prototypical cases, a frequency analysis of all topics addressed is presented in order to show the distribution, even if 540 min of video data of $n = 34$ students still do not allow for statistical generalizability.

**Pattern in the focus of attention for students of high and low SES urban areas**

To answer research questions Q1 and Q2, all student group discussions were analyzed according to the categories in Table 2 for capturing the addressed topics in the group discussion. The turns of the transcripts were counted with respect to the addressed topics for the frequency analysis. The percentages of addressed topics provide the quantitative operationalization of the student groups' joint focus of attention.

To compare the student groups of schools in high SES urban areas (two groups in the sample, abbreviated as high SES groups) and in low SES urban areas (four groups

**Table 3** Differences in focus of attention of student groups from low and high SES areas — frequency analysis of assignments of addressed topics in turns of the transcripts

| Category of addressed topics | Percentages of turns addressing a topic | |
| --- | --- | --- |
| | in low SES groups | in high SES groups |
| Focus on Students | | |
| ▪ Content and style of students' utterances (without interaction context) | 26.9 % | 18.0 % |
| ▪ Language aspects of students' utterances | 11.4 % | 11.0 % |
| ▪ Categorization of students or their pre-knowledge | 12.2 % | 13.7 % |
| Focus on Teacher | | |
| ▪ Content and style of teacher's utterances (without interaction context) | 9.5 % | 15.4 % |
| ▪ Didactical aspects of teacher's actions and utterances | 8.2 % | 19.8 % |
| ▪ Pedagogical aspects of teacher's actions and utterances | 9.1 % | 7.2 % |
| Focus on Interaction | | |
| ▪ Aspects of interactional relatedness or co-construction (e.g. feedback) | 8.2 % | 9.5 % |
| Focus on Content | | |
| Content-related aspects (e.g. clarifying the math itself) | 14.3 % | 5.3 % |
| **All category assignments to turns (some turns being categorized twice)** | 100 % (= 3136 ) | 100 % (= 1502 ) |

in the sample, abbreviated as low SES groups), their frequencies were summed up and are presented in Table 3.

The frequencies reported in Table 3 show that the groups share important parts of the focus of attention, especially in the frequency of addressed ‖interactional aspects‖ which has a similar rate for low and high SES groups (8.2% compared to 9.5%), ‖language aspects‖ with 11.4% and 11% as well as ‖categorizations‖ with 12.2% and 13.7%. Also, the category of ‖pedagogical aspects of teachers' actions‖ is similar with 9.1% and 7.2%. All these addressed topics seem to have a similar importance in the focus of attention for all students.

Important differences appear in the ‖content-related aspects‖ where the low SES groups spent many more turns (14.3% compared to 5.3%) than the high SES groups. The more thorough analysis in the transcripts shows that these differences can be traced back to a higher need of clarifying the content in the videos. It is also evidence for a serious interest of the low SES groups in the videos and a high engagement not to stay on the surface. This can be seen as an indicator for resilience of the findings from the group discussions.

The differences in the focus on ‖content and style of students' utterances‖ with 26.9% compared to 18.0% and in the focus on ‖didactical aspects of teacher's utterances‖ with 8.2% to 19.8% and ‖content and style of teacher's utterances‖ with 9.5% to 15.4% are most striking for the research questions of this article:

The graphical summary in Fig. 1 shows that not only in episode 2, but across all the video material, the focus of attention of low SES groups is much more student-centered
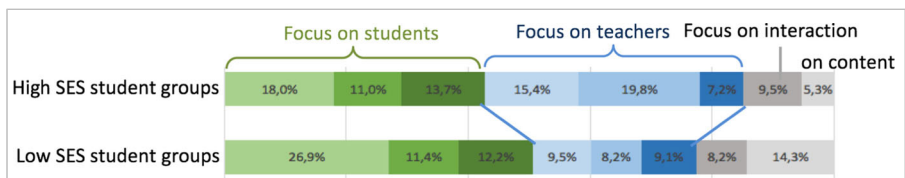


**Fig. 1** Comparison of foci of attention between student groups (colors of categories correspond to Table 3)

and less teacher-centered than the focus of attention in the high SES groups. The specific aspect of the teacher-centeredness of high SES groups has been illuminated by episode 1. Not only in episode 1 but across all the data material, the two high SES groups focus on the teacher's didactical intentions which is a very specific feature of the school context.

## Discussion of the findings on students' differential foci

The comparison of episodes 1 and 2 as well as the overview on the complete categorized data in Table 3 and Fig. 1 shows that the students in the different groups have different foci of attention, especially with respect to the ∥teacher's didactical intentions∥.

However, to interpret these results as being in line with the hypothesis of different competencies of decoding expectations and norms, it is important not only to consider the quantitative differences in focus on teacher and on students. Episode 2 shows that the low SES group also tried to evaluate the students in the video clip against the background of their interpretation of general expectations. Furthermore, in episode 1, the high SES group did not only focus more on the teacher and the implicit norms in the classroom. They also try much more intensively to decode the teacher's didactical intentions and also discuss strategies to realize a solution, whereas low SES students do not try to take the implicit norms and practices into account. Also, the low SES students in our sample try to extrapolate teachers' didactical intentions and discuss pedagogical issues, but to a 'lower degree' than the higher SES students. Mainly, they recognize context-independent norms like the adequacy of language, but less context-specific ones. The low SES students for example immediately realize the teachers' implicit negative evaluation of Kostas' utterance, but assign it to Kostas' stammering rather than recognizing his didactical intention of including all students. In the quantitative data, this is reflected by a less frequent focus on the teacher (Table 3).

Even if further analysis in larger samples is required, we can already tentatively conclude that the implicitness of the classroom discourse has not posed a problem for these students to understand the evaluation, but to understand the rationales and contextual interdependence of the underlying norms. The missing explicitness of different reasons for explaining and arguing might be one of the main obstacle for equitable access to participation for all learners (Herbel-Eisenmann et al. 2012).

Although these observations give a much wider picture, they can, among others, empirically strengthen the demand for a less implicit pedagogy and shift it from the socio-mathematical norms and practices to the discursive rationalities and teachers' didactical navigation pathways, as they form the crucial context for contextualization demands in whole class interaction (Erath, Prediger, Quasthoff, and Heller: Explaining to learn mathematics and learning to explain. Discourse competence as important part of academic language proficiency in mathematics classrooms, submitted). This confirms the need for teachers to have a systematic professional focus on the co-constructive mechanisms in the interaction in order to detect the moments in which a more explicit orientation is necessary for some students. The following investigation of teachers' focus of attention will show if they correspond to these needs.

## Empirical findings on teachers' focus of attention on classroom interaction

For the teachers, we report the analysis in inverse order, first the frequency analysis (for answering research questions Q3 and Q4) and then the case studies with deeper insights (for going deeper into Q3 and also Q5).

### Pattern in teachers' focus of attention

In analogy with the student group discussions, all four group discussions of the teachers were analyzed by the categories in Table 2 to capture the addressed topics. Again, the turns of the transcripts were counted with respect to the addressed topics for the frequency analysis and, therefore, offer the quantitative operationalization of the teacher groups' focus of attention. In order to show that the focus of attention can of course vary due to the course of the discussion (which also applies, to a smaller degree, to the students' discussions), Table 4 shows the data separately for all four groups of teachers.

All four groups have a ‖focus on the teacher‖ to a much higher degree than the student groups, with percentages varying from 49.0% to 66.6%, on average 57%. The didactical aspects are mostly focused by all groups, with 21.6% to 34%, on average 28.1%. This seems to be natural as the teachers are interested in their own professional issues.

In contrast, the ‖focus on interaction‖ is not higher than for the student groups: in one group, the interaction is only focused by 5.8% of the turns, maximally 12.4%, on average in 8.6% of turns in all groups. This is interesting with respect to the high relevance that interaction has in the research discourses on equity.

The comparison of all teacher groups with the student groups is visualized in Fig. 2. It shows that the teacher groups' ‖focus on teachers‖ is much stronger (which was expectable) but the ‖focus on interaction‖ is on a similar level. This result seems to be of big importance with respect to the teachers' capacities to support students in the interaction, it was the main focus for the deeper analysis of the transcripts.

**Table 4** Differences in focus of attention of four different teacher groups — frequency analysis of assignments of addressed topics in turns of the transcripts

| Category of addressed topics | Percentages of turns addressing a topic | | | | |
| --- | --- | --- | --- | --- | --- |
| | in Group A | in Group B | in Group C | in Group D | in all groups |
| Focus on Students | | | | | |
| ▪ Content and style of students' utterances | 21.1 % | 11.6 % | 11.6 % | 10.9 % | 13.5 % |
| ▪ Language aspects of students' utterances | 10.2 % | 7.8 % | 4.2 % | 4.0 % | 6.4 % |
| ▪ Categorization of students or their pre-knowledge | 10.0 % | 14.9 % | 11.5 % | 11.1 % | 12.0 % |
| Focus on Teacher | | | | | |
| ▪ Content and style of teacher's utterances | 7.3 % | 11.8 % | 23.4 % | 18.3 % | 15.8 % |
| ▪ Didactical aspects of teacher's utterances | 30.1 % | 21.6 % | 28.6 % | 34.0 % | 28.1 % |
| ▪ Pedagogical aspects of teacher's utterances | 11.7 % | 15.7 % | 10.9 % | 14.3 % | 13.1 % |
| Focus on Interaction | | | | | |
| ▪ Aspects of interactional relatedness | 5.8 % | 12.4 % | 8.1 % | 7.2 % | 8.6 % |
| Focus on Content | | | | | |
| ▪ Content-related aspects | 3.8 % | 4.2 % | 1.7 % | 0.2 % | 2.5 % |
| All category assignments to turns (some categorized twice) | 100 % | 100 % | 100 % | 100 % | 100 % (= 2267) |
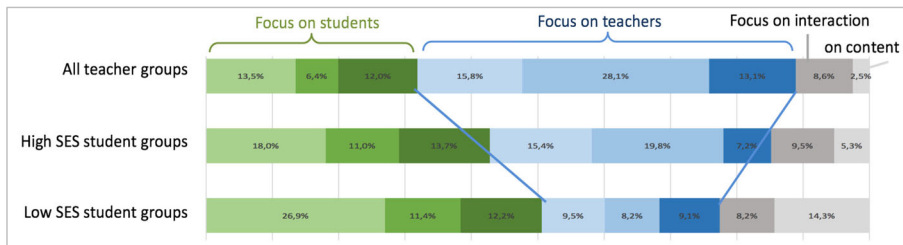
Fig. 2 Comparison of foci of attention between student and teacher groups (colors of categories in Table 4)

## Typical cases of teachers' discussions on interactional relatedness

As some students seem to be more apt at "reading" teachers' contextual expectations and didactical ideas than others, it might be important for teachers to focus their attention on aspects of interactional relatedness. Case studies on classroom interaction have shown that when teachers are attentive to the subtlety of relatedness between teachers' moves and students' answers and chose to make the contextual expectations and norms more explicit, they can support students to participate even if their abilities to decode the expectations are lacking. These insights still seem to be not too well developed (Boaler 2002; DIME 2007). In this perspective, the 8.6% of teachers' utterances which addressed the interactional relatedness were of specific research interest and were chosen for the deeper analysis in step 5 with respect to research question Q5 (What kinds of knowledge based reasoning do teachers activate with respect to the implicitness in classroom interaction?).

A major result of the deeper analyses is that even in these 8.6% of moments in which the teachers discuss aspects of interactional relatedness (in sum 194 occurrences), they rarely address the implicitness of the interaction. Within the few scenes, two major modes of discussing implicitness were found: Implicitness is attended.

(1) as a medium for reaching a certain didactical goal which has influence on Tab students, and

(2) as an obstacle but is immediately qualified by another teacher as legitimate.

(1) The first incidence of the video clip of 'Kostas and rounding 63' in which the observing teachers perceive a move as implicit refer to the very first turns, when Kostas rounds the 63 and provides a one word answer "60" (Turn 2 of the video clip transcript printed in Methods for data gathering). By asking back "60?" and "No?", the teacher Mr. Maler invites the whole class to comment (Turn 4, 6). The observing six teachers discuss this moment with respect to interactional relatedness for students' and teachers' contributions[1]:

| 258 | Mr. Neumann | Thus, I can underSTAND? |
|-----|-------------|-------------------------|
| 259 |             | That there are a lot who are saying NO |
| 260 |             | Well, first, there was some INDIGNATION within the classroom |

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[1] According to the adopted guidelines for transcribing and translating transcripts, all specialities of the spoken language (mistakes, grammar etc.) are mentioned in the translation. Emphasis is marked by upper case letters. Breaks are coded by a dot for every second in round brackets.

| 261 | Mrs. Jacobi | Of course, because he is somehow implicating that |
| 262 | | That the students are UNsettled |
| 263 | | By that NO? |
| 264 | | I mean |
| 265 | | He IS ASKING that only that one student |
| 266 | | And after it he is asking the others |
| 267 | | They indeed CONFIRM that |
| 268 | | so in grade 5 the students mostly aspire towards an acknowledgment by the TEACHER |

Mr. Neumann immediately refers to the students' reactions to the teachers' skeptical reaction "60?". So here, she does not consider students' utterances in an isolated form (like teachers do in 31.9% of all turns, cf. Table 4), but addresses the interactional relatedness. Mrs. Jacobi explains the students' indignation by the teacher's very implicit rejection and emphasizes that such kind of implicit rejection can unsettle the students, because usually, children in grade 5 prefer explicit acknowledgement by the teacher. The discussion continues by hypothesizing teachers' underlying didactical or pedagogical goals for these moves (like in 41.2% of the turns, Table 4).

(2) Whenever one teacher formulates a critique about teachers' evaluations being too implicit for some students, other teachers typically question the critique and argue that open feedback is often not adequate or not necessary. Thus, problematizing implicitness is not a position shared in the discussing teacher group. For example, when six teachers discuss Mr. Maler's prompt for Kostas (in Turn 14 of the video clip transcript), Mr. Nash criticizes the teacher's "I am not completely sure" as unfrank:

| 560 | Mr. Nash | to ME |
| 561 | | the SECOND to last line [of the transcript] is catching my attention |
| | | I am not completely SURE. |
| | | Well, that is a little UNFRANK. |
| 564 | | Because teachers are always PRETTY sure |
| 565 | | Well, and that is ehm (.) that (.) students EASILY figure out, aren't they? |
| 566 | | They already know that we are sure |
| 567 | | that's a little bit eh:- |
| ... | | |
| 570 | Mrs. Wittgenstein | I also think that he thereby could UNSETTLE him |
| 571 | | by these kinds of statements |
| 572 | | Well, he is a comparatively STRONG student |
| 573 | | that's what he is at least showing |
| 574 | | But, if it were a WEAKER student? |
| 575 | | He probably would have given UP to join the talk |
| 576 | Mr. Klein | That [student] would have given up BEFORE |
| 577 | Mrs. Wittgenstein | Pardon? |
| 578 | Mr. Klein | He would have given up before THAT POINT IN TIME |
| 579 | Mrs. Wittgenstein | Yes. |

Mrs. Wittgenstein agrees that the teacher's move could have unsettled Kostas, but puts this problem into perspective by mentioning Kostas' apparent strength (#572). A weaker student, in contrast, might not have managed to cope with the very indirect teacher move. This is one of the rare moments in the transcripts in which one of the teachers relates difficulties of decoding too implicit teacher moves to the weakness of students (#574, interpreted here as cognitive weakness). And, more importantly, she relates it to the weaker students' participation in the interaction (#575). However, interestingly enough, Mr. Klein immediately disagrees by mentioning that the weaker student would have been excluded (for other reasons?) *before* this moment of problematized implicitness (#576). So the thematic pathways of problematizing implicit moves as disturbing students from participation is not followed anymore.

In other segments of the discussion the teachers explain or excuse the implicitness of teachers' moves by the importance of face-saving: explicit (negative) feedback is problematized as possibly offending children.

These two brief excerpts are representative for the rest of the 194 occurrences in which the interactional relatedness of students' and teachers' utterances was addressed: Only in very few moments, the implicitness of the communication is problematized with respect to constraints of participation, but is always challenged by colleagues. Within the entire data set, no teacher explicitly relates implicitness to social disparities, but like in the presented scene, sometimes to (cognitive or motivational) weakness.

So the only persons in the data set who explicitly ask for less implicitness of teachers' expectations and norms, are the students from high SES schools.

## Discussion of teachers' and students' unequal focus of attention and consequences for classrooms and professional development

### Major findings

Classroom observation studies with a focus on equity have often criticized students' unequal opportunities for participation in conceptually and discursively rich discourse practices (Tait-McCutcheon and Loveridge 2016; Greeno and Gresalfi 2008; DIME 2007). Of course, the appearing disparities have different sources, among them cognitive and language related aspects. In this article, we focus on two possible sources: the sensitivity to interactional mechanisms in general and students' unequal capabilities to recognize and realize implicitly established norms and practices of classroom interaction (Bernstein 2000).

Most existing studies have investigated connections between students' recognition and realization of rules by classroom observation (Morais 2002; Gellert and Hümmer 2008; Straehler-Pohl et al. 2014). In contrast, our study follows Hunter's (2016) pathway to offer a triangulating perspective by investigating how different groups of students and teachers *perceive* and discuss video clips from classroom interactions and compare these perspectives.

The systematic comparison reveals interesting differences in the topics addressed by groups of students from schools in high or low SES urban areas,

which allow us to differentiate the classical, rather limited picture about missing recognition competencies for low SES students. In our data set, the low SES students *also* definitely try to take the implicit norms and practices into account, but in different ways. When trying to decode teachers' expectations, they mainly refer to context-independent norms like the adequacy of language, but less context-specific ones such as teachers' didactical intentions in a certain moment (cf. Fig. 1); hence, they miss the transition between school and out of school contexts (Bishop 2002). Even if they might be successful with this focus in their current classrooms, they are maybe less prepared for contextual variations.

The data triangulation reveals that the teachers' pattern of focus of attention matches much more with the high SES students' pattern than with the low SES students' patterns (Fig. 2) and that might condition the implicitness of discursive demands we can observe within data of classroom interactions. Additionally, the teachers' focus is very systematically on the teachers' didactical and pedagogical intentions but less on the interactive mechanisms in classroom exchange.

In contrast, when teachers focus on students' utterances at all, they do this either without taking into account the interactional context or with respect to the question "How can I use this utterance for reaching my goal". Only in 8.6% of the turns, the teachers in our data set address the fact that students' utterances are co-constructed in the interactional logic of interaction. To support students with lower abilities to recognize contextual expectations, however, a focus on the interactional relatedness would be of big advantage.

The in-depth analysis of teachers' discussion about the interactional relatedness of students' and teachers' contributions in classroom interaction has provided insights into teachers' perspectives on implicitness. While the academic discussion about implicit pedagogy (Schütte and Kaiser 2011; Gellert and Hümmer 2008) and the often cited call for more explicit pedagogy (Bourne 2003 and others) has sometimes been misunderstood as a critic for teachers intentionally hiding the rules, the presented analysis can reveal an alternative perspective. Of course, no teacher in our group discussions assumes someone to hide norms or contextual expectations intentionally in order to exclude some students. Nevertheless, they rarely problematize implicitness even if they identify it, presumably because the teachers consider it as normal. Especially, the teachers do not draw connections between implicitness and specific challenges of socially underprivileged students.

As Schoenfeld has resumed, "... what teachers attend to as they teach is highly consequential" (Schoenfeld 2011, p. 224). Based on the approach of professional vision (Sherin 2007) and the analyzed patterns of attention of teachers and students we summarize: what teachers notice, could be a filter of what they can take into account for action in classrooms. Although there is no immediate correlation between the classroom data and the discussions, we can assume that teachers with missing attention to interactional processes and implicitness of the discursive practice might continue under-privileging those students who are less acquainted to decoding the implicit contextual expectations and do not recognize the specific demands of the *classroom* discourse.

## Limitations of the study

Although the principal method of data gathering by video-stimulated group discussions has proved to provide interesting insights into teachers' and students' perceptions of classroom interaction, the results must be interpreted cautiously due to several methodological limitations.

- *Size of sampling:* Although 6900 categories were assigned to 769 pages of transcripts, the data set is still quite limited, as it only refers to 34 students and 27 teachers. Future studies should extend the size of sampling.
- *Contextualization of data gathering:* The most serious limitation of what teachers and students could show to perceive was given by the specific selection of five video clips. Other clips would perhaps have resulted in other foci of attention; so the interesting aspect is the comparison between groups confronted with the same stimuli.
- *Broadness of categorization:* Even if the process of category development for addressed topics was carefully done in an inductive data analysis procedure (Mayring 2015), the frequency analysis is based on a first generalization of the rich subcategories and cannot account for all differences and subtleties. That is why it was important to combine the frequency analysis with an in-depth analyses of the transcripts. From the rich results of these in-depth analyses, this article could only present a very small part. Future publications will present other aspects.
- *Adequacy of comparing high and low SES students:* Finally, the comparison of students from schools in high and low urban SES areas must be interpreted with greater care, as it is only a first approximation to students' backgrounds and is confounded in our sampling with the difference of comprehensive schools versus Gymnasium (i.e., schools for the higher achieving 50–60% of students). So some of the differences might also be drawn back to general ability issues rather than SES. Additionally, the interpretation of what the low SES students perceived might be biased by their discourse competence in expressing their major perceptions. Future studies will need to find methods of data gathering to bridge these difficulties.

In spite of these limitations, the theoretical embedding in existing literature seems to stabilize the validity of the empirical findings so that we could already draw consequences.

## Outlook: consequences for professional development of teachers

In synopsis with our findings about teachers' and especially learners' differing perspectives on classroom interactions, PD programs also need an extension toward a controlled shift of attention from only didactical demands to an awareness of different access of learners to the discourse. That is why we decided to include issues of diverse access to participation in classroom interactions into a new design of professional development for teachers (Vogler and Prediger 2017).

To initiate reflection and a shift of foci toward the subtle mechanisms of classroom interactions, we use the fruitful approach of video-stimulated discussion groups (Sherin 2007) and broaden it. In order to shift the attention to students' *diverse* perspectives, we developed a double-layer design and introduced empirical material from student discussions to the PD course (Vogler and Prediger 2017). First, results from empirical practices with this PD design show that this shift of attention is possible, and teachers could be led to focus on students' perceptions and draw conclusions for their own classroom practices by discussing the video clips of learners' perspectives. The first preliminary results justify our hope that further exploration of this PD design is worthwhile.

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