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## KNOWLEDGE-BUILDING PATTERNS IN EDUCATIONAL DIALOGUE

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Knowledge-building patterns in educational dialogue

### **Abstract**

This study aimed to examine knowledge-building patterns in Grade 6 educational dialogues. The data consisted of 20 video-recorded lessons from the classes taught by seven teachers, selected by using a latent profile analysis and examined with a qualitative functional analysis of classroom talk. Episodes of educational dialogue were found to represent three main types of knowledge, based on facts, views and experiences. These three types were further identified as forming six diverse knowledge-building patterns in educational dialogues. The findings indicated that factual orientation dominated the Grade 6 lesson dialogues. However, factual knowledge building often occurred with the other two main types of knowledge.

*Keywords:* educational dialogue; knowledge-building pattern; classroom interaction; primary school.

## 1. Introduction

Classrooms constitute settings of knowledge building, where ideally, students and their teacher jointly develop their understanding (Mercer, 1995). Accounts of knowledge building emphasise the key role of social interaction (e.g., Brown & Duguid, 2000; Sawyer, 2007; Scardamalia, 2002), as well as educational dialogue as a facilitator of students' learning (e.g., Alexander, 2006; Fernández, Wegerif, Mercer, & Rojas-Drummond, 2001; Lyle, 2008; Mercer, 2008). Wertsch (1979) elaborates on the Vygotskian view about the developmental relevance of dialogue to social interaction. Mercer (2008) points out the accumulated evidence that the functional structure of the dialogue between adults and children – not only its content – contributes to children's learning.

The literature on educational dialogue indicates that in science lessons, for instance, the dialogue features that are beneficial to students' intellectual growth consist of instructional practices that involve students proposing ideas and explaining their reasoning to peers (e.g., Howe et al., 2007). However, the functions that comprise productive educational dialogue in the early school years may be somewhat different, such as allowing space and time for children to share their experiences (Author et al., 2016), from those in the later grades of primary school, with the subject lessons' stronger and academically oriented focus. A limitation in the relevant literature is the lack of studies on knowledge building in the educational dialogues that are identified in teacher–student interactions in the whole class. Consequently, the present study aims to analyse the types of knowledge-building patterns in dialogues involving Grade 6 students and their teachers.

### *1.1. Sociocultural learning approach and classroom dialogue*

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The sociocultural approach to learning views knowledge as socially constructed through language. This view is largely based on Vygotsky's (1978) description of the dual functions of language as a psychological tool for individuals to make sense of their experiences and a cultural tool for sharing experiences and understanding them collectively. The sociocultural learning theory has since been widely applied in the research on classroom dialogue, collaborative learning and educational use of communication technology (Mercer, 2008). Similarly, the social semiotic approach (Halliday, 1978) perceives language as an important mediator through which social and cultural values are constructed, preserved and contested. When using language, individuals build meanings by representing their experiences of the world rather than just transmitting them. Meaning making implies creating relationships with other people that are relevant in the context in which they occur (Eggins, 1994). This approach to language aligns with the systemic theory that observes a systemic relationship between the form of the language and the context in which the language is used (Eggins, 1994; Halliday & Matthiessen, 2014).

According to Alexander (2006), the core intent of dialogue is to exchange ideas that prompt further questions. Dialogic teaching in the classroom setting can be predicated on five principles of interaction that harness the power of talk to stimulate and develop students' thinking, learning and understanding (Alexander, 2000, 2006). Through dialogic interaction in the classroom, students learn to ask questions, explain their viewpoints and comment on one another's ideas (Alexander, 2006). Classroom interaction can be considered dialogic when it fulfils the criteria of being: 1) collective (as a small group or the whole class, students and their teacher address learning tasks together), 2) reciprocal (students and their teacher listen to each other, share ideas and consider alternative viewpoints), 3) supportive (students may articulate their ideas without fear of embarrassment and help one another reach shared understanding), 4)

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cumulative (the participants build on their own and others' ideas and link them to form coherent lines of thinking and enquiry) and 5) purposeful (teachers plan and steer classroom talk with specific educational goals in mind). Furthermore, Barnes and Todd (1977) argue that classroom discussion should meet the basic requirements of everyday conversation – sharing relevant information, clearly explaining opinions and critically evaluating explanations.

The accumulated evidence on the developmental benefits of educational dialogue (or productive classroom talk, a term used in the literature with a similar meaning) indicates links between the quality of teacher–student dialogue and the growth of students' understanding about diverse school subjects, especially science (e.g., Alexander, 2000; Lemke, 1990; Mortimer & Scott, 2003; Wells, 1999). In their school-based research projects, Mercer and Littleton (2007) have aimed to help teachers provide their students with opportunities for engaging in focused, equitable and reasoned discussions to develop their thinking skills. They have pinpointed the essential qualities of a reasoned debate, which they call exploratory talk, in line with Barnes' (1976) study. With the open sharing of ideas and constructive conflict, the concept of exploratory talk constitutes a visible pursuit of shared understanding and knowledge building through dialogue. The use of exploratory talk for students' learning has been previously analysed with British and Mexican primary school children and has proven effective in promoting their collaboration, communication, reasoning and learning (e.g., Mercer, Wegerif, & Dawes, 1999; Rojas-Drummond & Mercer, 2003; Rojas-Drummond, Mercer, & Dabrowski, 2001). These studies have provided knowledge of how children talk when working on joint activities, as well as teachers' strategies when scaffolding the interactive process of knowledge construction.

### *1.2. Collaborative knowledge building in classroom dialogue*

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The meaningful role of the peer group in students' learning is widely acknowledged (e.g., Salisbury, 2012), while teachers are regarded as performing more of a coaching function in facilitating the students' knowledge-building processes (e.g., Hämäläinen & Laine, 2015; Hämäläinen & Vähäsantanen, 2011). Barnes and Todd (Barnes, 1976; Barnes & Todd, 1977) were among the first researchers to investigate students' talk when working together. As indicated, Mercer's (2008) findings have shown that focused, sustained and reasoned dialogue in a classroom helps students solve problems and promotes their conceptual understanding and learning. Introduced by Harasim (1989), the concept of collaborative knowledge building involves mutual exploration of issues and arguments, agreements and disagreements, questioning together, dynamic interaction and building on one another's ideas (Harasim, 1989; Kaye, 1992; Sorensen, 1997).

In his model of the knowledge-building process, Stahl (2000) views knowledge as a socially mediated product. Individuals first generate personal beliefs from their own perspectives on the basis of sociocultural knowledge, shared language and external representations. These beliefs are then transformed into knowledge through social interaction and discussion, provided that individuals' negotiations of different perspectives lead to their acceptance of a common result. For collaborative knowledge building to occur, it is not enough that students and their teacher share knowledge, but the knowledge needs further elaboration based on the presented ideas and thoughts (Arvaja, Salovaara, Häkkinen, & Järvelä, 2007). This requires reciprocal understanding among the participants (Byman, Järvelä, & Häkkinen, 2005).

Mercer and Littleton (2007) define learning through collaborative knowledge building as a process where not only the students work together, but the students and their teacher are also engaged in coordinated, continuing attempts to build common, shared knowledge or solve a

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problem. It has been argued that the successful pursuit of collaborative learning depends on students' sharing views relevant to the discussion and having a joint conception of its goal (Barnes & Todd, 1977; Bennett & Dunne, 1992; Galton & Williamson, 1992). Students' personal experiences, curiosity and ownership of their learning have also been emphasised (Goos, Galbraith, & Renshaw, 1999). Practices that align with educational dialogue aim at providing learners with spaces and tools to participate in collaborative meaning making (Nathan & Knuth, 2003; Wells, 1999).

Collaborative knowledge building and the length of time used in negotiation and planning have been linked to successful learning outcomes and problem solving (e.g., Fall, Webb, & Chudowsky, 1997; Webb, 1993). Several studies have concluded that collaborative learning may facilitate students' academic performance, motivation and self-esteem (e.g., Mercer, 2008; Slavin, 1980). For example, Underwood and Underwood (1999) document that students who express more opinions and verbally analyse the learning perform best in computer-based problem-solving tasks. Howe and colleagues (2007) propose that productive classroom interaction includes students' active involvement by presenting ideas, contrasting opinions and explaining and reasoning about them. Interestingly, although achieving consensus in problem solving can protect and peaceful dialogue, it does not necessarily support the participants' conceptual understanding (Howe & Tolmie, 2003).

Promoting knowledge-building dialogues through collaborative learning can be challenging for educators (Sorensen & Takle, 2002). Building an open educational dialogue in the classroom requires careful planning and structuring clear goals for learning (Gillies, 2015; Gillies, Nichols, Burgh, & Haynes, 2014). A teacher plays an important role in creating a space for students' active participation through open questions and feedback and by supporting the



students in explaining their ideas and opinions (Gillies, 2013; Gillies, Nichols, Burgh, & Haynes, 2012; La Paro, Pianta, & Stuhlman, 2004), as well as helping them recognise how their earlier experiences, actions and activities contribute to their understanding (Mercer, 1995). Scaffolding provided for both whole-class and small-group interactions can promote the development of individual reasoning and the advancement of learning and understanding (Rojas-Drummond & Mercer, 2003). However, previous research suggests that students do not typically experience high-quality instructional interactions (Justice, Mashburn, Hamre, & Pianta, 2008). Identifying key features of effective classroom interactions is important for teachers to be more instructionally supportive in their interactions with students (Jamil, Sabol, Hamre, & Pianta, 2015).

There are strong assumptions and accumulating evidence with respect to the benefits of productive and educational dialogue for learning opportunities. However, there is also an obvious need for a closer examination and description of the types of knowledge-building that transpire through and within dialogue. Consequently, the present study aims to analyse functions of classroom talk to describe what kinds of knowledge-building patterns can be identified in Grade 6 educational dialogues between the teacher and students.

## **2. Methodology**

### *2.1. Participants and classroom observations*

This study represents a subsample of a large, population-based follow-up (Author et al., 2006) of 2,000 children from four municipalities with their parents and teachers. The children have been followed up from preschool to Grade 9 to examine links between students' academic skill development (especially literacy and math), motivation, well-being (e.g., engagement,

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problem behavior), and the contribution of factors such as parent and teacher practices and beliefs, quality of classroom interaction, and teacher-student and peer relations to child outcomes. The teachers were asked for their written consent to participate in the study, and the parents gave their consent for their children's participation. All participating schools were Finnish speaking. A subsample of teachers participated on a voluntary basis in classroom video-recordings of at each grade. The video-recorded lessons of 46 Grade 6 teachers and their classrooms (12-year-old students), collected in spring 2013, comprise the sample for the present study. The teachers participating in the classroom video recordings were selected on a voluntary basis from the total of 98 participating teachers. In total, 158 lessons were video-recorded in Grade 6 classrooms (two to four lessons per teacher). On average, 19 students (3–30 students, depending on the class size,  $SD = 5.81$ ) were present in the classrooms during the video-recordings. The research situation was not manipulated in any way but represented a typical school day in Grade 6 classrooms. All teachers had at least a Master's degree.

## *2.2. Selection of data with latent profile analysis*

Due to the study's purpose to identify knowledge-building patterns in educational classroom dialogue, the first phase of the study involved identifying the teachers and lessons with the likelihood for high occurrence of teacher-student exchanges meeting the criteria of educational dialogue. This selection stage was carried out with latent profile analysis (LPA) based on the codings of the classroom video-recordings, using the Classroom Assessment Scoring System-Secondary (CLASS-S), an observational instrument based on Teaching Through Interactions (TTI) framework (Pianta, Hamre, & Mintz, 2012).

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The CLASS-S is a secondary school version of the CLASS observation instruments, which are validated and widely used to systemically code the quality of daily teacher–student interactions in classrooms. The CLASS-S measures three domains of teacher–student interaction along 12 dimensions: (1) emotional support (three dimensions: positive climate, teacher sensitivity and regard for student perspectives), (2) classroom organisation (three dimensions: behaviour management, productivity and negative climate), (3) instructional support (five dimensions: instructional learning formats, content understanding, analysis and inquiry, quality of feedback and instructional dialogue), and student engagement as the 12th dimension. Following procedures outlined for coding of videotapes (Pianta et al., 2012), each lesson (45 minutes) was coded in approximately three 15-min segments from videotape by a trained observer on a 7-point scale: low (1–2), moderate (3–5) or high (6–7) quality. The CLASS-S manual (Pianta et al., 2012) provides detailed indicators of each dimension and examples of teacher behaviour and classroom interactions for these ratings. CLASS-S is validated in the Finnish school context, and the training procedure is explained in more detail by Author et al. (2016). Inter-rater reliabilities, calculated as intraclass correlation coefficients (ICCs) based on 20% of the lessons rated by two observers, varied between 0.57 and 0.75. ICCs were computed in order to estimate the agreement between raters with a high ICC indicating a high inter-rater agreement (recommended by McGraw & Wong, 1996).

The data selection for qualitative analysis was based on the CLASS-S scores of five selected dimensions, using teachers as the unit of selection. The following five dimensions were chosen based on capturing the aspects of interactional quality that would be typically present in educational dialogues: 1) positive climate, 2) instructional learning formats, 3) content understanding, 4) quality of feedback and 5) instructional dialogue. Of the selected CLASS-S

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dimensions, positive climate represents an aspect of emotional support that indicates the enjoyment and emotional connection that students have with teacher, as well peers. and is reported to contribute to student achievement, engagement, and motivation (Pianta et al., 2012). The other four dimensions representing instructional support are known to foster students' thinking skills and conceptual development (e.g., La Paro et al., 2004; Yates & Yates, 1990), especially when associated with deep and meaningful conversation about educational content (Wolfe & Alexander, 2008). Instructional learning format specifies how teachers engage students in activities by maximizing their learning opportunities. Content understanding indicates the approaches teachers use to help students' understand the key ideas in an academic discipline. Quality of feedback refers to the ways in which teachers extend and expand students' learning through their responses, and instructional dialogue reflect how teachers use structured, cumulative questioning and discussion to guide and prompt students' understanding of content. (Pianta et al., 2012.) The purpose of choosing these five dimensions was to optimise the occurrence of educational dialogues in the data that was selected through latent profile analysis in the next stage.

The latent profile analysis (LPA) enables the identification of mixtures of subpopulations (subgroups) from the observed data and provides statistical tests for evaluating the existence and number of the subgroups. In the present study, latent profile analysis was applied to identify subgroups of teachers with different profiles on the five selected dimensions of CLASS-S. The eventuality was to identify a subgroup with a profile representing the highest interactional quality ratings, out of the entire sample pool, on these dimensions (i.e., a subgroup with the highest likelihood of dialogic episodes to be identified in the video-recorded lessons). The LPA was conducted using the Mplus 7.3 program (for a similar approach to data selection using LPA

to identify CLASS profile subgroups see Author et al., 2012). To determine the most appropriate number of latent subgroups, we used three criteria recommended by Muthén (2001, 2003). These three criteria comprise the following: 1) *the model fit*, using the indices of log-likelihood value, Akaike's information criterion, Bayesian information criterion and the adjusted Bayesian information criterion, as well as the Vuong–Lo–Mendell–Rubin test, the Lo–Mendell–Rubin adjusted likelihood ratio test and the parametric bootstrapped likelihood ratio test for statistical testing; 2) *the classification quality* by using posterior probabilities and entropy values; and 3) *the interpretability of the latent subgroups* – based on feasibility of the solution and number of teachers assigned to latent subgroups value in practice.

Based on all three information criteria (including the model-fit indices, values indicating classification quality, and interpretability), the three-subgroup solution was the best among the models to which different numbers (from two to five) of latent subgroups were fitted. For the subgroup of interest, comprising seven teachers with the highest mean scores (with respect to the other two subgroups) on all five CLASS-S dimensions, subgroup membership was stable in the three-, four- and five-subgroup solutions (see Table 1). Subsequently, the seven teachers (out of a total of 46 teachers participating in video-recordings) belonging to this subgroup, along with their 20 lessons (out of 158 lessons in total), were selected for the qualitative analysis. These selected teachers' lessons consisted of the following subjects: literacy (n = 9), mathematics (n = 6), religion (n = 3), physics/chemistry (n = 1) and history (n = 1). Each lesson had an average duration of 45 minutes.

### 2.3. Identifying episodes of educational dialogue within the lessons

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The transcribed lessons of the final sample (20 lessons by seven teachers) were read through several times to identify episodes containing educational dialogue and to set their boundaries. Educational dialogue was defined as continuous exchange between the students and their teacher in which the topic continued essentially unchanged and that fulfilled Alexander's (2006) five principles of dialogic teaching, i.e., the episode contained exchanges which were: 1) collective (teachers and students address learning tasks together); 2) reciprocal (teachers and students listen to each other, share ideas and consider alternative viewpoints); 3) supportive (students articulate their ideas freely, without fear of embarrassment, and they help each other to reach a shared understanding); 4) cumulative (teachers and students build on their own and each other's ideas and link them into coherent lines of thinking and enquiry); and 5) purposeful (teachers plan and steer classroom talk with specific educational goals in mind). Based on fulfilling these criteria (all principles needed to be present in every episode), 57 episodes of educational dialogue were identified within the 20 lessons. The classroom activities that did not involve any formal or informal learning tasks or exchanges between the students and their teacher (e.g., individual tasks, routines) were excluded from the analysis.

### *2.4. Functional analysis of episodes of educational dialogue*

The identified 57 episodes of educational dialogue were analysed by applying the Functional Analysis of Children's Classroom Talk (FACCT) developed by Kumpulainen and Wray (2002), who evaluated the quality of children's oral language interaction in the classroom. Because the present study focused on teacher–student educational dialogue, teacher talk was also included in the analysis. Altogether, 19 functions (16 originating from Kumpulainen and Wray's framework, with some modifications) were applied to both the teacher's and the students' talk

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(see Table 2 for the adapted framework). Kumpulainen and Wray's (2002) *informative* function was renamed *factual* function, with a specified definition to be more compatible to learning situations. A new function, *view*, was added to the framework to represent a function in which the expression of an opinion contained information. The *judgemental* function, an original code by Kumpulainen and Wray, was restricted to expressions that merely indicated agreement or disagreement. The *supportive* and *hinting* functions were included in the framework as actions used by teachers to encourage student participation and sharing of thoughts and knowledge.

The unit of analysis was a single word, a sentence, or sentences where at least one function was clearly identifiable. The coding using the functional framework thus encompassed all utterances expressed either by the teacher or the students. The units could be coded as having several overlapping functions (i.e., the functional codes were not mutually exclusive). For example, the question *Which planet is closest to the sun?* would be assigned to both the interrogative and factual functions. Table 3 presents an example of how the functional framework was applied to the classroom dialogue.

Although the first author identified the educational dialogue episodes and coded the functions, the research team applied researcher triangulation (Cohen, Manion, & Morrison, 2007) in all main phases of the analysis. The six identified patterns (presented in Section 3 – Results) were carefully discussed in the light of the various examples from the data. Ambiguities were acknowledged, identified and discussed by the research group; if consensus was not reached, the findings were re-examined.

### 3. Results

#### 3.1. Three types of knowledge in educational dialogue

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As the functional framework was applied, diverse functions of classroom talk were identified. Interrogative and responsive functions were especially present in all the analysed episodes, which is not surprising, considering that questions and answers are typical features of classroom dialogue. However, the research team was mainly interested in the functions associated with collaborative knowledge building and deepening the understanding of the content. *Factual*, *view* and *experiential* were the three main functions that occurred the most and were associated with collaborative knowledge building by bringing new knowledge and content to the discussion in the identified educational dialogue episodes. This finding indicated that the knowledge contained in the dialogues was mostly built through the corresponding three types of knowledge – *fact*, *view* and *experience*. The factual function occurred frequently and was predominant in the majority of the identified episodes. However, factual knowledge was often shared simultaneously with the other two main types of knowledge – view and experience. Sharing of these three types of knowledge and their combinations (e.g., stating of views based on factual knowledge) formed a total of six different knowledge-building patterns in educational dialogue (see Figure 1).



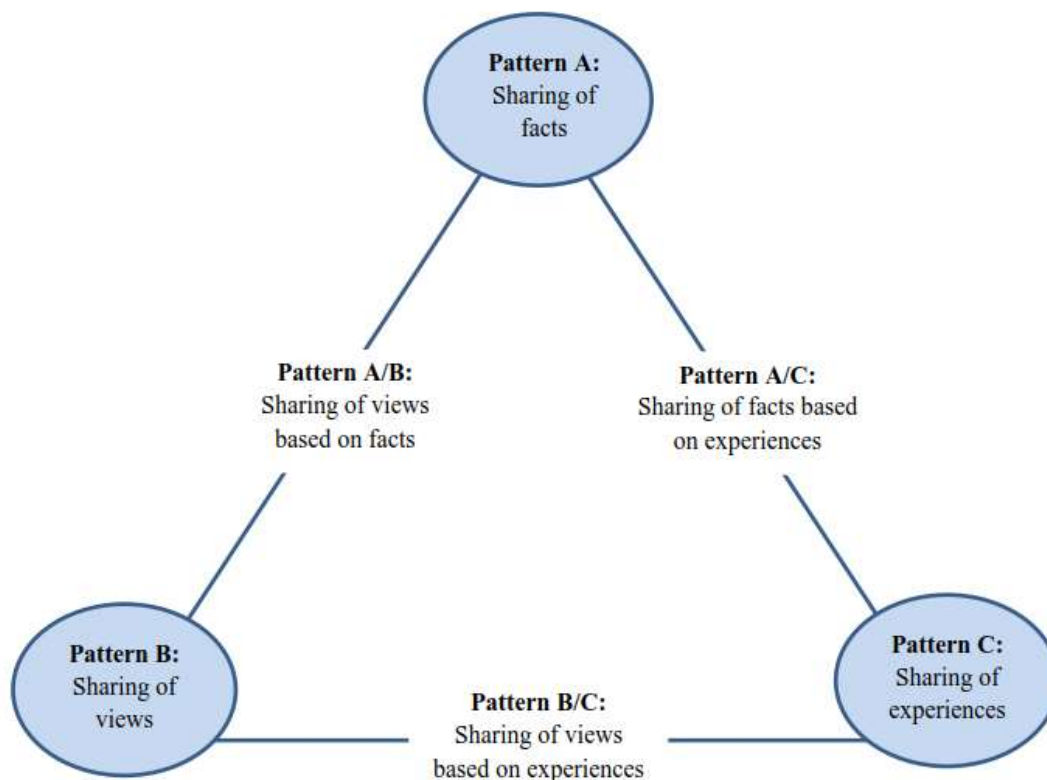


Figure 1. Knowledge-building patterns in educational dialogue, manifesting the three types of knowledge.

### *3.2. Knowledge-building patterns in educational dialogue, manifesting three types of knowledge*

#### **Pattern A: Sharing of facts (26 episodes)**

Pure factual dialogues (Pattern A) consisted of functions coded with factual intention and execution. The dialogue typically began with a factual question presented either by the teacher (18) or a student (8) and continued with question–answer sequences. The questions could be open or closed, seeking factual knowledge or requesting simple argumentation (which could be answered by closed alternatives, e.g., agree or disagree). The teachers and the students participated equally in knowledge building through inquiry and information sharing. Although

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facts were presented throughout the dialogues, the teachers and the students were often held accountable for justifying the shared factual knowledge (see Example 1). Collaborative knowledge building was usually based on a text that had been read together or on shared previous knowledge. A clear factual goal had to be attained as a result of each dialogue. Factual dialogues occurred in all subjects included in the study, as follows: literacy (10), mathematics (3), religion (11), history (1) and physics/chemistry (2).

### Example 1. Pattern A: Sharing of facts

*Context: The teacher and the students have studied the relationship between time units.*

Teacher: I have a task for you. Please convert 145 minutes into hours. Can you also explain what you do when you convert it? Andy.

Student: Well, first, I will naturally think that there is the 145. Then, I will figure out what is the closest [complete] hour that fits. That's 120 minutes, which is two hours. And when I add to that 25 minutes, it is 145.

Teacher: Very well explained.

Student: Thank you.

Teacher: So, first, you should look for what it is closest to, and then, you will get the hang of it. Did anyone think in some other way?

*More students begin explaining their own conversion techniques.*

### **Pattern A/B: Sharing of views based on facts (seven episodes)**

Pattern A/B comprised functions coded as factual intention and factual and views including execution. This type of dialogue typically started with the teacher's (6) or a student's (1) factual but reflection-seeking question. Shared knowledge was built through one or few open-ended questions, and the answers contained both factual knowledge and views, thus representing a balanced sharing of facts and ideas or opinions. Sharing of factual knowledge and someone's views on the issue were often linked together, since choosing to convey a specific fact to others could be interpreted as stating an opinion. By definition, there was rarely only one correct

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answer to the open-ended question presented by the teacher (see Example 2). The discussion and collaborative knowledge building in the A/B pattern were usually based on previous knowledge and related opinions, sometimes also on a text or a study chapter that the class had read together. This pattern appeared to be driven by a goal linked with increasing factual knowledge and raising awareness about the diversity of opinions on the issue at hand. This type of dialogue occurred in literacy (2), religion (3) and mathematics (1) lessons.

### Example 2. Pattern A/B: Sharing of views based on facts

*Context: The teacher tells the students that the topic of the religion lesson is discrimination.*

Teacher: Do we have discrimination in Finland? I mean, do some people get discriminated here?  
Alice.

Student: Well, you can always find it here in school.

Teacher: Yes, you can find it in school, many kinds of discrimination. Let's get back to it in just a moment. Sammy.

Student: People with darker skin.

Teacher: People with darker skin. Or as a whole, people who look different from the mainstream. I am pretty sure we have discrimination also here in our hometown in different areas. *(The teacher gives an example.)*

Student: Sometimes, you can have it also at work. If someone has made it into a high position though first he was among the weakest.

Teacher: Mm, yes, in the work life, lots of discrimination can be found. There is a lot of talk about the age racism. Any idea what it means?

Student: It means that older people call younger ones with names.

*The teacher and the students continue discussing the meaning of age racism and other forms of discrimination in and out of school.*

### **Pattern B: Sharing of views (11 episodes)**

This pattern predominantly consisted of functions coded as view-seeking intention and execution. In the majority of the cases, the dialogue started with a teacher's question prompting the students to express their views, ideas or opinions (9) and less often with a student expressing his or her views (1). Shared knowledge was built through questions presented by both the

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students and their teacher, as well as through balanced sharing of views and thoughts and arguments about views. Shared knowledge was usually based on previous knowledge, a text read together or sometimes, shared experiences. The dialogue's intended goal appeared to be directed towards reflecting different viewpoints rather than revising or understanding specific factual knowledge. As Example 3 indicates, although the pattern contained the expression of views, the discussion also had clear educational content. The episodes identified as Pattern B took place in literacy (6), religion (4) and math (1) lessons.

### Example 3. Pattern B: Sharing of views

*Context: In the previous religion lesson, the students learned about heroes.*

Teacher: In your own opinion, what is a good everyday hero like? There are no answers in the book, so these are just your own opinions. You can say three things. Jamie.

Student: Someone who is not afraid to stick out for someone and help.

Teacher: Mm, yes, all were good answers. Lenny.

Student: Someone who helps others, takes others into account, is brave and brings out courage in others, too.

Teacher: That is very important, that one takes others into account. And that is a quality that might be ... might be a bit difficult to even practise. I mean that for many people, encouraging others comes kind of naturally. Ralph.

Student: Someone who helps.

Teacher: The will to help is of course very important. Sammy.

Student: Police officers and firefighters.

Teacher: That's right; there are these professions where people help others as their work. But I don't think that people in those professions have hoped to become heroes or hope to save people. Rather, I believe they hope that they wouldn't have to save anyone, that things would be that good.

*The discussion about everyday heroes continues.*

### **Pattern B/C: Sharing of views based on experiences (two episodes)**

Pattern B/C consisted of episodes containing codes of view-seeking intention and experiential execution. The dialogue started typically with a teacher's open question asking students to

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express their views on an issue. This pattern comprised only one or a few questions, and shared knowledge was built mostly on balanced sharing of experiences and exchanging of personal views by both the students and their teacher (see Example 4). The pattern's educational goal seemed to focus on exchanging and reflecting on different viewpoints and experiences rather than reviewing any factual knowledge. This type of dialogue occurred only in two religion lessons.

### Example 4. Pattern B/C: Sharing of views based on experiences

*Context: The teacher and the students have watched a few short animated video clips about domestic violence.*

Teacher: What kinds of thoughts do you have about these different forms of violence? Sally.

Student: So basically, someone can do so that, for example, if a man beats his woman, and the woman wants to get a divorce, the man can say, for example, "I will kill myself if you go". And then, the woman can't do anything.

Student: Yes, like in that story where they had to live with a stepfather. And when they wanted to leave him, he said, "If you go, you won't get any money for living, or I will not pay child support".

Student: I also know a case in our [neighbourhood]. There is a couple, and from their place, you can hear fighting once in a while.

*Details about the case are discussed.*

Teacher: Why don't these people simply just leave the relationship? Terry.

Student: Well, like I said, it could be that even if [...] one wants to go, the other one earns more money.

Teacher: Money issues, yes. Jessica, did you have some opinions?

Student: Well, I thought, maybe they just don't want to leave. Like they might think that the other person is still nice.

*The discussion continues.*

### **Pattern C: Sharing of experiences (five episodes)**

Pattern C consisted of episodes containing functions coded as experience-seeking intention and experiential execution. The dialogue was started either by a student willing to share his or her

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experience (three episodes) or by the teacher requesting the students to share their experiences about a certain topic (two episodes). The way in which the dialogue was initiated had an impact on which of the two directions the dialogue headed toward. Example 5 presents a pattern of sharing experiences where the teacher's interrogative intention leads to a discussion that relies on questions and answers about experiences with different fuses. The other type of pattern, which started from a student's initiative to share an experience, typically led to a dialogue containing only a few questions. In Pattern C, shared knowledge was mostly built through balanced sharing of experiences by the students and their teacher. Patterns comprising pure sharing of experiences were identified in religion (2) and physics/chemistry (3) lessons.

### Example 5. Pattern C: Sharing of experiences

*Context: The teacher and the students are talking about fuses.*

Teacher:	How many of you have a fuse box at home? ( <i>The students raise their hands.</i> ) How many have it in the hallway? ( <i>Most of the students raise their hands again.</i> )
Student:	At the back of the hallway.
Teacher:	Yes. Usually, it is always in the hallway or near it. How many of you have been at home when a fuse has blown? ( <i>Many of the students raise their hands.</i> )
Student:	To me, it has happened two times.
Teacher:	What happened, Sarah, when a fuse did blow?
Student:	Well, the room went dark, and the TV shut down.
Teacher:	And what did you do then?
Student:	We [put in] a new fuse.

*The teacher and the students continue studying about fuses by reading their textbooks.*

### **Pattern A/C: Sharing of facts based on experiences (six episodes)**

Pattern A/C consisted of episodes with functions coded as factual intention and experiential execution. The dialogue started by either the teacher's (4) or a student's (2) factual questions or information sharing. The dialogue sometimes included a few factual questions, but mostly, it was constructed with balanced and interlinked sharing of facts and experiences (see Example 6). The

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shared facts were by definition based on and typically also justified with experiences, such as personal accounts and stories. This pattern occurred in physics/chemistry (5) and literacy (1) lessons.

### Example 6. Pattern A/C: Sharing of facts based on experiences

*Context: The teacher and the students are discussing different types of electric plugs and adaptors.*

Student: In the UK, there are three pins.

Teacher: Yes. And all around the world, they use different kinds of plugs. But how do you handle it when you go abroad? When you, for example, go on a trip to the UK, you take your phone with you and notice there that “hey, I can’t plug in my charger here”.

Student: Well, in the UK or if you go somewhere, they sell these things with three pins and two on the other side.

Teacher: What do you call them? Does anyone know?

Student: Is it an adapter?

Teacher: Yes. There are different kinds of adapters. The Finnish word for it would be maybe *sovitin* or *muunnin*, maybe. You really put this converter on, and then it works just normally there in the UK or wherever you go. Yes, Tommy.

Student: It is such a huge thing with all the plugs and everything.

Teacher: Yes, there are two types of adapters. I have seen one that you just turn around and can find different kinds of pins. Or then, there are these smaller ones that you can separate from each other but still carry as one piece.

Student: Well, in the guest boats, they have adapters, too.

*The teacher and the students continue sharing facts based on their experiences.*

## 4. Discussion

This descriptive study set out to examine how knowledge can be built through classroom interaction and, specifically, what kinds of knowledge-building patterns can be identified in educational dialogues in Grade 6 lessons. First, three types of knowledge were identified, as follows: fact, view and experience. Second, sharing of these three types of knowledge was identified to form six knowledge-building patterns in educational classroom dialogue. Three of the patterns represented the pure sharing of each type of knowledge (Pattern A: Sharing of facts,

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Pattern B: Sharing of views and Pattern C: Sharing of experiences). The other three patterns signified the blended forms of sharing knowledge (Pattern A/B: Sharing of views based on facts, Pattern B/C: Sharing of views based on experiences and Pattern A/C: Sharing of facts based on experiences). The factual function of knowledge was actively involved in the majority of the identified dialogic episodes. The starting point of the dialogue often concentrated on factual knowledge. The students and their teacher used the other two types of knowledge (i.e., experience and view), often to express their factual knowledge and in this way, contributed to collaborative knowledge building. In most of the patterns, sharing of knowledge took place in a way which represented relatively balanced turn taking and equal opportunities for both teacher and students to participate in the exchange by asking questions, providing answers and comments listening attentively or justifying and elaborating their thoughts. The teacher could invite students to discussion by asking both open and closed questions or asking for broader elaboration, but also students were found to make initiatives by asking questions or sharing their knowledge or stories.

The findings further indicated that classroom dialogues in Grade 6 strongly focused on factual knowledge. The factual function had an important contribution to half of the identified pattern types (sharing of facts, sharing of views based on facts and sharing of facts based on experiences), and most of the identified episodes were dominated by the factual function. This finding seems to indicate that educational discussions in the classroom in the final year of primary school mostly rely on earlier factual knowledge and inquiries of students and their teacher. This is an interesting result since our previous studies have shown that in the early school years' authentic educational classroom talk, students are most devoted to and actively participate in the dialogue when the discussion focuses on sharing their own experiences (Author



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et al., 2016; Author et al., 2012). The results of these studies with younger children imply that the nature of the classroom dialogue and shared knowledge building may change from the experience-dominated to the fact-dominated type by student age.

The function of sharing views also played an important role by being represented in three types of knowledge-building patterns (sharing of views, sharing of views based on facts, and sharing of views based on experiences). In these patterns, educational talk was built through sharing opinions and justifying individual viewpoints. The successful pursuit of collaborative learning has been shown to depend on students' sharing views relevant to the discussion and having a joint conception of the discussion's goal (Barnes & Todd, 1977; Bennett & Dunne, 1992; Galton & Williamson, 1992). This finding was also evident in the identified episodes. Opinions and justifications were always related to the topic being discussed and studied, and the conceptions shared by the students and their teacher were positively accepted in most of the cases. According to Howe and colleagues (2007), expressing contrasting opinions in a group is an important predictor of learning. Stahl (2000) proposes that the acceptance of a common result in the negotiation of different perspectives can be considered knowledge. In this study, contradictory opinions were mostly presented between the students and their teacher, but the sharing of views and opinions among the students was mostly harmonious and contributed to joint understanding. In their study about peer-group interaction in collaborative meaning making, Kumpulainen and Kaartinen (2000) point out that successful collaboration requires active negotiation and adjustment of varying viewpoints. The difference between the teacher's and the students' views prompted the participants to explain and to argue about their positions, which seemed to lead to a more versatile and richer dialogic exchange. It was not always clear whether

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a final agreement was reached; particularly concerning facts based on experiences or views, it might be unlikely and would not even be necessary to arrive at a consensus.

The function of sharing views was perceived as also connected to the third main function, experience – previously acknowledged as important for students' learning (Goos et al., 1999). In all three pattern types involving experiences (sharing of experiences, views based on experiences, and facts based on experiences), sharing of students' and their teacher's personal experiences took place in a balanced fashion. Stahl (2000) views language – a medium of knowledge – as based on individual experiences that are accepted in acts of understanding or agreement. Individual experiences originally have their meaning and value only for the student or the teacher in question, but when this personal experience is brought to a joint discussion, often linked to facts and views, and is acknowledged and possibly validated by others, the individual experience can be defined as shared knowledge. In school, examinations and activities typically focus on testing students' factual knowledge, and opinions and experiences may be given relatively little space. However, factual knowledge may provide the necessary background for students to feel comfortable in participating in dialogue by sharing their experiences and opinions as well.

Out of the framework that used 19 functions of classroom talk, only three functions were identified as being focally involved in producing shared knowledge building in the educational dialogue. Other kinds of functions in the classroom are present but may not be as critical for contributing important new content to the discussion. Constructing open and dialogic classroom talk is typically regarded as requiring teacher planning and structure provision (Gillies, 2015). In the light of the present study's results, we suggest that the teacher's most pivotal role is to actively foster and utilise student participation and talk to build knowledge together through

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shared discussion in the classroom. It is essential for the teacher to create a supportive classroom climate for the students to freely express their thoughts (e.g., Alexander, 2006). Although sharing of factual knowledge seemed to dominate in Grade 6 lessons, for some students, it might be easier or more natural to share their thoughts based on their views or experiences. It is vital to acknowledge the need to support diversity in classroom talk and to allow different types of knowledge to enter the discussion, which will likely help all students in dialogue participation.

In comparison to previous studies' results, the Grade 6 students seem to play a more active role in their lessons, including dialogue and especially in collaborative knowledge building, than the students in the early school years. For example, Author and colleagues (2016) show that most of the identified classroom dialogues are actively supported by teachers in the early school years, especially in teacher-initiated dialogues. On the other hand, children perform a significantly more active role in child-initiated dialogues where they eagerly share their personal experiences and stories. However, this present study among Grade 6 students shows their ability to actively participate in classroom discussion and collaborative knowledge building in any kind of educational dialogue. The students do not entirely depend on their teacher's support; instead (as described in the pattern descriptions), they ask questions, spontaneously share information and initiate discussions. The students express mature thoughts and respect one another by listening and commenting politely. This behaviour might indicate that students' collaborative and interactive skills can be developed during their primary years, both in expressing knowledge and becoming more independent and competent in dialogue participation.

This study's results also have some practical implications. Because the nature of classroom dialogue may vary between early and late primary grade students, teachers should take this into account in lesson planning, but teacher education should already pay attention to this

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matter. Previous research has indicated that teachers play a key role in creating cooperative learning opportunities for students (Gillies, 2016), and they can engage students in higher-level thinking through scaffolding in classroom interaction and educational dialogue (Gillies et al., 2012; Author et al., 2016). Since the Finnish National Curriculum (2014) stresses interaction and discussion in classroom practices, it is imperative that teachers utilise dialogue as an active knowledge-building method. Teachers should also explore the possibilities of different knowledge-building patterns to acknowledge the concrete ways to scaffold educational dialogues.

This study's outcomes may serve as useful tools for teacher education for the purpose of enhancing the quality and variety of teacher training and teaching practices. Diverse knowledge-building structures of classroom dialogues can already be discussed, demonstrated and practised during pre-service teacher training. Authors' (2011) intervention study shows that student teachers are able to challenge traditional teaching methods and increase their dialogic approach. However, they experience certain challenges when implementing dialogic teaching, such as timing, discipline and the possible lack of content knowledge. It is important that student teachers learn to utilise dialogue as an effective and meaningful method of daily teaching practice at an early stage in order to increase dialogic teaching and learning in classrooms. Teachers should pay attention to careful lesson planning and structuring, with clear goals for learning in order to build an educational dialogue (Gillies, 2015; Gillies et al., 2014). However, the nature of scaffolding and the strategies to support shared understanding in knowledge building can vary, depending on whether the educational dialogue is initiated by the teacher or the students (Author et al., 2016; Author et al., 2012).

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This study also has some limitations. First, due to the lack of studies on the functional structure of classroom talk between the teacher and the students in primary school, the function framework was a modified version of the FACCT framework (Kumpulainen & Wray, 2002). The original framework concentrated only on the talk among the students, excluding the teacher's talk. After the data-driven modifications, the framework became applicable to the whole class talk. However, many of the functions included in the original framework did not occur in this study's data, probably due to the teachers' involvement in the dialogue analysis. Though qualitative content analysis could be conducted through the data-driven approach, a more condensed and specific function framework would have been useful as a guide for the analysis. Hennessy and colleagues (2016) have recently developed and piloted a coding scheme for analysing educational dialogue for whole-class, group and paired work. They are also in the process of developing subschemes for more specific educational contexts, such as learning of specific knowledge domains, peer interaction and use of digital technology. There is a need to develop more frameworks that can be applied in diverse ways to both whole-class and small-group settings. Second, the original number of teachers ( $n = 46$ ) was relatively small, which might have decreased the power of testing in the LPA. For this reason, we focused only on the subgroup of seven teachers with the highest CLASS-S scores since this subgroup was clearly separated from the others in all solutions. Third, the observed teachers voluntarily participated in this study. The subjects and the number of recorded lessons also varied among the teachers. Fourth, the analysis and inquiry dimension was not included in the LPA since it seemed to favour the teachers who were conducting mathematics lessons, at the expense of the other subjects. By excluding this dimension, the entire domain of instructional support was not covered in the selection phase. Finally, we acknowledge that knowledge building in the

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classroom can take place in diverse ways, for example through more teacher-centered teaching methods such as lecturing. The study focuses on describing the ways of knowledge building manifested in educational dialogues in the present data, identified by selecting teachers with lessons of relatively high interactional quality.

This study's findings indicate the need to increase classroom talk and dialogue in primary school. Though several educational dialogues were found from the data, the majority of the teachers who chose to volunteer had relatively low teacher–student interaction scores (measured by the CLASS-S) in utilising dialogue as a way of teaching. In this study, three subgroups of teachers, categorised by their interaction quality during the lessons, were identified through the LPA, but only the subgroup of teachers with the highest scores was qualitatively analysed. In the future, it would be interesting to study the other two subgroups of teachers in order to analyse the possible differences between higher- and lower-quality teaching practices, especially regarding classroom dialogues. Moreover, the nature and functions in lower-quality subgroups should be analysed to find ways to enhance dialogic teaching and to evaluate what kinds of tools are needed by the teachers.

### **5. Conclusions**

Knowledge building through educational dialogue in Grade 6 lessons seems to emerge from three types of knowledge – fact, view and experience. These three types of knowledge, on their own or blended with each other, form six knowledge-building patterns in educational dialogue. Based on the identified episodes of classroom dialogue, factual knowledge seems to dominate in Grade 6. The students assume an active and versatile role in the dialogues, and they spontaneously participate and share their knowledge and thoughts. By acknowledging the three

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types of knowledge and their utilisation in educational dialogues, teachers can support a wider variety of educational discussions and students' active participation in knowledge building in the classroom. The results of the present study are of particular significance as they contribute to the literature by providing insights about the nature of educational dialogue and examples of the diverse ways in which knowledge can be built through dialogue in Grade 6 classrooms.

## References

- Alexander, R. (2000). *Culture and pedagogy: International comparisons in primary education*. Oxford: Blackwell.
- Alexander, R. (2006). *Towards dialogic teaching*. (3rd ed.). New York: Dialogos.
- Arvaja, M., Salovaara, H., Häkkinen, P., & Järvelä, S. (2007). Combining individual and group-level perspectives for studying collaborative knowledge construction in context. *Learning and Instruction, 17*(4), 448–459. doi:10.1016/j.learninstruc.2007.04.003
- Author et al., 2006 [details removed for peer review]
- Author et al., 2011 [details removed for peer review]
- Author et al., 2012 [details removed for peer review]
- Author et al., 2012 [details removed for peer review]
- Author et al., 2016 [details removed for peer review]
- Author et al., 2016 [details removed for peer review]
- Barnes, D. (1976). *From communication to curriculum*. Harmondsworth: Penguin Books.
- Barnes, D., & Todd, F. (1977). *Communication and learning in small groups*. London: Routledge and Kegan Paul.
- Bennett, N., & Dunne, E. (1992). *Managing classroom groups*. London: Simon and Schuster.
- Brown, J. S., & Duguid, P. (2000). *Social life of information*. Boston, MA: HBS Press.
- Byman, A., Järvelä, S., & Häkkinen, P. (2005). What is reciprocal understanding in virtual interaction? *Instructional Science, 33*(2), 121–136. doi: 10.1007/s11251-004-7689-8
- Cohen, L., Manion, L., & Morrison, K. (2007). *Research methods in education*. (6th ed.). London: Routledge/Falmer.
- Eggins, S. (1994). *An introduction to systemic functional linguistics*. London: Pinter.



## KNOWLEDGE-BUILDING PATTERNS IN EDUCATIONAL DIALOGUE

- Fall, R. Webb, N., & Chudowsky, N. (1997). Group discussion and large-scale language arts assessment: Effects on students' comprehension. CSE Technical Report 445. Los Angeles: CRESST.
- Fernandez, M., Wegerif, R., Mercer, N., & Rojas-Drummond, S. M. (2001). Re-conceptualising scaffolding and the zone of proximal development in the context of symmetrical collaborative learning. *Journal of Classroom Interaction*, 36(2), 40–54.
- Finnish National Board of Education. (2014). *Perusopetuksen opetussuunnitelman perusteet. National core curriculum for basic education*. Helsinki: Author.
- Galton, M., & Williamson, J. (1992). *Group work in the primary classroom*. London: Routledge.
- Gillies, R. (2013). Productive academic talk during inquiry-based science. *Pedagogies*, 8, 126–142. doi:10.1080/1554480X.2013.767770.
- Gillies, R. (2015). Dialogic interactions in the cooperative classroom. *International Journal of Educational Research*, 76, 178–189. doi:10.1016/j.ijer.2015.02.009
- Gillies, R. (2016). Cooperative learning: Review of research and practice. *Australian Journal of Teacher Education*, 41(3), 39–54. doi: 10.14221/ajte.2016v41n3.3
- Gillies, R., Nichols, K., Burgh, G., & Haynes, M. (2012). The effects of two meta-cognitive questioning approaches on children's explanatory behaviour, problem-solving, and learning during cooperative, inquiry-based science. *International Journal of Educational Research*, 53, 93–106. doi:10.1016/j.ijer.2012.02.003
- Gillies, R., Nichols, K., Burgh, G., & Haynes, M. (2014). Primary students' scientific reasoning during cooperative inquiry-based science activities. *International Journal of Educational Research*, 63, 127–140. doi:10.1016/j.ijer.2013.01.001

- Goos, M., Galbraith, P., & Renshaw, P. D. (1999). Establishing a community of practice in a secondary mathematics classroom. In L. Burton (Ed.), *Learning mathematics: From hierarchies to networks* (pp. 36–61). London: The Falmer Press.
- Halliday, M. A. K. (1978). *Language as social semiotic: The social interpretation of language and meaning*. London: Edward Arnold.
- Halliday, M. A. K., & Matthiessen, C. M. I. M. (2014). *Halliday's introduction to functional grammar*. (4th ed.). London: Routledge.
- Hämäläinen, R., & Laine, K. (2015). Classroom orchestration: Balancing between personal and collaborative learning processes. *International Journal of Virtual and Personal Learning Environments*, 5(3), 33–50. doi: 10.4018/IJVPLE.2014070103
- Hämäläinen, R., & Vähäsantanen, K. (2011). Theoretical and pedagogical perspectives on orchestrating creativity and collaborative learning. *Educational Research Review*, 6(3), 169–184. 10.1016/j.edurev.2011.08.001
- Harasim, L. M. (1989). Online education. A new domain. In R. Mason, & A. R. Kaye (Eds.), *Mindweave. communication, computers, and distance education* (pp. 50–62). Oxford: Pergamon Press.
- Hennessy, S., Rojas-Drummond, S., Higham, R., Márquez, A. M., Maine, F., Ríos, R. M., ... Barrera, M. J. (2016). Developing a coding scheme for analysing classroom dialogue across educational contexts. *Learning, Culture and Social Interaction* (in press). doi:10.1016/j.lcsi.2015.12.001
- Howe, C. J., & Tolmie, A. (2003). Group work in primary school science: Discussion, consensus and guidance from experts. *International Journal of Educational Research*, 39, 51–72. doi:10.1016/S0883-0355(03)00073-9

- Howe, C. J., Tolmie, A., Thurston, A., Topping, K., Christie, D., Livingston, K., ... Donaldson, C. (2007). Group work in elementary science: Towards organizational principles for supporting pupil learning. *Learning and Instruction, 17*, 549–563.  
doi:10.1016/j.learninstruc.2007.09.004
- Jamil, F. M., Sabol, T. J., Hamre, B. K., & Pianta, R. C. (2015). Assessing teachers' skills in detecting and identifying effective interactions in the classroom. *The Elementary School Journal, 115*(3), 407–432. doi: 10.1086/680353
- Justice, L. M., Mashburn, A. J., Hamre, B. K., & Pianta, R. C. (2008). Quality of language and literacy instruction in preschool classrooms serving at-risk pupils. *Early Childhood Research Quarterly, 23*(1), 51–68. doi:/10.1016/j.ecresq.2007.09.004
- Kaye, A. R. (1992). Learning together apart. In A. R. Kaye (Ed.), *Collaborative learning through computer conferencing* (Vol. 90, pp. 1–24). NATO ASI Series. Springer-Verlag.
- Kumpulainen, K., & Kaartinen, S. (2000). Situational mechanisms of peer group interaction in collaborative meaning-making: Processes and conditions for learning. *European Journal of Psychology of Education, 15*(4), 431–454. doi: 10.1007/BF03172986
- Kumpulainen, K., & Wray, D. (2002). *Classroom interaction and social learning: From theory to practice*. London: Routledge-Falmer.
- La Paro, K. M., Pianta, R. C., & Stuhlman, M. (2004). The classroom assessment scoring system: Findings from the pre-kindergarten year. *The Elementary School Journal, 104*(5), 409–426. doi:10.1086/499760
- Lemke, J. (1990). *Talking science: Language, learning and values*. Norwood: Ablex.
- Lyle, S. (2008). Dialogic teaching: Discussing theoretical contexts and reviewing evidence from classroom practice. *Language and Education, 22*, 222–240. doi: 10.2167/le778.0

- Mashburn, A. J., Pianta, R. C., Hamre, B. K., Downer, J. T., Barbarin, O., Bryant, D., ... Howes, C. (2008). Measures of classroom quality in prekindergarten and children's development of academic, language, and social skills. *Child Development, 79*(3), 732–749.  
doi:10.1111/j.14678624.2008.01154.x
- McGraw, K.O., & Wong, S.P. (1996). Forming inferences about some intraclass correlation coefficients. *Psychological Methods, 1*(1), 30–46. doi:10.1037/1082-989X.1.1.30
- Mercer, N. (1995). *The guided construction of knowledge: Talk among teachers and learners*. Clevedon: Multilingual Matters.
- Mercer, N. (2008). Talk and the development of reasoning and understanding. *Human Development, 51*(1), 90–100. doi:10.1159/000113158
- Mercer, N., & Littleton, K. (2007). *Dialogue and the development of children's thinking: A sociocultural approach*. London: Routledge.
- Mercer, N., Wegerif, R., & Dawes, L. (1999). Children's talk and development of reasoning in the classroom. *British Educational Research Journal, 25*(1), 95–111.  
doi:10.1080/0141192990250107
- Mortimer, E. F., & Scott, P. H. (2003). *Meaning making in science classrooms*. Milton Keynes: Open University Press.
- Muthén, B. O. (2001). Latent variable mixture modeling. In G. A. Marcoulides, & R. E. Schumacker (Eds.), *Advanced structural equation modeling: New developments and techniques* (pp. 1–33). Mahwah, NJ: Erlbaum.
- Muthén, B. O. (2003). Statistical and substantive checking in growth mixture modeling: Comment to Bauer and Curran. *Psychological Methods, 8*(3), 367–377.  
doi:10.1037/1082-989x.8.3.369

## KNOWLEDGE-BUILDING PATTERNS IN EDUCATIONAL DIALOGUE

- Nathan, M. J., & Knuth, E. J. (2003). A study of whole classroom mathematical discourse and teacher change. *Cognition and Instruction, 21*(2), 175–207.  
doi:10.1207/S1532690XCI2102\_03
- Pianta, R. C., Hamre, B. K., & Mintz, S. (2012). *Classroom Assessment Scoring System-Secondary (CLASS-S)*. Charlottesville, VA: University of Virginia.
- Rojas-Drummond, S., & Mercer, N. (2003). Scaffolding the development of effective collaboration and learning. *International Journal of Educational Research, 39*, 99–111.  
doi:10.1016/S0883-0355(03)00075-2
- Rojas-Drummond, S., Mercer, N., & Dabrowski, E. (2001). Collaboration, scaffolding and the promotion of problem solving strategies in Mexican pre-schoolers. *European Journal of Psychology of Education, 16*(2), 179–196. doi: 10.1007/BF03173024
- Salisbury, J. (2012). Vocational education and training: Sites for qualitative study. In S. Delamont (Ed.), *Handbook of qualitative research in education* (pp. 143–156). Cheltenham, UK: Edward Elgar Publishing.
- Sawyer, R. K. (2007). *Group genius: The creative power of collaboration*. New York: Basic Books.
- Scardamalia, M. (2002). Collective cognitive responsibility for the advancement of knowledge. In B. Smith (Ed.), *Liberal education in a knowledge society* (pp. 67–98). Chicago, IL: Open Court.
- Slavin, R. E. (1980). Co-operative learning. *Review of Educational Research, 50*, 315–342.  
doi:10.3102/00346543050002315
- Sorensen, E. K. (1997). *Learning in virtual contexts. Navigation, interaction, and collaboration*. (Unpublished doctoral dissertation). Aalborg University, Denmark.

## KNOWLEDGE-BUILDING PATTERNS IN EDUCATIONAL DIALOGUE

- Sorensen, E. K. & Takle, E. (2002). Collaborative knowledge building in web-based learning: Assessing the quality of dialogue. *International Journal on E-Learning*, 1(1), 28–32.
- Stahl, G. (2000). A model of collaborative knowledge-building. In B. Fishman, & S. O'Connor-Divelbiss (Eds.), *Proceedings of the Fourth International Conference of the Learning Sciences* (pp. 70–77). Mahwah, NJ: Erlbaum.
- Underwood, J., & Underwood, G. (1999). Task effects in co-operative and collaborative learning with computers. In K. Littleton, & P. Light (Eds.), *Learning with computers: Analysing productive interaction* (pp. 10–23). London: Routledge.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge: Harvard University Press.
- Webb, N. M. (1993). Collaborative group versus individual assessment in mathematics: Processes and outcomes. *Educational Assessment*, 1(2), 131–152.  
doi:10.1207/s15326977ea0102\_3
- Wells, G. (1999). *Dialogic inquiry: Toward a sociocultural practice and theory of education*. Cambridge: Cambridge University Press.
- Wertsch, J. V. (1979). From social interaction to higher psychological processes: A clarification and application of Vygotsky's theory. *Human Development*, 22, 1–22.  
doi:10.1159/000112532
- Wolfe, N., & Alexander, R. J. (2008). Argumentation and dialogic teaching: Alternative pedagogies for a changing world. London: Futurelab.
- Yates, G. C., & Yates, S. M. (1990). Teacher effectiveness research: Towards describing user-friendly classroom instruction. *Educational Psychology*, 10(3), 225–238.  
doi:10.1080/0144341900100304

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Table 1. CLASS scores in subgroups, mean (SD)

<i>Dimension</i>	<i>Subgroup 1 (n = 17)</i>	<i>Subgroup 2 (n = 22)</i>	<i>Subgroup 3 (n = 7)</i>	<i>Total Sample Mean (n = 46)</i>
Positive climate	4.59 (0.16)	4.95 (0.15)	5.71 (0.16)	4.93 (0.10)
Instructional learning formats	4.33 (0.10)	4.97 (0.10)	5.43 (0.17)	4.80 (0.08)
Content understanding	3.07 (0.11)	4.07 (0.09)	5.05 (0.14)	3.85 (0.12)
Quality of feedback	2.46 (0.12)	3.11 (0.09)	4.08 (0.24)	3.02 (0.10)
Instructional dialogue	2.13 (0.12)	2.75 (0.09)	4.14 (0.18)	2.73 (0.12)

*Note.* Scores vary from 1 to 7.

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Table 2. Adapted version of the Functional Analysis of Children's Classroom Talk (FACCT) framework applied to the context of classroom dialogue

<i>Function</i>	<i>Code</i>	<i>Description</i>
1. Factual*	(F)	Providing facts, knowledge or general information, from previous ideas, pre-existing knowledge
2. Interrogative	(Q)	Asking questions to obtain information or social approval
3. Responsive	(R)	Answering questions
4. Organisational	(OR)	Organising and controlling behaviour
5. Judgemental	(J)	Expressing agreement or disagreement
6. Argumentational	(ARG)	Reasoning in language
7. Compositional	(C)	Creating written or spoken text not earlier mentioned, revising or dictating
8. Reproductional	(RP)	Reproducing previously encountered language either by reading or repeating
9. Experiential	(E)	Expressing personal experiences
10. Expository	(EXPO)	Using language with the demonstration of a phenomenon
11. Hypothetical	(HY)	Formulating a hypothesis
12. External thinking	(ET)	Thinking aloud during a task
13. Imaginative	(IM)	Introducing or expressing imaginative situations
14. Heuristic	(HE)	Expressing discovery
15. Affectional	(AF)	Expressing personal feelings
16. Intentional	(IN)	Signalling intention to participate in discourse
17. View**	(O)	Expressing personal opinions
18. Supportive**	(S)	Encouraging someone to share thoughts, opinions or information
19. Hinting**	(H)	Giving clues to obtain further information

\*Name of the function changed from *informative* to *factual*. The definition of the function is also more specified to correspond to educational talk.

\*\*Added function



Table 3. Application of the adapted functional analysis framework to educational dialogue

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*Context: Teacher and students are discussing about plugs*

Student:	In the UK, there are three pins.	(F), (E)*
Teacher:	Yes. All around the world they use different kinds of plugs. But how do you handle it when you go abroad? When you, for example, go [on] a trip to the UK, take your phone [...] and notice there, “Hey, I can’t plug in my charger here”.	(J), (F) (Q), (H), (IM)
Student:	Well, in the UK or if you go somewhere, they sell these things with three pins and two on the other side.	(F), (E)

Though the teacher supports the students by asking questions, encouraging and giving hints, the students participate and share their knowledge in a balanced way. The students’ knowledge and facts are based on their travelling experiences, giving their utterances a double meaning – factual and experiential.

\*Each row including one or more function codes represents one unit of analysis.

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