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Dialogic Discourse in the Classroom

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Abstract

The study aimed to explore the impact of an SDM-based professional development program on teacher discourse. Two types of discourse, authoritative and dialogic discourses, was the focus of the search. From a Bakhtinian standpoint, authoritative words are viewed as located in a distanced zone, do not reflect any individual point of view, and are not disputable. Moreover, in these words, one hears only one, single voice. Whereas, internally persuasive (dialogic) words are freely developed, applicable to new material and conditions, and, in these words, one hears at least two voices. A total of seventeen teachers volunteered and participated in a four-week professional development program. The program provided information about and classroom uses of authoritative and dialogic talk. After the program had been fulfilled, the classroom activities were videotaped and then transcribed. The transcriptions were later analyzed deductively. The results indicated that the SDM-based program had a positive and statistically significant impact on teacher dialogic discourse. The analysis revealed that after the program, all the teachers altered their discourse to a more dialogic one. It was specifically observed that a total of eleven teachers' dialogic-authoritative talk ratio was over 7/3.

Key words: Authoritative discourse, Classroom talk, Dialogic discourse, Teacher talk.

Introduction

Classroom talk has been and is still one of the most important topic of concern. Once, teachers were almost entirely undertaking the talk and students was simply listeners. At that time, it was believed that the better, one listens to his/her teacher, writes down what teacher declares, and duplicates the board, the greater, one understands the subject matter. Such a voiceless student was well liked and found to be a good one. Even today this teacher-does-the-talk belief has not lost its attractiveness and is still in use in many parts of the world including the USA and UK (Lyle, 2008). To illustrate, a report on the results from the TIMSS 1999 (Hiebert, et al. 2003, pp 109-110) indicated that eighth-grade mathematics teachers had spoken significantly more words relative to their students. The videotapes of classroom discourse signified that the overall teacher-student talk ratio for Hong Kong was 16/1, Australia 9/1, the Czech Republic 9/1, and the United States was 8/1. Besides, almost 91 % of the students' utterances on average included short phrases or did not involve 10 or more words. The underlying reason for the emergence of this belief is undoubtedly the view that talk facilitates the transmission of words from instructor to students.

In 1998, however, Sfard had called public attention towards the growing popularity of a novel idea called participation metaphor. What made it different was how it viewed the learner. Rather than a passive receiver, it viewed the learner as an active participant in a learning community where the learner communicates in the language of the community, discovers its norms, and acts according to its culture. Eventually, through the negotiation of community norms, the learner becomes an integral part of it. For instance, having a private language or symbols such as *rectangle*, *triangle*, ∞ , *equation*, and *pi*, math class characterizes a specific culture; with such special concepts as *solution*, *reaction*, *Ka*, *surface tension*, and *pH*, chemistry class represents a different culture, and similarly art class holds a different one, and so forth. Learning is therefore viewed as a cultural development and such a development occurs when speech and practical activity converge (Vygotsky, 1978, p. 24). Similarly, others viewed this action as symbolic interaction amongst people (Blumer, 1969, p. 4) or negotiation of meaning (Cobb, Yackel & Wood, 1989, 1993; Voigt, 1992; 1995, pp 163-201; Yackel, 2004; Yackel & Rasmussen, 2002). Accordingly, unlike transmission view, all these perspectives considered students'

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voices or talk to be an important part of the learning activity. On the other hand, the involvement of students' voices depends significantly on the type of discourse teachers practice. Wertsch (1998, p. 66), interpreting Mikhail M. Bakhtin's works, alleged that unlike authoritative one, internally persuasive discourse (dialogic discourse) creates such a contact and dialogue. In dialogic words, one hears the voices of others, and *understanding* comprises one voice's response to another (ibid. 1991, p.73) and hence emerges only from dialogue. Therefore, there is close connection between learning and dialogic talk. Recently, dialogic teaching is found an important concept in discussions of learning and teaching (Lyle, 2008). In the present study, it is aimed to display how elementary teachers' discourses altered to dialogic ones after participating in a professional development program, which was supported by a grant from the *Scientific and Technological Research Council of Turkey (Grant #: 113K693)*.

Research Question

The following question is the focus of our investigation: What is the impact of an SDM-based professional development program on teachers' discourse?

Theoretical Framework

Sociocultural Dialectic Model (SDM)

Saglam (2013), in his book, tells a story about his mental expedition for the exploration of the source of meaning and, in the story, he presents and examines a variety of philosophers and researchers' ideas. Further to that, the author attempts to offer responses to such questions as what is the source of meaning? Could one's observations be affected by one's own prior knowledge structures? Could theoretical ideas be explored through observation? How does meaning emerge from social context? And so forth. Though, the ideas of Vygotsky, Wertsch, and van Oers mainly influence his model and are briefly presented below.

To Vygotsky (1978, p. 57), one's cultural development appears first on *social plane*, between people, and, next, on the individual plane, inside the one. In other words, one's higher functions originate as actual relations between people and the internalization of these socially developed activities is the distinguishing feature of one's psychology. Accordingly, the process of intramental functioning could be traced to their precursors on the intermental plane (Wertsch, 1993, p. 27). In other words, to Vygotsky, the origin of one's mental functioning derives from participation in social activities and one's inner speech grows out of this societal contacts. Interpreting this notion of social plane and Bakhtin's that of dialogicality, Wertsch (ibid. pp 48-60, 86-92) further alleged that *communicative moves* emerge from external dialogues. With these moves, initiative-and-responsive utterances arise. They indeed play a paramount role and become links in the chain of speech communication. Through this interanimation of two or more voices, meaning comes into existence on social plane and, in this communication; the adult's utterances serve as a thinking device and are transformed into the child's inner dialogue.

Enthused by the works of Vygotsky (1983, pp 226-233), van Oers (2001) viewed abstract thinking as always originating from a particular concrete situation. That is, to him abstract thinking is a context-bound way of acting starting from a process of contextualization of a concrete situation. This occurs through a mental action of attending to and recognizing important aspects of a particular context. In this course, one is focused on particular distinguishing aspects of a specific situation, which potentially leads to the construction of a novel mental object. However, one cannot accomplish this by oneself; rather, it is the professional (teacher) that discursively focuses the one in particular and increasingly isolated aspects of the situation. He further proposed a *novice-with-expert* model of the development of abstract thinking.

Based largely on the above views, the SDM developed by Saglam possessed three important stages: (1) *Creating a meaningful context*, (2) *Contextualizing action* and (3) *Labeling action*. One can ask, what is this model anyway? Let us imagine a primary science teacher, whose goal is to have his/her students appreciate the term *tolerance*. He/she plans a play where one student, Jack, borrows a pencil from his friend (Linda), but he accidentally breaks it up; but right after, Jack apologizes to Linda; Linda, in response, says '*never mind! Do not worry!*' This play indeed created a meaningful *context* where tolerance is brought to the classroom, but in fact only the teacher could see it. The students, on the other hand, because of not being familiar with the term *tolerance* yet, they could not see it in the play. If asked what they see, they most probably would say, '*I think Linda did a favor*'. They could not see *Tolerance* in the play. Thereafter, the teacher interrupts and discusses the

play with the class. Teacher specifically calls the students' attention towards the actions of barrowing, accidentally breaking up and Linda's decent response to it. The important elements of the activity setting are therefore isolated and pinpointed by the teacher. Thereafter, the teacher calls Linda's behavior as TOLERANCE and announces this to the whole class. In this particular instance, the play produced a meaningful *context*; the teachers' call on the important elements of the activity setting is a *contextualizing action*; and naming the behavior of the student is called *labeling action*.

Dialogic vs. Authoritative Discourse

In order to appreciate the meanings of dialogic and authoritative discourses, let's examine the following dialogues. In these and succeeding dialogues, the teacher is abbreviated by the capital letter *T* and the letter *S* signified students. However, in some dialogues nicknames are used for students. The first dialogue illustrates dialogic discourse while the second one exemplifies the authoritative one. The dialogue is taken from a sixth grade math class (Forman, McCormick & Donato, 1998). In this dialogue, a group of students and their teacher are trying to figure out the perimeters of three hexagons, which are depicted below.

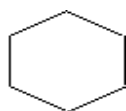


Figure 1

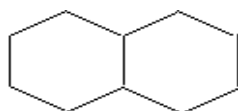


Figure 2

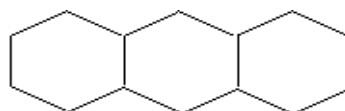


Figure 3

- 01 T: Alright hon. (*Previous student sits down*) Let's listen to some other people's ideas so that you'll get it. Eric, what did you discover?
- 02 Eric: I discovered that it was 6.
- 03 T: You discovered what was 6?
- 04 Eric: I mean around the hexagon is 6.
- 05 T: OK, get up there and tell us that (*Eric goes to overhead projector (OHP)*)
- 06 Eric: Around the edges, it's 6 (*Points to right most hexagon of figure 3*).
- 07 Eric: OK, the first one has 6 around it (*Points to figure 1*) and then you take away 1 (*Point to the meeting place in Figure 2 and then to the perimeter of the figure*) because right here it meets. So it'd be 5 plus 5 which is 10. So it adds up to 6 plus 4 is 10 (*Points to figure 2*) so the answer is 4 on each one. You add 4 on each one.
- 08 T: Alright, just write 10 under that and then show me how when you get to (*Eric writes 10 under figure 2*) OK, so then are you saying for every block that's added it's gonna to go up 4.
- 09 Eric: Yeah, on here it's 6,6,6, (*Points all three hexagons in Figure 3*) take-away, you take away these ones (*Points to meeting places*) because they meet so it'd be 14. Because here's 5- Wait, no, let's see (*Counts the sides that do not touch another hexagon on the first hexagon of figure three*), it's 5, 5, 5 it'd be 15.
- 10 T: You have 15. Take a look at your middle one there, honey.
- 11 Eric: Yeah, OK, I see.
- 12 T: How many sides in the middle one?
- 13 Eric: The middle one has 2. So it doesn't have. it. So it's 14 because both of the sides meet so it'd be 14.

According to Bakhtin (Emerson & Holquist, 2011, p. 342-46), although being not privileged, admired by the authority, and not even acknowledged in society, internally persuasive words (dialogic words) are freely developed, applicable to new material and conditions, and able to enter interanimating relationships with new contexts. To him, further, on social plane, meaning comes into being only if two or more voices come into contact (Bakhtin, 1986, pp 84, 91, 99). As seen in the above dialogue, a teacher and student (Eric) were talking about a particular situation. The perimeter of three hexagons became in the center of their talk. In the dialogue, the teacher and Eric's speech involved such terms as *around the edges* (Turn 6); *first one has 6 around it* (Turn 7); *right here it meets* (Turn 7); *you take away these ones because they meet* (Turn 9); *take look at your middle one there* (Turn 10); and so forth. The talk is therefore highly contextualized (Forman, McCormick & Donato,

1998). Since the talk took place in a specific context (on the hexagons, their edges, and meeting places), it was freely developed, understandable, open to participation of others, and could be easily followed by the rest of the class. Furthermore, in this interaction more than one voice is heard. Both Eric and the teacher's voices could be heard. To illustrate, in turn 10-13, when Eric's response (Turn 9) was found lacking by the teacher, a dialogue followed as to *you have 15. Take a look at your middle one there, honey; Yeah, OK, I see; How many sides in the middle one; The middle one has 2...* Importantly, through this interaction of the two voices (dialogic discourse), the meaning that the middle hexagons contribute less to the total perimeter emerged. After Eric returned to his seat, the teacher asked Jimmy to explain his solution for figure 20 that has twenty contiguous hexagons (*Note that this figure is not shown on the board*).

- 35 T: Figure 20, Jimmy.
 36 Jimmy 20? Well, see on figure 20 you would count, you see, the sides, each side like for
 : here and here (Points to the end hexagons of Figure 3) it'd be 5. And so you'd
 take 2 ... you would subtract 2 from 20, which would be 18, and you would
 multiply 18 by 4, because that's all the s-, cause all the sides in the middle have 4
 sides and then you would add 10 from the sides.
 37 T: OK, so you'd add 10 from the sides. I am sorry Jimmy.
 38 Jimmy And you would multiply the middle by 4.
 :
 39 T: And how many in the middle?
 40 Jimmy It would be 18 times 4 and then you'd add 10 and that'd be your answer.
 :
 41 T: And add 10. So you could do that for any number I give you.
 42 Jimmy Yeah.
 :

According to Bakhtin (Emerson & Holquist, 2011, p. 342-46), authoritative word possesses a special script, is located in a distanced zone, does not reflect any individual point of view, is not disputable, does not allow play with its borders, and belongs to no one. Moreover, in these words, as indicated by Bakhtin, one hears only a single voice (i.e. voice of the author, or the father, or the teacher, etc.). This single voice demands unconditional allegiance, is not open to contact with other voices, and addresses nobody. In the above dialogue, there is only one voice heard. However, you might oppose this assertion and allege that, other than teacher, the voice of Jimmy could also be heard and easily seen in the dialogue. Both Jimmy and the teacher's voices, in fact, produced one unique speech that was scientific and belonged to the language of science. The words used as *you, would subtract 2 from 20, which would be 18, and you would multiply 18 by 4, because that's all the s-, cause all the sides in the middle have 4 sides and then you would add 10 from the sides (Turn 36); OK, so you'd add 10 from the sides (Turn 37); you would multiply the middle by 4 (Turn 38); and It would be 18 times 4 and then you'd add 10 and that'd be your answer (40)* are scientific. This is the language of the scientists or superiors in the field of science. It is very similar to the language of teacher and math books. For the rest of the class, however, this language is located in a distanced zone. The students who are not familiar with this language are indeed not allowed to participate in this discussion. This scientific language is not disputable or fallible and belongs to no one. It characterizes the culture of scientists.

Furthermore, while solving the problem, Jimmy used a general procedure (Turn 35) that the ends contribute 5 and the middles contribute 4. Therefore, he utilized a mathematical formula that 5 (the contribution of the ends) times 2 plus 4 (the contribution of the middles) times the number of middles, which were 18 in this particular instance. This formula is context and time free and creates a link between past and future. In other words, the use of this algorithm is not limited to this particular setting, and it was used in the past and is going to be potentially used in the future (Forman, McCormick & Donato, 1998). Besides, the authority appreciates this language. The teacher, by focusing on, rewording, guiding, and repeating Jimmy's explanations (Turns 37, 39, 41), seemed to approve this language. This is again the language of superiors. Jimmy seemed to assume the role as teacher and seemed to be teaching the general algorithm to his classmates rather than learning it and the teacher seemed to be assisting him to explain the algorithm to the rest of the class. In brief, in comparison of dialogic discourse with that of authoritative, the former grows from a particular context where more than one voice could be heard and views are freely developed. The latter one, on the other hand, is context free and embraces only one voice, the voice of science.

Method

A total of 21 primary school teachers volunteered and were selected for the present study. The candidates were required to apply in pairs. That is, unaccompanied applicants were not allowed to register. And the pairs were required to be from the same school. However, during the program, because of several reasons such as having a vigorous health problem (undergoing surgical operation) or being reluctant to get videotaped, four teachers ceased their involvement. The remaining 17 teachers, seven pairs and a group of three, participated in the program. Except for one pair, all the pairs were at the same grade level. All the pairs were either at grade level 2 or 3. Before the program starts, both consents of parents and children were received and, thereafter, the teachers' routine classroom practices were videotaped. A total of 90 videos (an average of 5 videos for every teacher) were recorded.

Afterward, in order to have teachers get the skills and knowledge about dialogic talk, a professional development program was created. In April 2014, the program began; it lasted approximately one month; and four sessions were held. And each one lasted around three hours. The program involved theoretical and practical info about SDM and authoritative and dialogic talk. In this course of training, the teachers were also given the opportunity of observing real classroom applications directly related to their own area of schoolwork. They had watched several videos on math, science, literature and social science classroom applications of their colleagues. In particular, such views as the source of meaning from the perspectives of positivism and idealism, inductive and deductive approaches to teaching and learning, social aspects of learning, sociocultural dialectic model, dialogic and authoritative talk in the classroom were discussed. After the program had been completed, the teachers worked within pairs and designed lesson plans for their forthcoming classroom activities. The program instructors also assisted them in designing and organizing those activities. Thereafter, the teachers returned to their schools, but continued working with their partners and course instructors. While working with their partners at the school, they communicated with the instructors via phone.

Thereafter, the teachers' classroom performances were again videotaped. A total of 63 videos (an average of four videos) were recorded. The videos were later transcribed. In the literature, it is uncovered that getting an opportunity of observing other teachers, participating a program sustained over time, getting informed about a topic (dialogic talk in this case) directly related to daily life of the school, working with teachers from the same school and grade level, and being actively engaged in discussion, planning and designing lesson plans are the core features of high quality professional development programs (Wilson & Berne, 1999; Garet et al., 2001; Desimone, 2009).

Data Analysis

In the analysis of the transcriptions, we specifically focused on the teacher discourse and were inspired greatly from the works of Bakhtin, and Mortimer and Scott (2003). To them, in a typical authoritative discourse, teacher focuses on scientific view, prescribes the direction of discourse, acts as a gatekeeper to student points of view, checks and corrects or reshapes student ideas, ignores and rejects those ideas that are inconsistent with scientific view, asks instructional questions, and constrains the direction of discourse to avoid dispersion. Whereas, in dialogic discourse, teacher assumes a neutral role and is open to distinctive views, does not prescribe the flow of discourse, encourages initiation of student ideas, solicits or probes student individual ideas even inconsistent with scientific view, seeks clarification and further elaboration, and avoids evaluative comments. Although, here, stressing on getting students' differing ideas, Mortimer and Scott seemed not calling attention to contextual aspects of dialogic talk. For us, as well as getting differing ideas, dialogic talk must also happen in a context-dependent situation. Operational definitions for these two terms are displayed in Table 1.

A deductive approach is utilized for analyzing data (Patton, 2002, pp 453-54) and the analysis is performed according to the theoretical frameworks suggested by Bakhtin, Mortimer and Scott. Based on operational definitions in Table 1, the video-transcripts were categorized and coded. Two additional coders also used Table 1 and coded randomly selected transcriptions independently. An inter-rater reliability of 96 % was calculated, which indicated strong inter-coder reliability (Miles & Huberman, 1994).

Table 1. Operational definitions for authoritative and dialogic talk (Adapted from the works of Bakhtin, Mortimer and Scott)

Categories and Codes	Operational Definitions for Codes
1. Authoritative Talk	
1.1. Promoting scientific view	The case where teacher delivers scientific view; teacher asks students to offer scientific view or explain a phenomenon using the language of science; teacher leads students to explore the scientific view by giving hints; or teacher asks students to confirm his own scientific explanation.
1.2. Judgment	The case where teacher checks and compares student explanation with scientific view and labels the explanation as right or wrong; teacher corrects reshapes, or adds to student explanation in order to make it look like scientific view.
1.3. Inattention	The case where teacher ignores or overlooks student explanation that is inconsistent with scientific view.
2. Dialogic Talk	
2.1. Being open to student view	The case where teacher creates a context and solicits student individual ideas, or probes student thoughts; or teacher lists student ideas on the board.
2.2. Neutrality	The case where teacher listens to (or repeats) student ideas and avoids evaluative comments.
2.3. Use	The case where teacher uses student ideas to build meaning or relates the student ideas to scientific view.

The Codes for Authoritative Talk

The succeeding dialogue represents the codes for authoritative teacher. It is taken from one of the participating teacher's (T15) math class. The class had been videotaped before the program began. In the dialogue, she endeavored to have students appreciate geometric figures. She initially brought several geometric objects to the class and discussed the shape of each one with her students. Then, the dialogue continued as follows:

- 3 T: (*Holding an object in his hand*) ... this is a geometric object. Why is it geometric? Because all the faces are made of geometrical shapes, made of squares. Do you see that? Made of squares, what is the name of it? Who knows the name of it? Yes, S1.
- 4 S1: Square.
- 5 T: Who knows the name of it? All faces are square, all faces; this part is square (*Pointing to one of the face of the object*), this part is also square (*Pointing to another face*), this part is too (*Pointing to a different face*).
- 6 S2: I know. What was the name? (*Thinking*)
- 7 T: Who knows the name of it?
- 8 S3: It is cube.
- 9 S2: Yeap.
- 10 T: It is cube. This is a cube. Then, kids, what is the name of the one of the geometric figures?
- 11 Class: Cube
- 12 T: ... This is a kind of geometric object too (*Holding this time a different object in his hand*). Let's first check it. Is every one of you looking at it? Look! This face (*Pointing to one of the face of the object*). Kids, do you think what is the shape of it?
- 13 Class: It is square.
- 14 T: What geometric figure is this? Please raise your hand before speaking.
- 15 S4: It is square.
- 16 T: Square, this part is square (*Pointing to one of the face of the object*). Now, I'm turning it. What is the shape of this face? (*Pointing to a different face*). Yes,
- 17 S5: It is rectangle.
- ...
- 50 T: Triangle. I hold it like this and if its upper and lower parts are triangle, then what is the name of it?
- 51 Class: (*Raising their hands and murmuring*).
- 52 T: S10.
- 53 S10: It is cone.
- 54 T: He said cone, I cannot believe you say that. Yes, S2.
- 55 S2: Triangular prism.
- 56 T: Triangular prism (*Writing it down on the board*). It is called triangular prism. It's called triangular prism...

In the above dialogue, the teacher initially stated, *this is a geometric object. Why is it geometric? Because all the faces are made of geometrical shapes, made of squares. Do you see that? Made of squares, what is the name of it? Who knows the name of it? (Turn 3)*. Then, she continued, *who knows the name of it? (Turn 5, 7, 50) what is the shape of it (or this face)? (Turn 12, 16); and what geometric figure is this? (Turn 14)*. Here, by asking to figure out the name of the object, she seemed to be seeking a scientific explanation. In response, the students stated, *square (Turn 4); it is cube (Turn 8); cube (Turn 11); it is square (Turn 13, 15); it is cone (Turn 53); and triangular prism (55)* and, therefore, provided their scientific views. They seemed to use a particular scientific language following the directions of the teacher. Square, cube, cone, and triangular prism are scientific and belong to the language of science. For the rest of the class, who are unfamiliar with this language, this dialogue is quite scientific and located in a distanced zone. This part of the dialogue is hence coded as *promoting scientific view*. Further, in turn 4, upon the student inappropriate response, *square*, the teacher seemed to ignore S1's response (Turn 5) so this part is coded as *inattention*. Finally, upon the S10's response (Turn 53), the teacher stated, *I cannot believe you say that (Turn 54)* and seemed to have been surprised and have found the student response quite incorrect. Accordingly, this part is coded as *judgment*.

The Codes for Dialogic Talk

On the other hand, the following dialogue represents the codes for dialogic talk and is taken from a different teacher's (T4) math class. The class had been videotaped after the program completed. In the dialogue, she endeavored to have students appreciate consecutive numbers. At the beginning, the teacher asks students to form groups of five and solicited each group to construct a hand-made necklace. She, then, handed out some ropes and colored beads to the groups. However, each group, without being informed by the teacher, received a different quantity of beads. The teacher wrote the group numbers up on the board. After the groups built their necklaces, the necklaces hanged up under those numbers. Then, the teacher asked the amount of beads in each one of the necklaces. The students stated that the first necklace had got 14 beads; the second one had got 15; the third 16; the fourth 17; and the fifth 18. Thereafter, the dialogue continued as follows:

- 51 T: Please, look at the necklaces! The first one has got 14 beads, the second one 15, the third one 16, the fourth one 17, the fifth one 18. Do you think there is regularity amongst numbers? In what way do they continue? What can you say about these numbers?
- 52 S13: It is lined up from small to large one.
- 53 T: Yes, it is lined up from small to large one. What else?
- 54 S12: It is rising one by one.
- 55 T: It is rising one by one. Look from fourteen to fifteen.
- 56 Class: One.
- 57 T: It increased by one (*Writing 1 between the numbers of fourteen and fifteen on the board*). From fifteen to sixteen?
- 58 Class: One.
- 59 T: From sixteen to seventeen? (*Writing 1 between the numbers of fifteen and sixteen on the board*).
- 60 Class: One.
- 61 From seventeen to eighteen? (*Writing 1 between the numbers of sixteen and seventeen on the board*).
- 62 T: Yes, it is rising one by one.
- 63 Class: One.
- 64 T: Please look. Is there any regularity here? (*Writing 1 between the numbers of seventeen and eighteen on the board*).
- 65 S9: These numbers form a pattern. It rises one by one.
- 66 T: Yes, look! There is a pattern; these are the numbers lined up according to a rule. Look here are the numbers rising one by one. That is, there is a pattern. Yet, we are going to call that in a different way. If the numbers continue in a pattern and follow one another in order, we call them consecutive numbers.

In the above dialogue, the teacher initially created a context where the students built necklaces in groups and figured out the numbers of beads that each necklace had got. The teacher next asked students if they could see regularity amongst the numbers (Turn 51) and probed student ideas in the rest of the dialogue (Turn 53, 55, 57, 59, 61, 63). The teacher seemed to be seeking students' personal opinions. In response, the students were seen

uttering, *It is lined up from small to large one (52); It is rising one by one (54); these numbers form a pattern (64)*. Therefore, the students seemed expressing their own thoughts. Therefore, here, we can hear more than one voice, voices of students and teacher. This part of the dialogue is hence coded as *being open to student view*. Further, in the course of the dialogue the teacher did not label student responses as right or wrong. Therefore, the code of *neutrality* could also be seen in this part. In the last part of the dialogue, the teacher utilized students' ideas such as, *there is a pattern; the numbers lined up; the numbers rising one by one (Turn 65)* to build the meaning for the concept of consecutive number. This part is hence coded as *use*. The teacher used the students' ideas in order to build the meaning of a mathematical concept, which is the concept of consecutive number.

Furthermore, from the perspective of SDM, the activity of constructing necklaces, counting and writing the number of beads on the board created a meaningful *context* where the concept of consecutive number is brought to the classroom, but in fact only the teacher could see that here, in this particular part of the activity. The students, on the other hand, because of not being familiar with the concept of consecutive number yet, could not see that in the activity. Thereafter, the teacher specifically called the students' attention towards *lining up from small to large one* and *rising one by one (Turn 53, 55, 57, 59, 61, 63, and 65)*. The important elements of the activity setting are, in this way, isolated and pinpointed by the teacher. This act is called *contextualizing action*. In the last part of the dialogue, she stated, *if the numbers continue in a pattern and follow one another in order, we call them consecutive numbers (Turn 65)*. This act of labeling the emergent meaning is called *labeling action*.

Results

Based on the operational definitions displayed in Table 1, the teachers' classroom talks were analyzed. Table 2 displays the codes of the teacher discourses before and after the intervention. Thereafter, the total number of codes divided by the number of videos in order to figure out the average number of codes for a single class. Note that the numbers shown in parenthesis indicate this measure.

Table 2. Analysis of video-transcripts before and after intervention

Categories	Teacher 1 (Male)	Teacher 2 (Female)	Teacher 3 (Female)	Teacher 4 (Female)	Teacher 5 (Male)	Teacher 6 (Male)
Pre-Intervention Codes for Authoritative Talk	Promoting scientific view (20) Judgment (8)	Promoting scientific view (40) Judgment (17)	Promoting scientific view (17) Judgment (5)	Promoting scientific view (22) Judgment (4)	Promoting scientific view (15) Judgment (2)	Promoting scientific view (19) Judgment (3)
Codes for Dialogic Talk	Voice of student (1) Neutrality (4)	Neutrality (4)	Voice of student (4) Neutrality (1)	Neutrality (11)	Voice of student (7) Neutrality (8)	Voice of student (5) Neutrality (6)
Post-Intervention Codes for Authoritative Talk	Promoting scientific view (1) Judgment (2)	Judgment (8) Inattention (1)	Promoting scientific view (7) Judgment (16) Inattention (2)	Promoting scientific view (1) Judgment (2)	Promoting scientific view (4) Judgment (2) Inattention (1)	Promoting scientific view (8) Judgment (6)
Codes for Dialogic Talk	Voice of student (24) Neutrality (15)	Voice of student (28) Neutrality (19)	Voice of student (68) Neutrality (14) Use (6)	Voice of student (48) Neutrality (32) Use (2)	Voice of student (17) Neutrality (9)	Voice of student (36) Neutrality (8) Use (1)

Table 2 (Continued)

Categories	Teacher 7 (Female)	Teacher 8 (Female)	Teacher 9 (Female)	Teacher 10 (Female)	Teacher 11 (Female)	Teacher 12 (Male)
Pre- Intervention Codes for Authoritative Talk	Promoting scientific view (19) Judgment (7) Inattention (3)	Promoting scientific view (25) Judgment (11)	Promoting scientific view (16) Judgment (14)	Promoting scientific view (17) Judgment (11) Inattention (1)	Promoting scientific view (20) Judgment (11) Inattention (1)	Promoting scientific view (19) Judgment (5) Inattention (2)
Codes for Dialogic Talk	-	-	-	-	-	Voice of student (2) Neutrality (1)
Post- Intervention Codes for Authoritative Talk	Promoting scientific view (11) Judgment (6)	Judgment (11) Inattention (11)	Promoting scientific view (15) Judgment (12)	Promoting scientific view (23) Judgment (12) Inattention (2)	Promoting scientific view (4) Judgment (2) Inattention (0)	Promoting scientific view (17) Judgment (6) Inattention (3)
Codes for Dialogic Talk	Neutrality (8)	Voice of student (1)	Voice of student (2)	Voice of student (21) Neutrality (10) Use (1)	Voice of student (24) Neutrality (18) Use (1)	Voice of student (8) Neutrality (2)

Table 2 (Continued)

Categories	Teacher 13 (Female)	Teacher 14 (Male)	Teacher 15 (Female)	Teacher 16 (Female)	Teacher 17 (Female)
Pre- Intervention Codes for Authoritative Talk	Promoting scientific view (16) Judgment (8)	Promoting scientific view (2)	Promoting scientific view (14) Judgment (5)	Promoting scientific view (11) Judgment (14)	Promoting scientific view (20) Judgment (12)
Codes for Dialogic Talk	-	Voice of student (14) Neutrality (7)	Voice of student (4)	Voice of student (1)	-

Post-Intervention					
Codes for Authoritative Talk	Promoting scientific view (1) Judgment (10)	Promoting scientific view (1) Judgment (5)	Judgment (13)	Promoting scientific view (2) Judgment (9)	Promoting scientific view (3) Judgment (3)
Codes for Dialogic Talk	Voice of student (8)	Voice of student (68) Neutrality (35) Use (1)	Voice of student (36) Neutrality (17) Use (1)	Voice of student (53) Neutrality (21) Use (3)	Voice of student (11) Neutrality (4)

In order to see the change in dialogic discourse, the percentages of dialogic codes that emerged before and after intervention were calculated independently. To illustrate, for Teacher 1, in order to compute percentage of dialogic talk emerging before intervention, the number of dialogic codes, 5, was divided by the total number of codes, 33. This resulted in approximately 15%. In the same way, to figure out the percentage of dialogic talk emerging after intervention, the number of dialogic ones, 39, was divided by the total number, 42. It resulted in approximately 93%. Figure 1 displays the average percentages of dialogic talk for every teacher. The letter T stands for teacher.

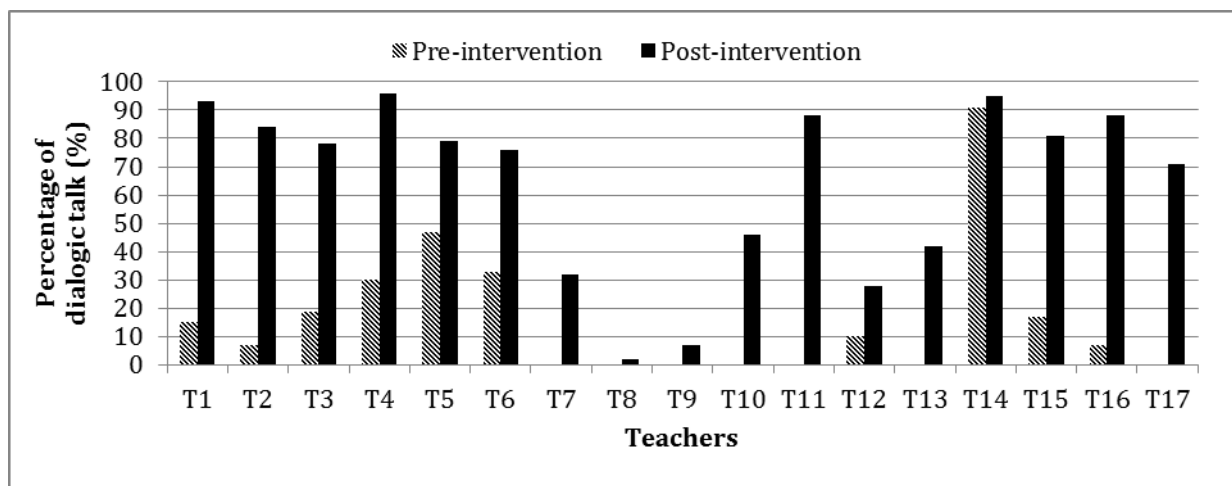


Figure 1. The percentages of dialogic talk determined before and after the intervention

As seen in Figure 1, after intervention, all the teachers altered their discourse to a more dialogic one. Particularly, before intervention, seven teachers (T7, T8, T9, T10, T11, T13, and T17) did not use dialogic talk at all. Another seven (T1, T2, T3, T4, T12, T15, and T16) only used it at a low percentage (between 0-30 %). Two teachers (T5 and T6) used it at a medium or lower percentage (between 31-50 %). On the other hand, after the intervention, only three teachers (T8, T9, and T12) used it at a low ratio (between 0-30 %), three (T7, T10, and T13) used it at a medium ratio or lower (between 31-50 %), but ten teachers (T1, T2, T3, T4, T5, T6, T11, T15, T16, and T17) used it at a high ratio (70 % or higher). This indicated that the program caused an increase in the number of teachers using dialogic talk at a high proportion, over seventy percent. Further to that, unexpectedly, one teacher, T14, was witnessed using dialogic discourse over 90 % at both pre and post-intervention. The discourses were later categorized based on those percentages. Level 0 indicated no dialogic talk at all; Level 1 indicated dialogic talk at most 25 %, Level 2 indicated dialogic talk varying from 26 to 50 %; Level 3 indicated that varying from 51 to 75 %; and finally, Level 4 indicated that varying from 76 to 100 %. Table 3 displays the codes categorized according to these levels.

Table 3. The levels of teacher discourses

Teachers	Levels of Teacher Discourses									
	Before Intervention					After intervention				
	Level 0	Level 1	Level 2	Level 3	Level 4	Level 0	Level 1	Level 2	Level 3	Level 4
T1		✓								✓
T2		✓								✓
T3		✓								✓
T4			✓							✓
T5			✓							✓
T6			✓							✓
T7	✓							✓		
T8	✓						✓			
T9	✓						✓			
T10	✓							✓		
T11	✓									✓
T12		✓						✓		
T13	✓							✓		
T14					✓					✓
T15		✓								✓
T16		✓								✓
T17	✓								✓	

The succeeding graph displays the number of teachers for every discourse level.

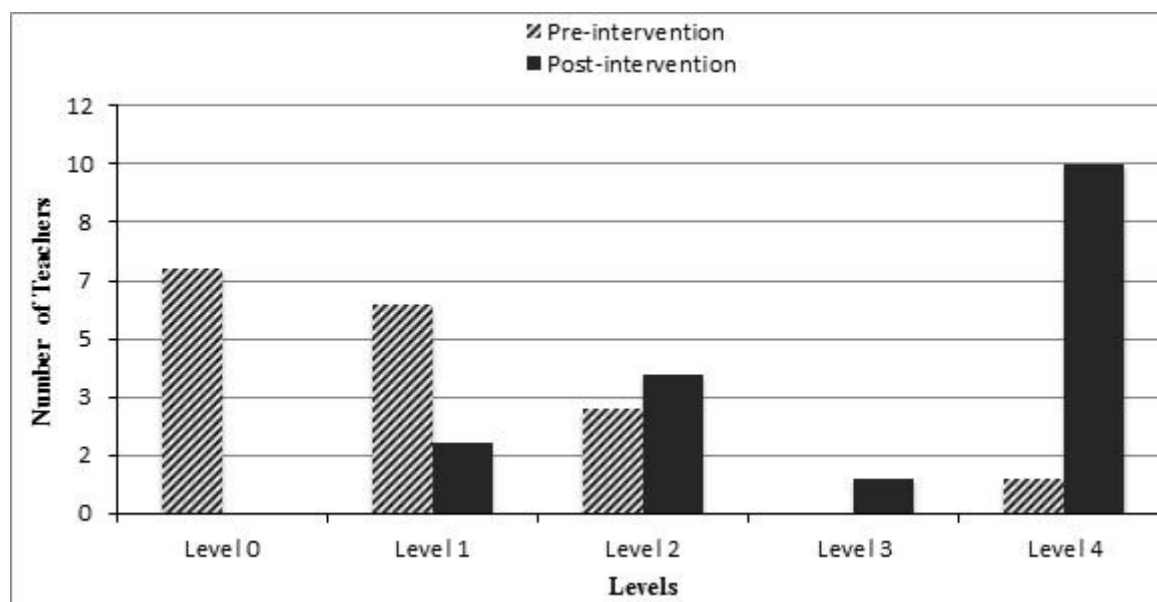


Figure 2. The number of teachers for every discourse level

A similar pattern can be seen in Figure 2. Before the intervention, at level 0, there were seven teachers and at level 1 and 2 were six and three teachers respectively. Only one teacher was at level 4. On the other hand, after the intervention, there was no teacher at level 0. At level 1 and 2 were two and four teachers respectively. At level 3 and 4 were one and ten teachers respectively. Therefore, after the intervention the number of teachers using dialogic talk at a high rate (Level 3 and 4) increased. Inversely, after the intervention, the number of teachers using dialogic talk at low level (Level 0 or 1) decreased. In order to determine whether this variation in the talk is meaningful, a dependent samples t-test, which is found appropriate for our study where the same subjects are observed in different times, was conducted. The pre and post-intervention mean scores for dialogic codes were compared. However, before undertaking that, the paired difference should be normally distributed; accordingly, tests of normality were initially performed.

Accordingly, the codes for dialogic talk are first counted. To illustrate, for T1, before the training, the video analysis indicated a total of 5 dialogic codes, 1 (*the voice of student*) plus 4 (*neutrality*). After the training, a total of 39 dialogic codes, 24 (*the voice of student*) plus 15 (*neutrality*) codes, were observed. Before running the t-test, since the sample size is smaller than 50, Shapiro-Wilk test was run. Table 4 displays the normality test results.

Table 4. Normality test

	Shapiro-Wilk		
	Statistic	df	Sig.
Difference	,910	17	,070

As seen in Table 4, the test of Shapiro-Wilk is discovered not significant at 0.05 levels. This result indicated that the difference scores are normally distributed. Then, dependent samples t-test was performed. Table 5 displays the t-test outcome.

Table 5. The difference means scores of dialogic codes

	Mean	N	Std. Dev.
Pre-intervention	4,71	17	6,24
Post-intervention	39,47	17	31,49

Means difference	Standard Deviation	t	df	Sig. (2-tailed)
-34,76	28,27	-5,07	16	,000

As seen in Table 5, the means of the codes for dialogic talk shifted from 4.71 to 39.47 and this difference is found significant ($t = -5.07$, $p < .01$). Furthermore, a Cohen's d of 1.23 (> 0.80) was calculated, which indicates a large effect size. Therefore, the t-test revealed that the SDM-based professional development program had a positive and statistically significant impact on teacher dialogic talk.

Conclusion and Discussion

The results indicated that SDM-based professional development program had a statistically significant impact on teachers' dialogic talk. Compared with their former practices, the teachers began to use dialogic talk more often. Most of them began to use it at higher levels, more than 70%. One could ask, 'what made it effective in creating such a talk?' The answer is buried in its one of the central elements: *creating a meaningful context*. As witnessed in the videos, in this action, teachers using such cultural tools as symbols, videos, pictures, stories, lab equipment, puzzles, plays, and most importantly *language, and probing students' ideas*, created meaningful contexts or shared activities. The emergent talks, teacher and students utterances, as a result, have unescapably become highly contextualized, wide-ranging, multivoiced, and freely developed. This paper, hence, suggesting a sociocultural method of instruction (SDM) for the emergence of dialogic talk, we believe, could make an important contribution to the current literature and classroom practices.

Interpreting the words of Vygotsky and Bakhtin, Wertsch (1991, pp 34, 38, 86-92) similarly asserted that dialogic process involves concrete, face-to-face communication. Further, he claimed the child's intramental functioning results from the mastery of such a dialogic organization of speech on intermental plane, on which two or more voices are heard and communicative moves are carried out through this social dialogue. In this course of action, however, the adult's utterance serve as a thinking device for the child and later on becomes a part of child's inner speech. The genetic precursor of child's way of thinking on intramental plane could therefore be found in intermental functioning. In other words, the egocentric speech grows out of its social foundations via transferring social, collaborative forms of behavior to the sphere of the child's psychological functioning. This, hence, makes classroom dialogic talk an important social act for the development of child's way of thinking or cultural development.

Mortimer and Scott (2003) stressed that the emergent talk of school science involved four basic categories: interactive/dialogic communicative approach, non-interactive/dialogic communicative approach, interactive/authoritative communicative approach, and non-interactive/ authoritative communicative approach. Whereas, in our data, since there is always an interaction between students and teacher, we did not observe a

non-interactive way of communication. Accordingly, the emergent classroom talks were seen being either dialogic or authoritative. Further to that, to Mortimer and Scott, in dialogic communicative approach, attention is paid to more than one point of view. However, we further view dialogic talk as context dependent. In other words, to us, classroom communication, other than involving probing, listening to, and exploring students' ideas, must also be contextualized within a meaningful activity. To us, for instance, discussing relationship between pressure and boiling point without conducting an experiment would very likely not allow the dialogic talk to grow.

The descriptive analysis further indicated that while some teachers started using dialogic talk at high levels, some began or continued using it at a very low level, lower than 50 %. There could be many reasons for this weak improvement and this indisputably need further research. However, when examining teachers' total number of contact hours that they spent in the activity (see Appendix A), we observed that ten teachers, T1, T2, T3, T4, T5, T6, T11, T15, T16, and T17, using dialogic talk at high levels attended all the contact hours. However, it was also observed that two teachers, T7 and T12, even attending all the hours, used dialogic talk at low level. On the other hand, four teachers, T8, T9, T10, and T13 using dialogic talk at low level attended 75, 50, 50 and 50 % of the hours respectively. From this data, therefore, it could be speculated that high attendance rate does not warrant high performance, but the low attendance rate might be a predictor of low performance. A study (Garet, Porter, Desimone, Birman & Suk Yoon, 2001) on professional development programs reached a similar outcome. It was reported that contact hours have a significant positive impact on opportunities for active learning, active learning opportunities have a positive but a weak effect on enhanced teachers' knowledge and skills, and teachers' knowledge and skills have a substantial positive effect on changing teacher practices. In the forthcoming paper, the impact of dialogic talk on student classroom involvement is going to be reported.

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