Journal of Mathematics Education
December 2013, Vol. 6, No. 2, pp. 1-16

Teacher Interventions as an Analytical Entry Point to Study Cooperative Learning in Middle School Mathematics Classrooms in China

Lianchun Dong
Monash University, Melbourne, Australia;
Yiming Cao
Beijing Normal University, Beijing, P.R. China

Cooperative learning has been emphasized in China since the initiation of curriculum reform in mathematics. In recent years, many mathematics teachers in China have begun to investigate how cooperative learning could be employed in classrooms with more than 50 students. In this study, a teacher intervention was operationally defined as a sequence of speaker turns in which the teacher and students in a cooperative-learning group addressed one another regarding an assigned problem. This study investigates when the teacher chose to initiate a teacher intervention and what actions the teacher took during such interventions. Analysis reveals the tension between well-established interactive patterns derived from whole class discussion and individual guidance and the new demands of promoting student cooperative learning. This analytical approach identifies those student performances in cooperative learning that are given more attention (and therefore performatively valued) by teachers.

Key words: cooperative learning, teacher interventions, middle school, mathematics classrooms

Cooperative learning is the instructional use of small groups in which students work together to maximize their own and each other's learning (Johnson & Johnson, 1999). It provides an alternative to competitive or individualistic classroom activities by encouraging collaboration among students in small groups (Emmer & Gerwels, 2002). And the potential value of this learning activity has been widely recognized (Dekker & Elshout-Mohr, 2004). Cooperative learning was introduced to Chinese researchers and practitioners around 30 years ago (Liu, 2009). It has received increasing attention with the promotion of mathematics curriculum reform which cconsiderably values interaction and cooperation among students and recommends the teachers to employ cooperative learning in mathematics classrooms (Ministry of Education, 2001).

However, Chinese school mathematics teachers has been reported to experience great difficulties when they try working with small groups in classes (Cheng, 2010; Lin, 2004), which not only hinders the functioning of group work, but also makes both teachers and students feel disappointed at the effects of so-called cooperation.

This may not be difficult to understand when we consider deeply the situation in China. The first issue is the fact that the teachers in China have been the persons who dominate the mathematics classrooms for a long period. Mathematics teachers get used to teacher-centered instructional models and it is difficult for them to implement drastic changes from teacher-dominating classrooms to cooperative-learning classrooms. Some of them even expressed great concern about losing control of the class when students are allowed to discuss at their own pace. Moreover, despite the large amount of investigations into teachers' behavior in mathematics cooperative-classes (Ebrahim, 2012; Leikin & Zaslavsky, 1997;), the class size in most research is relatively smaller than that occurring in China, where it is a great challenge for teachers to monitor the group work of more than 45 students and to provide them with the necessary assistance. This means these methods developed in small-class-size cooperative-learning classrooms could not be borrowed directly for use in Chinese cooperative-learning classrooms. Therefore, it is urgent to investigate cooperative-learning classes in mainland China and thus provide some suggestions particularly suitable for Chinese classrooms.

Research Objective and Question

The teacher, who seems to stand outside the groups during cooperative learning, actually plays an absolutely essential role in promoting the functioning of small groups (Ding et al., 2007; Webb, 2009). Not only should teachers monitor students' on-task behavior (Johnson & Johnson, 1990), but also they need to provide necessary assistance when no students in the group can answer one question, or when students have difficulty in communicating with each other, or when group members treat one another with authority and no true dialogue occurs (Ding et al., 2007).

A TI (Teacher Intervention) was operationally defined as a sequence of speaker turns in which the teacher and students in a cooperative-learning group addressed one another regarding the assigned problem (Chiu, 2004). Teacher intervention is significant to the success of group work in that it provides students and groups with necessary assistance and guidance (Chiu, 2004; Dekker & Elshout-Mohr, 2004; Ding et al., 2007).

In this case study, I investigated how a Chinese mathematics teacher intervened when students worked in groups and what kinds of students' performance were given more attention. By doing this, I intended to identify the problems associated with teacher intervention in cooperative-learning

classrooms and to provide mathematics teachers with some suggestions about how to intervene more effectively. Specifically, this research intended to answer the following questions: When the teacher chose to initiate a teacher intervention and what actions the teacher took during such interventions?

Conceptual Framework

Teacher intervention is of great importance especially at the beginning stage of employing cooperative-learning in classes, because students may lack the experience of cooperating, as well as the essential interpersonal and group skills and abilities required for cooperative leaning (Lin, 2004; Cheng, 2010). Based on the previous studies (Cao, 2011; Chiu, 2004; Johnson & Johnson, 1999), three aspects of TIs were investigated in this research:

(1) **The initiation of TIs:** It is necessary to look at who actually starts teacher interventions. Sometimes, students also actively ask the teacher for help. Under these circumstances, students' requests for specific help might make teacher evaluation of the group's work easier and elicit a helpful teacher response, which in turn might improve the TI outcome (Chiu, 2004). In contrast, teacher evaluation of the group's work relied solely on the teacher's own diagnose if the teacher starts TIs all the time.

(2) **The targets of TIs:** The targets of TIs are worthy of particular attention in that they could reflect the teacher's values and beliefs on cooperative learning. Different types of targets could be reflected through different ways of teacher-student interactions which, according to Cao (2011), could be divided into 1) with the whole class, 2) with one particular student, 3) with all the members in one particular group. When students work in groups, however, the teacher seldom interacts with the whole class except when repeating and emphasizing some details. So the most common targets of TIs are individual students or one group.

(3) **Teacher actions during TIs:** Through teacher approaches in TIs, it will become more obvious what kinds of student performances are valued by the teacher and in which way the teacher will affect students' cooperative learning. According to Johnson and Johnson (1999), while students work in their groups, the teacher should observe each group and intervene to provide academic assistance and help in using the interpersonal and small group skills required to work together effectively.

These aspects of teacher interventions lay basis for the whole research reported in this article, including research design, data collection and analysis.

Methods

Settings and Participants

Data were drawn from video-recorded observations collected from one

mathematics teacher's class in a junior high school in China, which were sampled for the Alignment Project (http://www.alignment.iccr.edu.au/). The selected junior high school is located in an urban area of a city in Jiangsu Province—an eastern coastal province of China. The overall academic level of teachers and students in this school is much higher than their counterparts in the city. The main characteristic of the school is that students study all subjects mainly through independent exploration, followed by cooperation and exchange.

There were 46 students in total in the particular class chosen for this study and the whole class was divided into 8 regular heterogeneous groups. For each small group, a group leader was appointed to mediate group members' cooperation. The mathematics teacher in this class, Mr. Zhang, who had a bachelor's degree in mathematics and a teaching certification diploma, is a well-recognized, competent teacher with 16 years of teaching experiences.

Data Collection

When the data collection started for this research, cooperative learning had been implemented in this school for more than two years. The class was observed and video recorded for 11 consecutive lessons with three cameras which respectively focused on the teacher, one selected group of students, and the whole class. Out of the 11 consecutive lessons, 7 lessons involved the activity of group work and thus were selected for data analysis. Apart from video recordings, the data collected for each lesson also included teaching and learning materials, such as textbooks, lesson plans, PowerPoint slides, courseware produced by *Geometer's Sketchpad*, test papers, learning plans and etc.

The instructional topic involved in all the lessons collected was quadratic function. For each lesson, the teacher had established a very regular structure, which consisted of four distinct parts.

(1)One day earlier, the teacher passed out learning plans to every student, asking students to learn the new topic and to accomplish the tasks in learning plans independently. Next day, students handed in their learning plans to be corrected by the teacher, who would pass out the corrected learning plans to students before the lesson (Note: teacher tended to give some opinions on students' solutions, rather than to merely tell students whether their solutions were right or wrong). .

(2)At the beginning of the lesson (around 10-15 minutes), the teacher asked students to exchange ideas on the tasks in learning plans in groups, as well as on the solutions to the tasks. The teacher would move around in the classroom to provide help and guidance to each group when needed. Sometimes, the teacher gave a short lecture about the common mistakes students made in the learning plans before group work.

(3)After discussion and exchange in groups, one group was selected by

the teacher to present the unanimously agreed ideas they had achieved on how to solve the tasks, on divergence of ideas within the group, and on the questions they could not answer by themselves. Each group member was responsible for some particular part of the presentation. After each member's presentation, other members in this group could add some points to what he/she had presented. Then other students could express their opinions about what had been presented. The teacher would generally get involved in this part and give a lecture to summarize the main points. This part usually took 15-20 minutes.

(4) After the whole group completed the presentation, the teacher always gave an overall summary of the tasks, as well as the main mathematical points in this lesson. The time for this part was 10-15 minutes.

Data Analysis

The researchers firstly watched the classroom videos and identified the episodes where students worked in groups, followed by the transcription of all identified episodes. Then, with the assistance of other data (such as lesson plans, learning plans, etc) collected for the study, all the transcripts were coded in two rounds. The first round of coding was intended to identify the initiation of TIs, the targets of TIs, teacher actions during TIs. The detailed introductions to the coding systems are presented in the following parts. The second round of coding focused particularly on one of teacher actions during TIs: to provide academic assistance. The reason for this round is because it was revealed that a variety of approaches were employed by the teacher to provide academic assistance. And the name and explanations of these sub-categories are also demonstrated in the following paragraphs. Qualitative analysis software, *NVivo*, was employed for data analysis in this research.

Coding Systems

The initiation of TIs. Not all teacher interventions were initiated by the teacher, since students could make a request for help or directions when they faced challenges which could not be solved by cooperation. Therefore, two situations in which teacher interventions were initiated are coded in this study: 1) by teacher, 2) by students.

The targets of TIs. According to the conceptual framework, the target of teacher intervention was coded using two categories: 1) one particular student or several members of the group, 2) all the members in one particular group.

Teacher actions during TIs. Based on the conceptual framework, there are two main teacher actions during teacher interventions: 1) to provide academic assistance, 2) to provide guidance on interpersonal and small group skills. Apart from these, three other teacher behaviors were also identified

through watching the videos: 3) to monitor the students' progress by enquiring, 4) to evaluate students' work, 5) to demand other student performances. Therefore, the teacher actions during teacher intervention were coded using 5 categories as listed below.

1) To provide academic assistance. Teacher provides directions and assistance on the tasks that students are working on. Through watching the videos, the directions and assistance were coded further into 6 sub-categories, including:

a) To respond to students' questions. Teacher responds to the questions that students put forward;

b) To ask students to explain their correct solutions. When students achieve the correct solutions, the teacher asks students to give explanations for their solutions;

c) To supplement students' explanations. When students failed to make complete explanations for their correct solutions, the teacher makes a supplement to the explanations;

d) To correct students' mistakes. When the teacher finds out mistakes made by students, he or she directs students to identify and to realize the mistakes, thereby help students to correct the mistakes;

e) To provide scaffolding tasks to students. The teacher provides some small or scaffolding tasks to promote students' accomplishment of the final tasks;

f) To provide challenging tasks to students. When students accomplish the assigned tasks completely, the teacher provides some more challenging tasks to further their learning.

2) To provide guidance on interpersonal and small group skills. The teacher guides students to discuss and exchange ideas with each other more effectively and efficiently.

3) To monitor the students' progress by enquiring. The teacher asks students questions about their progress of cooperation and discussion in order to monitor their progress.

4) To evaluate students' work. The teacher praises or criticizes students' work or behavior.

5) To demand other types of student performances. The teacher requires students to perform something non-academic, such as requirements on learning habits.

Results

During group work period in classroom instruction, the teacher visited all the eight groups, with the overall number of teacher interventions observed in the seven lessons being 73 (1.3 TIs per group per lesson).

The initiation of TIs. Almost all the TIs were started by the teacher

who initiated 64 out 73 TIs (See Figure 1). In contrast, students seldom asked for help, with only 9 TIs being initiated by students.

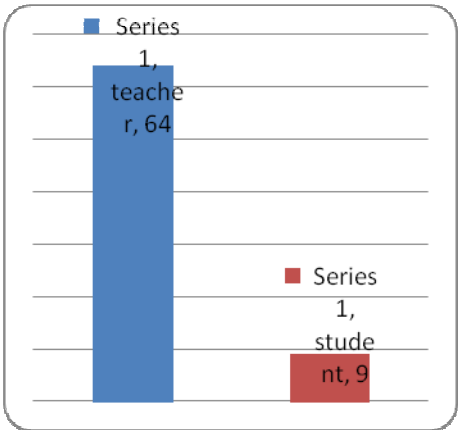


Figure1. Initiation of teacher interventions.

The targets of TIs. In most TIs, the target was one particular student or several members of one group, which took up more than 60% of all TIs (See Figure 2). In contrast, only 28 out 73 TIs observed in the research were aimed at all the members in one group.

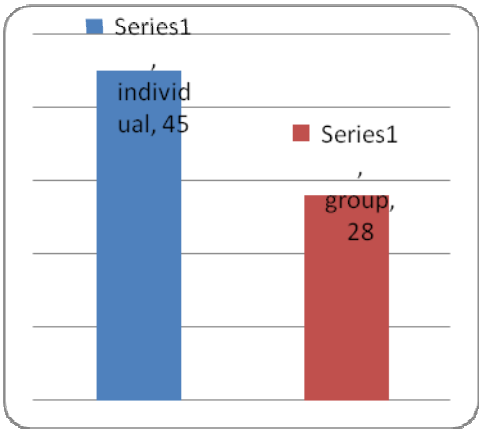


Figure 2. Targets of teacher interventions.

Teacher actions during TIs. The overall number of teacher actions observed during teacher interventions is 101 (Note: several types of teacher actions may be observed in one TI). In most cases, the teacher provided students with academic assistance (See Table 1), which accounts for almost 70% of all teacher actions observed in teacher interventions. The cases when the teacher provided students with guidance on interpersonal and group skills are nearly the same as those when the teacher monitored students' progress through enquiring, each representing around 10% of all teacher actions. The

teacher rarely made comments on students' work, with only 8 out 101 teacher actions aiming to evaluate students' work, accounting for 7.92% of all teacher actions. The least common teacher actions observed during TIs was to demand other types of student performances, the proportion of which is less than 3%.

Table 1
Teacher Actions During Tis

Teacher actions	N	Percent
To provide academic assistance	6	68.32
To provide guidance on interpersonal and	1	9.90
To monitor students' progress through	1	10.89
To evaluate students' work	8	7.92
To demand other types of student performances	3	2.97

Academic assistances during TIs. As is presented in Table 1, the overall number of teacher actions aimed at providing students with academic assistance was 69. The breakdown of this kind of teacher actions is illustrated in Table 2. The predominant purpose of academic assistance was to correct students' mistakes, which took up approximately 50% of the whole. The second most common academic assistance was to provide scaffolding tasks to students, representing almost 16%. The number of cases when the teacher responded to students' questions was 9 (13.04%), which is just around 1% more than the cases when the teacher asked students to explain their correct results. The situations when the teacher supplemented students' explanations happened 5 times, the same as those when the teacher provided challenging tasks to students, occupying 7.25% each.

Table 2
Academic Assistance during Teacher Interventions

Academic	Number	Percentage %
To respond to	9	13.04
To ask students	8	11.59
To supplement	5	7.25
To correct	31	44.93
To provide	11	15.94
To provide	5	7.25

Discussion

When Did Teacher Interventions Occur and What Kinds of Student Performance Were Valued By Teacher

From Table 1 and Table 2, which present the teacher's actions in TIs,

we can also see the most common situations when teacher implemented TIs. As presented in Table 1, it is evident that what teacher did most frequently during TIs was to provide students with academic assistance. To be more specific, two kinds of academic assistances occurred most frequently during TIs, namely to correct students' mistakes, and to provide scaffolding tasks to students. The two kinds of assistance mentioned above are mainly for students who experienced difficulty in finding the correct solution. This reflects that the teacher implemented most TIs when students made mistakes and made little progress. For students who had difficulties in finding correct solutions, their performance valued by the teacher was to forward in right directions. To this end, the teacher guided them to realize the mistakes or lower the difficulty of the task through providing scaffolding tasks. One transcript of the episode when teacher corrected students' mistakes is presented below.

Transcript 1 - Correct the mistake

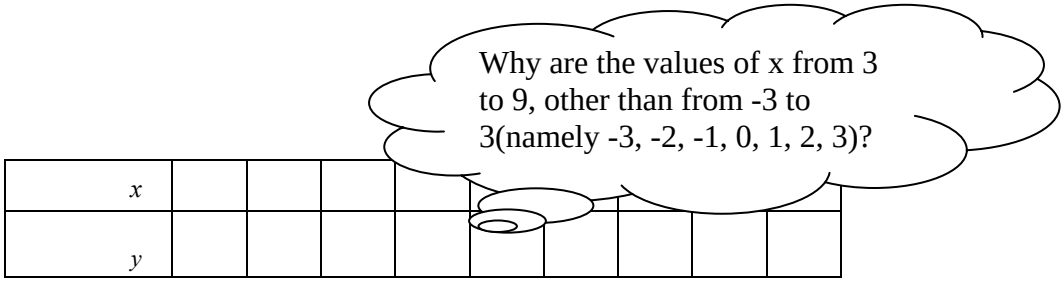
Task:

[Practice] Follow the steps below to sketch the graph of $y=\frac{1}{2}x^2-6x+21$.

Step 1: The vertex of $y=\frac{1}{2}x^2-6x+21$ is__.

Step 2: The axis of symmetry of $y=\frac{1}{2}x^2-6x+21$ is__.

Step 3: fill out the table according to the symmetry of graphs:



Step 4: draw the points according to the above table and sketch the graph of $y=\frac{1}{2}x^2-6x+21$.

Situation:

The following is one student's answer to the question "Why are the values of x from 3 to 9, other than from -3 to 3 (namely -3, -2, -1, 0, 1, 2, 3)?" *[**Note**: in the previous tasks, the values given in the table were from -3 to 3 (namely -3, -2, -1, 0, 1, 2, 3). So this is mentioned in this task].*

By "completing the square" technique, I can get $y=\frac{1}{2}(x-6)^2+3$

from $y=\frac{1}{2}x^2-6x+21$.

$\because \frac{1}{2}(x-6)^2 \geq 0$

$\therefore \frac{1}{2}(x-6)^2+3 \geq 3$

Therefore, the values begin from 3.

Conversation:

T: What are doing by this (pointing at the student's answer)?

S: I am answering the question "Why are the values of *x* from 3 to 9, other than from -3 to 3 (namely -3, -2, -1, 0, 1, 2, 3)?"

T: You have achieved "the values are larger than 3". Whose values do you mean?

S: I mean the whole value of calculating $\frac{1}{2}(x-6)^2+3$

T: Then could I write $y \geq 3$?

S: Sure.

T: Please tell me that whose values, *x* or *y*, are larger than 3?

S: *y*.

T: But in the question it means the values of *x* when it states "-3,-2,-1, 0, 1, 2, 3". It asks you why the values of *x* are from 3 to 9, doesn't it?

S: Yes.

T: Now what are you calculating? You are showing that the minimum value of *y* is 3, aren't you?

S: [nodding the head]

T: Discuss this question again with the members in your group.

As well as the actions mentioned above, the teacher also provided academic support to students who succeeded in achieving the correct results, namely by asking students to explain their correct results, by supplementing students' explanations and by providing challenging tasks. These TIs all occurred when students had achieved correct results, which means that another occasion when TI happened frequently was the occasion of the achievement of correct results by students.

Transcript 2 - Ask students to explain the correct results & supplement students' explanations

Task:

Summarize the relationship between quadratic function $y=ax^2+k$ and quadratic function $y=ax^2$?

Situation:

In one group, one of the main conclusions is: when $k<0$, we can get the graph of quadratic function $y=ax^2+k$ by translating the graph of quadratic function $y=ax^2$ vertically through $|k|$ units.

Conversation:

T: [pointing at students' results] Tell me, why it is the absolute value of k ?

S: Because when we express the units of translation, we mean positive numbers.

T: In other words, when we add a k to ax^2, the value of k could be a positive number, a negative number, or a zero. Now $k < 0$, it means we add a negative number to ax^2, doesn't it?

S: [nodding the head]

[Then teacher left]

For these students, who had achieved correct results, the performance explicitly valued by the teacher was evident in the teacher's efforts to encourage them in the direction of high-level cognition. The teacher developed students' high-level cognition by asking them to explain the results according to their understanding, which could improve students' thinking ability and their mathematical reasoning and help to produce higher achievement (Mevarech & Kramarski, 2003). The teacher also encouraged students to move beyond the current task by challenging them with more complicated tasks. What the teacher expected was that these students' high-level cognitive skills would be developed as soon as possible.

Tension between Well-Articulated Ways of Teaching and Cooperative Learning

The initiation of TIs. Most of the TIs were initiated by the teacher (See Figure 1), which shows that the teacher played an active role in intervening in the groups' activities. In most cases, the students in a cooperative group tended not to ask for the teacher's help, although they might realize that they had some difficulties in solving the problem by themselves. The students got used to waiting for the teacher's guidance. The teacher, however, seemed to be satisfied with this situation, and did not explicitly require students to identify their difficulties and to actively ask for teacher's help.

The student requests for specific help might make the teacher's evaluation of the group's work easier and thereby elicit a helpful teacher response, which in turn might improve the TI outcome. In contrast, students who cannot identify or recognize their plight rely on the teacher's diagnosis of the problem, so they might benefit less from a TI than those who recognize that they need help (Chiu, 2004).

Transcript 3

Task:

Please write down three different forms of quadratic functions.

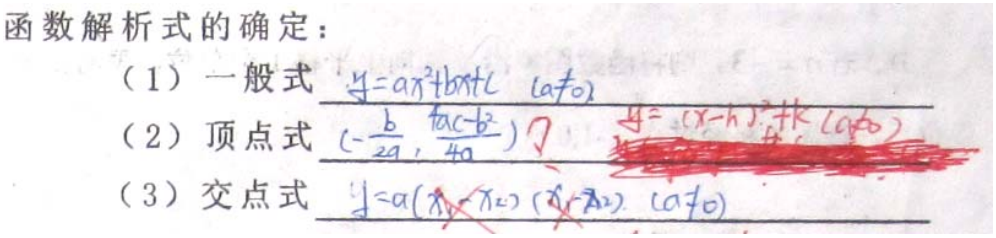
(1) Standard form_____.

(2) Vertex form_____.

(3) Factored form_____.

Situation:

One student in a group gave wrong answers to (2) and (3). Although he had corrected (2), he did nothing to the wrong answer to (3). This student was figuring out other problems when the teacher intervened. His wrong answer to (3) is $y=a(x_1-x_2)(x_1-x_2)\ (a\neq0)$, which is shown below.



Conversation:

T: [pointing at the wrong answers] Why did you make this wrong again?

S: ……

T: You made the same mistake last time when I had emphasized this. It should be $y=a(x-x_2)(x-x_2)\ (a\neq0)$. [Then teacher left]

From what the teacher said, it was not the first time that this student made the same mistake. The fact the student corrected the answer to task (2) without doing anything to task (3) suggests that this student may have some difficulties in identifying his mistakes and in understanding the factorized form. But the student did not ask the teacher or other members in the group for help and the teacher also did not require him to clarify why the student had produced such answers before the TI. The only thing the teacher did was to criticize the student and tell him the right answer. After that, the teacher left him. Without understanding the meaning of the right answers, the student may make the same mistakes next time.

The targets of TIs. As we can see from Figure 2, the main focus of TIs was one individual student or several members of one group, rather than the whole group. In transcript 1, when the teacher found the student made mistakes, he directly communicated with the student and directed the student attention to the mistakes, rather than getting other members of the small group involved in discussing the incorrect solution. The case is similar in transcript 3, where the teacher told the student the right answers without asking other members to provide support. In these situations, the student who made the mistakes was actually singled out as an individual by the teacher, rather than as a member of his small group.

Support on group work. Compared with the teacher's great commitment to provide academic assistance, the teacher provided less guidance on interpersonal and group skills (See Table 1). Actually, from the

videos collected, it was obvious that some groups did not work effectively. For example, in one group, there were only two or three members dominating the discussion, while other members listened to the discussion passively, in which situation the teacher did not implement TIs to help them. Even in some situations when the teacher provided guidance on group skills, it did not help a lot. See the transcript of a TI below.

Transcript 4

T: Do not just write down what they said. You should first tell them your own opinion on the problem and then discuss this with other group members.

S: Yes, sir

T: [walked away].

Through the video observation, it is clear that the student continued to be silent in the discussion after the teacher walked away. The TI only targeted this individual student, without providing advice to other members of the group. It is fair to claim that the guidance was ineffective to some extent.

Individual seatwork vs group work. Of all the lesson events that might be observed in mathematics classrooms around the world, one of the most immediately familiar is that moment when the teacher, having set students independent or group work, moves around the classroom (O'Keefe, Xu, & Clarke, 2006). Actually, individual seatwork is a much more common activity than group work in Chinese classroom instructions. This activity is one where students work on a task individually, without discussion with other students (Mok & Lopez-Real, 2006). It is undoubted that individual seatwork is completely different from group work, which emphasizes discussion and cooperation among students.

From the analysis above, we can clearly see that: 1) the teacher initiated most of the TIs, 2) the focus of the TIs were one individual student or some students of one group rather than one whole group, and 3) the teacher paid less attention to the function of cooperative learning than to academic matters and provided less guidance on skills essential for cooperative learning. In some extent, the TIs implemented by the mathematics teacher in cooperative learning worked more like the guidance during individual seatwork, where the teacher does not have to care about anything but helping one individual student move forward. Although the mathematics teacher had implemented cooperative learning for two years at the time the data was collected, he seemed not to succeed in transferring from providing students with guidance during individual seatwork to implementing TIs during cooperative learning. TIs implemented by the teachers retained strong features that were the same as those the teacher would employ when students engage in individual seatwork. There existed great tension between the teacher's behavior during individual seatwork and that employed during cooperative learning.

Implications

According to the discussion above, three main suggestions for mathematics teachers and policy makers about how to implement TIs in mathematics cooperative-classes are suggested.

Firstly, the teacher should train the students' and groups' ability to summarize and express the difficulties they encounter in group work. When students in one group cannot solve the challenges, even after the whole group discussion, they should not wait for teachers' assistance passively. Rather, they should learn how to recognize and clarify their challenges and ask for the teacher's help by expressing the problem clearly. If the students are only capable of asking for general help, such as "We don't know what to do next", the teacher should encourage them to express more detail about the nature of their difficulties. This will help the teacher to evaluate the group's rate of work and to provide guidance and assistance in an appropriate and focused way, which will improve the quality of teacher intervention and help the whole group to move forward.

Secondly, the teacher should provide academic assistance after allowing the group to have the opportunity to discuss sufficiently. The teacher should keep in mind that seatwork instruction in Chinese traditional classes is completely different from teacher interventions in cooperative classes. Each student in cooperative classes should be regarded as one member of one group rather than one single individual who has little connection with other students. Therefore, when the teacher finds some students have made mistakes, it is not recommended for the teacher to implement TIs immediately. The teacher should encourage the whole group to solve the problems through discussion and interaction. Only when no-one in the whole group could figure out how to solve the problems, should the teacher provide necessary assistance and guidance to the whole group.

Lastly, the teacher should learn how to provide effective guidance on interpersonal and group skills. As is mentioned in the discussion above, the teacher provided less support on group work, compared with academic assistance. The actual condition of group discussion, however, required more guidance because the discussion in some groups were dominated by one or two members and some group discussion turned into seatwork without exchanges. Although the teacher provided some support on group work, it did not work as effectively as expected. Some measures should be taken to change the conditions. For one thing, the teachers themselves should receive relevant training courses on how to provide guidance on interpersonal and group skills in cooperative classes. Different levels of educational departments should take this into consideration when organizing professional training for in-service teachers.

References

Alfie, K. (1992). Resistance to cooperative learning: Making sense of its deletion and dilution. *Journal of Education*, *174*(2), 38–56.

Blatchford, P., Kutnick, P., Baines, E., & Galton, M. (2003). Toward a social pedagogy of classroom group work. *International Journal of Educational Research*, *39* (1-2), 153–172.

Cao, Y. (2011). *Guojishiyexiadezhongxueshuxueketangweiguanfenxi*. Beijing: Beijing Normal University Publishing Group

Cheng, H. (2010). Shuxueketanghezuoxuexiwentitouxi—Yixianshimouchuzhongweili. *JiaoYuDaoKan*, *1*, 40-42.

Chiu, M. M. (2004). Adapting teacher interventions to student needs during cooperative learning: How to improve student problem solving and time on-task. *American Educational Research Journal*, *41*(2), 365-339.

Dekker, R., & Elshout-Mohr, M. (2004). Teacher interventions aimed at mathematical level raising during collaborative learning. *Educational Studies in Mathematics*, *56*(1), 39-65.

Ding, M. , Piccolo, D., & Kulm, G.. (2007). Teacher interventions in cooperative-learning mathematics classes. *The Journal of Educational Research, 100*(3),162-175

Ebrahim, A.(2012). Effect of cooperative learning strategies on elementary students' science achievement and social skills in Kuwait, *International Journal of Science and Mathematics Education*, *10*, 293-314.

Emmer, D.. & Gerwels, M. (2002). Cooperative learning in elementary classrooms: Teaching in practices and lessons characteristics. *Elementary School Journal*, *103*, 75-91.

Gillies, R. M., & Boyle , M. (2008). Teachers' discourse during cooperative learning and their perceptions of this pedagogical practice. *Teaching and Teacher Education*, *24*(5), 1333–1348.

Gillies, R. M. (2004). The effects of communication training on teachers' and students' verbal behaviors during cooperative learning. *International Journal of Educational Research*, *41*(3), 257–279.

Johnson, D. W., & Johnson, R. T. (1999). Making cooperative learning work. *Theory into Practice*, *38*(2), 67-73

Kutnick, P., Blatchford, P., & Baines, E. (2002). Pupil groupings in primary school classrooms: Sites for learning and social pedagogy? *British Educational Research Journal*, *28*(2), 187-206.

Liu, J. (2009). Conversion from explicitness to implicitness: Retrospection and reflection on 20 years of researches of cooperative learning in china. *Theory and Practice of Education*, *20*(6), 50-53.

Lin, G. (2004). Mistaken idea and countermeasure of mathematics group cooperation learning. *Journal of Mathematics Education*, 13(3), 99-101.

Leikin, R., & Zaslavsky, O. (1997). Facilitating student interactions in mathematics in a cooperative learning setting, *Journal for Research in Mathematics Education,28* (3),331-354.

Mevarech, Z. R. & Kramarski, B. (2003). The effects of metacognitive training versus worked-out examples on students' mathematical reasoning. *British Journal of*

Educational Psychology, 73(4). 449-471.
Ministry of Education. (2001). *National curriculum standards of mathematics for basic education* (2011 edition). 2-3, Beijing: Beijing Normal University Publishing Group.
Mok, I. A. C., & Lopez-Real, F. (2006). A tale of two cities: A comparison of six teachers in Hong Kong and Shanghai. In D. Clarke, C.Keitel,., & Y.Shimizu, (Eds). *Mathematics classrooms in twelve countries: The insider's perspective* (pp. 237-246). Rotterdam, The Netherlands: Sense.
O'Keefe, C., Xu, L.H., & Clarke, D. (2006). Kikan-Shido: Between desks instruction. In D. J Clarke,. J.,Emanuelsson, E.Jablonka, & I. A. C. Mok (Eds). *Making connections: Comparing mathematics classrooms around the world* (pp. 73-105). Rotterdam, The Netherlands: Sense.
Rachel, H-L.(2008). Beyond the classroom and into the community: the role of the teacher in expanding the pedagogy of cooperation. In R. Gillies, A. Ashman, & J. Terwel (Eds.), *The teachers' role in implementing cooperative learning in the classroom* (pp.37-54). New York, NY: Springer.
Webb, N. M., Nemer, K. M., & Ing, M. (2006). Small-group reflections: Parallels between teacher discourse and student behavior in peer-directed groups. *The Journal Of The Learning Sciences*, *15*(1), 63–119.
Webb, N. (2009). The teacher's role in promoting collaborative dialogue in the classroom. *British Journal of Educational Psychology 79*, 1-28.

Authors:

Lianchun Dong
Monash University, Melbourne, Australia;
Email: donglianchun1986@163.com

Yiming Cao
Beijing Normal University, Beijing, P.R. China
Email: caoym@bnu.edu.cn