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An investigation into participation in classroom dialogue in mainland China

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Abstract: Classroom dialogue is commonly used in teaching and learning, and viewed as in terms of helping students to think critically and understand knowledge better. Thus, educators and scholars call on active participation in classroom dialogue. However, students in mainland China are traditionally viewed as less talkative in class. In this study, I aimed to investigate how Chinese students in secondary school normally participate in classroom dialogue. I designed an instrument for measuring students' participation, and my research yielded initial evidence for its reliability and validity. The findings indicated that most students generally talked less and the teachers took the lead in initiating dialogue. Accuracy was used as the main criterion for evaluating whether students made a good contribution in class. A positive change was that students developed their reasoning through participating in dialogue.

Subjects: Behavioral Sciences; Development Studies; Education

Keywords: participation; classroom dialogue

1. Introduction

Classroom dialogue is a widely used tool for teaching and learning (Howe & Abedin, 2013, p. 326). Numerous studies have been conducted on classroom dialogue. According to a recent review by Howe and Abedin (2013, p. 326), classroom dialogue may be summarized as verbal communication in classroom settings where "one individual addresses another individual or individuals and at least one addressed individual replies". A three-step pattern, initiation–response–feedback as illustrated

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PUBLIC INTEREST STATEMENT

Students in mainland China seem to leave people an impression of being silent in class. In my paper, I would like to investigate the current situations of students' participation in classroom dialogue, and whether there are any positive changes as regards students' participation after the reforms.

I have designed a new measurement tool to measure the frequency and quality of students' participation, and obtained initial evidence for its reliability and validity. I found that most students still tended to remain silent in classroom dialogue and preferred to listen to others' talk. Teachers took the lead in initiating dialogue. Accuracy was used as a main criterion for evaluating whether students made a good contribution in class; nevertheless, a positive change is that a number of students showed reasoning when contributed a dialogue, which was a way to train critical thinking skills.

by Sinclair and Coulthard (1975), is taken as the typical structure for describing classroom dialogue. Initiation means one individual, usually the teacher, starting a dialogue by posing a question or raising a topic. Teachers' initiation can be divided into two main types: one type has definite answers (e.g. "26 plus 17 equals?"); the other one asks for students' opinions and does not have fixed answers (e.g. "Do you like a musical called the Phantom of Opera, and why?"). Then, responses are given, usually by students. Finally, initiators provide feedback according to students' answers, which could be further classified into short judgments (e.g. "good", "interesting") or detailed evaluations (Schwab, 2011; Wiebe Berry & Kim, 2008).

Teacher–student interaction and student–student interaction are two main forms of classroom dialogue, and there have been numerous studies of both (Howe & Abedin, 2013). Yet talk among students where no teacher is involved is less common in classrooms, and does not typically facilitate productive exchanges of views when it happens (e.g. Galton, Hargreaves, Comber, Wall, & Pell, 1999). Also, small-group work is rarely seen in Chinese classes, as there are so many students within one class and it is difficult to group students effectively (Fung & Howe, 2014). Thus, my research focused only upon teacher–student interaction in whole-class classroom dialogue. Whole-class dialogue is characterized by a quantitative imbalance of contributions, and a lack of reciprocity in the exchanges (Flanders, 1970). Teachers often take the dominant role with only one-third of talk typically contributed by students (Fritschner, 2000; Wade, 1994). In whole-class interaction, unlike small-group talk, with the constraints of time and lesson plans, the possibilities for each student to talk are limited (Cook, 1989).

Examining classroom participation is one essential aspect of research into classroom dialogue (Howe & Abedin, 2013; Wray & Kumpulainen, 2010). Participation is a ubiquitous idea in education, yet it is rarely defined nor, to some extent, is there any discussion of whether a particular behaviour should be counted as active participation. Verbal contribution or talk is viewed most often as its delegate and has broad applications in both research and educational practices (Schultz, 2009). There seems to be a commonly acknowledged view that teaching and learning could not achieve their goals without the involvement of frequent and high-quality classroom talk (Department of Education & Employment, [DfEE], 1998; Howe & Abedin, 2013). Successful teaching is described as "discursive, characterised by high quality oral work" (DfEE, 1998, p. 8). Although some scholars claim that silence should be included as a form of participation (e.g. Schultz, 2009), this has not been widely accepted and most scholars still insist that talk is the essence (e.g. Howe & Abedin, 2013; Klenowski & Lunt, 2008; Mercer & Sams, 2006). Following this approach, I defined participation in classroom dialogue as students' verbal contribution to classroom discourse concerning topics usually initiated by teachers.

As seen in a review conducted by Loftin, Davis, and Hartin (2010), there is a variety of types or classifications of classroom participation, for instance, negative/positive participation, participation frequency/quality and passive/spontaneous participation, among which frequency and quality are probably the most commonly used types. Many official agencies use these two criteria for the assessment of classroom participation. For instance, an agency named the Assessing Discussion Board of the University of New South Wales (2014, p. 4) has stated that students' contributions to class dialogue should be graded according to (1) "frequency" and (2) "depth and quality". Thus, in order to be compatible with the mainstream, I have narrowed my focus to the division between quantitative contribution (frequency) and qualitative contribution (quality) to classroom dialogue. Also, it is believed that students aged over 16 years generally have better self-understanding, and are capable of acknowledging what is suitable for their learning (Coffield, Moseley, Hall, & Ecclestone, 2004). Students make their own choices about whether or not to answer questions, and how to make verbal contributions. Depending on their individual characteristics, when students perceive their learning will benefit, they will be more likely to participate in classroom dialogue (Fassinger, 1995). I aimed to examine students' initiation of participation, and therefore merely focused on participation in which students talked voluntarily, rather than passive participation, for example, being called upon by teachers when they did not raise their hands or talking in turn.

Participation in classroom dialogue is consistently emphasized by both educators and researchers, one reason being that it facilitates contact between teachers and students, as well as between the students themselves (Howe & Abedin, 2013; Mercer, 2000, 2008). A sociocultural explanation is that classroom dialogue offers a platform for students to exchange ideas with others (Alexander, 2008; Mercer & Littleton, 2007) and to build on knowledge together (Mercer, 2000). In particular, it forces students to formulate arguments and give an explanation for their reasoning process (Alexander, 2008; Lacina, 2009). Thus, it is reckoned that students can understand better and think more critically through this process (Roehling, Vander, Dykema, Quisenberry, & Vandlen, 2011). The resulting potential benefits are that students, especially primary and secondary school students, are encouraged to talk actively in classroom dialogue (Burns & Myhill, 2004; Jones, 2010).

Yet students vary greatly in classroom participation: some are very active while others remain silent (Roehling et al., 2011). Chinese students are traditionally viewed as more likely to remain silent in classroom dialogue, and to be less active in classroom participation (Fung & Howe, 2014). At the same time, an impression of being good at memorizing knowledge while lacking the ability of thinking critically is constantly linked with students in mainland China (Li & Ni, 2011). In acknowledgement of this phenomena, the Chinese government launched the largest ever curriculum reform starting in 2001, entailing a series of measures to reform curriculum standards, textbooks, teaching methods and assessment systems, with the aim of helping more students to take an active role in the process of learning (Ministry of Education, 2001a, 2001b). Ten years have passed since the launch of the reform, so what is the current state of classroom participation? This study investigated how secondary school students in mainland China perform in classroom dialogue, with the purpose of discovering the current situation of Chinese students' participation and this may be referential for teaching and learning.

2. Methodology

2.1. Participants

I conducted my research in a secondary school (grade 9) in a medium-sized urban city in China. The reason for my selection of grade 9 students was that these students, with an average age of 16 years, will generally have passed their formative stages (Moreland & Levine, 1982). Therefore, they should have achieved reasonably good self-understanding, including acknowledgement of their most appropriate learning strategies and goals (Garner, 2000; Velmurugan & Balakrishnan, 2011). More specifically, it was assumed that these students would be able to decide for themselves whether participation was beneficial and comfortable, and then to choose to participate or not, rather than being largely influenced or impelled by teachers. Thus, it should be possible to make reliable observations of when or whether students took the initiative to participate in classroom dialogue.

The selected school had an enrolment of 2,680 students in total, of whom 836 students were from grade 9. There were eight classes in grade 9, from which I randomly chose three classes (Classes A, B and C) to participate in my study. Students from these three classes generally had the same level of learning ability. There were originally 58, 63 and 65 students, respectively, in Classes A, B and C. However, 16 students from the three classes expressed unwillingness to be studied, and they were excluded. Thus, an overall total of 170 participants (77 male and 93 female) were involved in my study, with 54, 56 and 60 participants from Classes A, B and C, respectively. All participants were of Chinese ethnicity.

2.2. Methods

2.2.1. Instrument for collecting data

I employed systematic observation together with the assistance of video to measure students' participation in classroom dialogue. In conducting systematic observation, a critical procedure is to "construct a set of categories into which all relevant talk can be classified" (Mercer, 2010, p. 3). As seen in the literature review, participation was generally grouped into two main categories: participation frequency and quality. Participation frequency refers to the amount of time that a student contributes or

talks in classroom dialogue (Brophy & Good, 1970). This raises the issue of what specific behaviours should be counted as participation. In Jones and Gerig (1994), several forms of participation are differentiated as follows: raising hands to answer questions voluntarily, raising hands to initiate a comment or a question, speaking out "a response without waiting to be called on by teachers" (p. 173), and being called on by teachers when not putting hands up or giving answers in turn. However, Altermatt, Jovanovic, and Perry (1998) combine the first two forms, and produce three forms: students raising hands waiting to be called by teachers, students answering without waiting to be called, and students being called upon to answer questions when they do not volunteer to do this. The categorization in Burns and Myhill (2004) is similar to that of Altermatt et al. (1998), but uses different expressions, which include raising hands to answer questions, joining in collective answers, shouting out answers without being called and being called to answer questions when failing to raise hands.

In order to clarify the above expressions, I summarized forms of participation according to two dimensions: whether or not a teacher initiated a dialogue, and whether or not students contributed when they had indicated an intention to participate. I subsequently produced four forms of participation (see Table 1). When participants' behaviour fitted one of these four categories, it was counted as one instance of participation in classroom dialogue, and marked in the grids under corresponding categories.

As regards participation quality, Brophy and Good (1970) designed a relevant coding scheme, whose categories have been heavily used in a great many studies, and are considered to have sound validity and reliability (see e.g. Altermatt et al., 1998; Jones & Gerig, 1994; Marsha & Webb, 2012). The categories, comprising "correct response", "incomplete or partially correct response", "incorrect response" and "no response", are generally related to the accuracy of answers. This was applicable in my study as well, for the reason that accuracy is particularly crucial for Chinese students and something that is highlighted by teachers (Fung & Howe, 2014; Li & Ni, 2011). During classroom dialogue, most questions or topics allow for answers from students which are clearly codable as correct or not, which means students' contributions can be judged with a pre-existing criterion or framework. Thus, I used categories—"incorrect", "partially correct" and "correct" to evaluate the standard level of students' participation.

However, it was insufficient merely to measure the standard level of contribution as some responses were unlikely to be assessable against an absolute standard of correctness, especially when students' own views were expressed. Also, it has been suggested that a correct answer does not necessarily indicate it is of higher quality than a partially correct one (Chin, 2006). For instance, a correct answer may be given in response to a simple question that requires a low level of cognitive skills, while a partially correct answer may be given in response to a question that requires a high level of cognitive skills. In that case, correctness alone cannot comprehensively represent quality of participation, which calls for the involvement of cognitive level. Furthermore, according to Mercer (2000), the function of dialogue should be to enable the co-construction of knowledge, and improve

Table 1. Forms of classroom participation that are included in my study

	Teacher initiates	**Teacher does not initiate**
Student shows intention to respond and contributes	*TISC*: Teacher initiates a dialogue (e.g. ask a question), students are allowed to respond (answer questions, make comments or ask questions) when they intend to participate (e.g. raise hands)	*TNISC*: Teacher does not initiate a dialogue (e.g. ask a question), but students contribute (e.g. call out an answer)
Student shows intention to respond, but does not contribute	*TISNC*: Teacher initiates a dialogue, students are not selected to respond (answer questions, make comments or ask questions) when they intend to participate (e.g. raise hands)	*TNISNC*: Teacher does not initiate a dialogue (e.g. ask a question). Students show intention to participate (raise hands), but they are not allowed to contribute

understanding and thinking through interaction. In line with this view, high-quality participation should embody students' thoughts and reasoning processes (Pontefract & Hardman, 2005).

With regard to this consideration, some studies have included cognitive levels in the coding of participation quality (see e.g. Chin, 2006; Marsha & Webb, 2012; Pontefract & Hardman, 2005). For instance, in Chin (2006), students' responses are divided into two levels. One is the information statement, which is usually given in answer to closed questions and recall of predetermined facts. This type of response is usually pitched at a lower cognitive level (Chin, 2006). The other level includes statements showing a "higher order cognitive process", such as comparing, evaluating, hypothesizing, explaining, interpreting and drawing conclusions (Chin, 2006, p. 1321). Marsha and Webb (2012) and Pontefract and Hardman (2005) also consider the cognitive level when coding participation quality. It is noticeable that in order to simplify responses at a higher order cognitive level, they merely use "provide an explanation" (Marsha & Webb, 2012) or "reasoning/thought" (Pontefract & Hardman, 2005) to illustrate high-cognitive utterances. I intended to use the categories in Chin (2006), which include hypothesis, comparing, explaining and so on. However, I pre-tested the coding scheme in a chemistry class of a sixth-form college in Cambridge and in an MPhil class at the University of Cambridge. I found that it was really difficult to keep up with the ongoing discourse and to mark a particular behaviour on one of the many grids. Further, I focused on every individual student, while Chin's (2006) study was limited to the general interaction between the teacher and the class as a whole. Copying the detailed categories in Chin (2006) was unrealistic for my study. Thus, I simplified the categories into "information statement" and "reasoning". The revised coding scheme was manageable for these observations.

Both of the two dimensions of coding quality were suitable, and thus I combined "standard level" and "cognitive level" to measure participation quality, consisting of "incorrect", "partially correct", "correct", "information statement" and "reasoning". The description of each category is illustrated in Table 2. The overall coding instrument for observing participation in classroom dialogue is as summarized in Appendix 1.

2.2.2. Procedure for collecting data for participation

The observations were conducted over two weeks during the spring semester.[1] I selected Chinese literacy, physics and mathematics as my research focus, for the reason that these subjects are emphasized by the Chinese Government (Ministry of Education of the People's Republic of China's, 2010). At the same time, these three subjects are the most heavily studied worldwide[2] (Howe &

Table 2. Coding categories for participation quality

	Coding dimension	Category	How to differentiate a category?
Participation quality	Standard level	Incorrect	Explicit correction—direct instruction (e.g. not right, think more carefully), sometimes followed by revised answers
		Partially correct	Evaluation and extended response (e.g. good, however, ...)
		Correct	Affirmation—direct instruction (e.g. correct, right, excellent, yes, exactly)
	Cognitive level	Information statement	Recall predetermined information, either previously learned knowledge or daily experiences; referring back to prior contributions made by other students in the dialogue
			Describe an accessible or visible phenomenon—Example: "Temperature of solvent" [response to a question: "What affects the rate of dissolving?"] (Chin, 2006, p. 1323)
		Reasoning	Explain or justify behaviours or phenomenon; clarify how to reach a conclusion; illustrate thinking process, and usually respond to "why"—Examples: "It takes up space" [response to "Can you elaborate on why the volume will be less?"] (Chin, 2006, p. 1331)

Source: Standard level is adapted from Brophy and Good (1970) and Chin (2006).
Cognitive level is adapted from Chin (2006), Marsha and Webb (2012) and Pontefract and Hardman (2005).

Abedin, 2013), and observation of classroom dialogue in these subjects enables comparison between diverse social contexts. In each class, I conducted four observations in each of the Chinese literacy, physics and mathematics lessons, respectively. Thus, 36 lessons were observed in total: 3 classes × 3 subjects × 4 observations per subject. There were six teachers involved in my study, with students in Classes A and B sharing the same teachers for the three subjects, and students in Class C having the other three teachers delivering the three curriculum subjects. It was hoped that this variation would dilute the influence of teachers' individual characteristics on students' classroom participation.

Before conducting the observations, I asked for a seating map, as the students' seats were fixed in my selected school. This was helpful in identifying the students from the back of classroom where I was seated during observation. Another use of the seating map was in the coding of students; for example, the student sitting in column six and row five was coded as 6.5. This increased the likelihood of anonymity and protected participants' confidentiality. Also, I received parental and students' consent that the video could be used for research purposes.

During the observations, I coded students' participation using the coding scheme described above. At the same time, a video camera was suspended from the top-front corner of the classroom, recording students' contributions. Video cameras were fixed in every classroom in my selected school for the purpose of monitoring how the class proceeded, and students were used to this instrument. The camera generally had a clear and broad view of the classroom, and was able to capture students' behaviour. Each observation lasted for 40 min, which was the length of one lesson in the selected school. I referred to the videotapes after the lessons to check whether I had missed some information. Every time a student's behaviour fitted the description of one category, it was marked once on the grids under the corresponding category after the student's ID. Only one category within the range of "participation forms" (i.e. TISC, TISNC, TNISC and TNISNC) or "standard level" (i.e. incorrect, partially correct and correct) could be selected per instance of participation, while "information statement" and "reasoning" could be ticked simultaneously (see Appendix 1). It was possible that after a student had answered a question, commented on a topic or initiated a dialogue, he/she would continue to be asked a further question or about another topic or would initiate another dialogue. In this case, the student was counted as having contributed twice, and corresponding categories were marked twice. However, within each instance of participation, a single student was likely to have provided, for example, multiple correct answers and reasoning processes. In the case of multiple correctness and reasoning given for a problem, I marked only one instance of "correct" behaviour and one instance of "reasoning".

In order to ensure the reliability of observation, after coding the participation myself, I asked a tutor from the selected school to recode nine lessons (25% of the total observations) based on the videotapes. The tutor was familiar with the coding scheme and coded using the same criteria. Inter-coder reliability between the tutor's and my own observations was good (.82 > .65)[3], and the inconsistent points were fully discussed before reaching consensus. This indicates that participation data collected using the coding scheme designed above were generally reliable.

During the process of measuring participation, I also collected data relating to gender, subjects, class number and attainment. According to a review conducted by Howe and Abedin (2013), gender, subjects, class and attainment have been commonly studied in relation to primary and secondary school students' participation during the past 40 years, and were at the same time, relevant to my study. Acknowledging this information is helpful in understanding students' participation in classroom dialogue.

3. Data analysis and results

3.1. Analysis with raw data

The number of instances marked under a category was used to represent students' participation performance. I firstly counted the number of times that each individual contributed under the nine categories (see Appendix 1). This served as raw data for participation, based on which I computed means and standard deviations. This was intended to give a preliminary impression of how students performed along each scale. As seen in Table 3, the mean for TISC (2.27) was the highest among the scales, indicating that students tended to answer questions raised by teachers. The mean for "correct" (1.37) was quite high within the participation quality group, which reflected that accuracy of answers was emphasized by teachers, and students were expected to give answers according to the pre-determined rules. The means for "reasoning" (1.89) and "information statement" (1.86) were almost the same, as students were asked to give explanations or report their reasoning process whenever they stated an answer.

As seen in Table 4, means and standard deviations in each subject were computed. The average times of contributions to all types of dialogue in three subjects were below one, which indicated that some students made no verbal contributions throughout the four lessons observed for each subject. Compared to the contributions made in physics and mathematics lessons, students answered many more questions initiated by teachers, contributed more correct answers and stated more information in Chinese lessons. Students showed more reasoning processes in mathematics lessons.

Table 3. Participation scales in classroom dialogue: means and standard deviation (*N* = 170, using raw data)

Scale	*M*	SD
TISC	2.27	2.34
TISNC	.56	1.22
TNISC	2.12	3.94
TNISNC	.65	1.73
Incorrect	.27	.66
Partially correct	.79	1.09
Correct	1.37	1.84
Information statement	1.86	2.48
Reasoning	1.89	2.52

Table 4. Description of participation in each subject (*N* = 170, using raw data)

Scale	Chinese literacy		Physics		Mathematics	
	M	SD	*M*	SD	*M*	SD
TISC	.95	1.03	.53	.88	.79	1.20
TISNC	.17	.62	.25	.65	.14	.54
TNISC	.73	1.80	.74	1.35	.65	1.48
TNISNC	.22	.98	.23	.66	.21	.67
Incorrect	.11	.48	.06	.26	.10	.30
Partially correct	.39	.68	.18	.43	.22	.50
Correct	.54	.79	.37	.76	.47	.90
Information statement	.88	1.31	.45	.90	.54	.87
Reasoning	.65	1.09	.55	.99	.69	1.11

Table 5. Spearman correlation coefficients between scales of participation (*N* = 170, using raw data)

Scales	TISC	TISNC	TNISC	TNISNC	Incorrect	Partially correct	Correct	Information statement	Reasoning
TISC	1								
TISNC	.22**								
TNISC	.33**	.59**							
TNISNC	.32**	.31**	.55**						
Incorrect	.47**	.14	.07	.06					
Partially correct	.63**	.21*	.43**	.46**	.22**				
Correct	.78**	.12*	.34**	.28**	.30**	.38**			
Information statement	.80**	.24**	.49**	.41**	.27**	.64**	.64**		
Reasoning	.86**	.20*	.44**	.38**	.30**	.58**	.74**	.70**	

I also calculated Spearman correlations between sub-scales of participation. Spearman's rho correlation coefficient, abbreviated as *rs*, is a non-parametric measure of correlation between two variables (Field, 2009; Sani & Todman, 2006). Spearman correlation is applicable when either of the variables is non-continuous, such as ordinal variables or continuous but not normally distributed (Strand, 2010). Histograms and normal distribution curves showed that the 11 scales for participation were strongly right-skewed, indicating that all the scales of participation were most appropriate for non-parametric analysis (Sani & Todman, 2006). Thus, I used Spearman correlation analysis. As seen in Table 5, there were significantly strong correlations within most of the participation scales. The relationships of every two participation scales were positively significant, except for three pairs: TISNC and incorrect, TNISC and incorrect, and TNISNC and incorrect. The correlation coefficients of reasoning were high when it was tested against information statement and correct.

3.2. Analysis with transformed data

Then, for the convenience of data interpretation, the raw data will be transformed. In terms of participation frequency, I added together the number of times that each individual contributed under categories TISC, TISNC, TNISC and TNISNC. The added number was used to represent each student's participation frequency. A higher number suggested that a student was more active in classroom dialogue. As regards participation quality, I firstly counted the number of times that each individual contributed under the categories within the range of participation quality. Then I attributed values 1, 2 and 3 to "incorrect", "partially correct" and "correct", respectively, in the standard-level group, and 1 and 2 to "information statement" and "reasoning", respectively, in the cognitive-level group, that was to multiply the values by the number of times under each category. For instance, if a student contributed eight instances of correct answers, and the value for "correct" was 3, then the student's score for "correct" participation was 8 instances × 3 = 24. The values represented different levels of contribution to the classroom dialogue. A correct answer is viewed as more challenging and qualified than a partially correct or incorrect answer under the condition of the same cognitive level (Brophy & Good, 1970), and thus their values were in descending order. Reasoning shows a higher level of cognitive skills than information statement (Chin, 2006), and reasoning was accordingly assigned a higher value than information statement. Lastly, the multiplied scores were added together to represent each student's participation quality. The higher a student's score was, the higher the level of contribution he/she made in classroom dialogue, and vice versa. The above transformation of data on participation quality was for the convenience[4] of data interpretation, and I used the transformed data in the further analysis.

The Mann–Whitney *U*-test and Kruskal–Wallis test can be used to compare between-group differences as counterparts to the *t*-test and one-way ANOVA, respectively, when internal/ratio data do

Table 6. Differences in participation based on gender, class and subjects (using transformed data)

	Mann–Whitney *U*-test based on gender (*N* = 170)		Kruskal–Wallis test based on class (*N* = 170)		Kruskal–Wallis test based on subjects (*N* = 170)	
Scale	***Z***	**Sig (2-tailed)**	χ^2	**Sig (2-tailed)**	χ^2	**Sig (2-tailed)**
TISC	−1.04	.30	.11	.95	9.92	.09
TISNC	−.73	.46	3.52	.17	4.13	.13
TNISC	−.78	.44	5.92	.06	1.41	.49
TNISNC	−.78	.44	8.53	.06	.49	.78
Incorrect	−1.75	.08	.61	.74	2.29	.32
Partially correct	−1.28	.20	.54	.76	8.29	.07
Correct	−.49	.62	1.47	.48	7.07	.10
Information statement	−.65	.52	2.38	.31	9.64	.09
Reasoning	−1.32	.19	2.23	.33	1.97	.37
Participation frequency	−.13	.90	2.85	.24	2.08	.35
Participation quality	−.92	.36	.50	.78	.35	.11

not meet parametric assumptions (Sani & Todman, 2006). I submitted the participation scales to Mann–Whitney *U* and Kruskal–Wallis tests to identify whether there were possible gender, class and attainment differences, respectively. As seen in Table 6, I identified that there were no differences between boys and girls in their participation in classroom dialogue. Similarly, students' participation in the three classes was not significantly different as the Kruskal–Wallis test showed that the levels of significance for all the participation scales were above .05. Moreover, students' contributions to

Table 7. Difference in participation based on attainment (*N* = 170, using transformed data)

Participation scales	Score for Chinese literacy	Score for physics	Score for mathematics	Average score for Chinese literacy
TISC	.29**	.25**	.20*	.28**
TISNC	.25**	.23**	.17*	.24**
TNISC	.27**	.24**	.12	.23**
TNISNC	.08	.09	.02	.06
Incorrect	.08	.09	.02	.06
Partially correct	.12	.13	.05	.11
Correct	.21**	.21**	.18	.23**
Information statement	.14	.12	.15	.13
Reasoning	.30**	.26**	.21**	.29**
Participation frequency	.34**	.32**	.21*	.32**
Participation quality	.26**	.25**	.19*	.26**

*$p < .05$.
**$p < .01$.

the classroom dialogue of three subjects were also not significantly different. This confirms the assumption behind most studies reviewed in Howe and Abedin (2013) that curriculum context does not matter significantly as regards conclusions about dialogue.

Attainment, calculated by averaging students' scores for Chinese literacy, physics and mathematics, was also tested against participation scales using Spearman correlation analysis. As seen in Table 7, students' participation was significantly associated with their attainment. It was noticeable that all the coefficients were positive, suggesting that students with higher attainment generally made more and higher level contributions to classroom dialogue. In the categories of TNISNC, incorrect, partially correct and information statement, there were no significant correlations based on attainment. However, for the rest of the categories, in particular categories showing a higher cognitive level (i.e. correct and reasoning), students with high attainments scored more highly.

4. Discussion relating to participation in classroom dialogue

Due to the limitations of both time and funding for my work, it was not possible for me to observe classroom participation over a long period, and thus the data collected seem not to be overwhelming. Despite this limitation, the results are still capable of demonstrating how Chinese secondary school students participate in classroom dialogue. In terms of participation frequency, the strongly right-skewed distributions, together with a large number of zeros, indicate that most students in the selected school tended to remain silent in classrooms, with a small number of students constantly active in classroom dialogue and making qualified contributions. Moreover, teachers often led the process of classroom dialogue, while students played a passive role. Most students talked or chose to answer questions initiated by teachers, and were given very limited opportunities to explore problems and discuss topics. The nature of student responses was often shaped by the nature of the teachers' questions. Similar results have also been reported by other studies, for instance, Li and Ni (2011). One essential reason may be that there were often too many students in one class, and it was impossible to give every student a chance to talk in a 40-min lesson, otherwise teachers could not possibly "keep up with the pace and meet objectives" (Burns & Myhill, 2004, p. 39).

As regards participation quality, it is found that accuracy was highlighted by teachers and was constantly viewed as a prior requirement in evaluating the quality of a dialogue. Students were expected to give correct answers, and use predetermined principles to support their statements, which in a way verified the superior status of memorization in Chinese education (Kember & Watkins, 2010). A positive change in relation to participation is that the average score of "reasoning" was quite high compared to other categories and "reasoning" was highly associated with information statement and correct answers. This suggests that students did not merely give a simple answer; instead, they tended to give explanations of how they came up with answers, which implies that students can develop their critical thinking skills through classroom dialogue.

There was no significant difference between boys and girls in classroom participation. Similarly, students' contributions were not significantly different between Chinese literacy, physics and mathematics lessons. Nevertheless, the data can allow people a glimpse of how students' participation patterns vary across subjects. It was found that, in Chinese lessons, teachers gave students more opportunities to talk in class by asking questions, and students were more likely to state information and contributed correct answers. This is probably because, in Chinese literacy, personal opinions and experiences are important, and at the same time, memorization of content (e.g. poems, texts and ancient Chinese prose) is required. In comparison, mathematics and physics have high requirements in terms of critical and logical thinking. Students need to master a series of complex formulae before they can solve the problems and thus they may participate less in class. However, students showed more reasoning processes in mathematics lessons, and this suggests that students are more likely to develop their critical thinking skills through dialogue in mathematics. Attainment was significantly associated with students' participation, and this indicated that students with good scores were more likely to dominate classroom dialogue.

More notably, this study has proved that my newly invented coding scheme for participation is reliable and valid. A considerable body of studies have been conducted to examine classroom participation, yet very few systematic instruments have been developed to code students' participation behaviours, especially for quantitative research. I designed a coding scheme to measure participation frequency and quality, and within each group several sub-categories were distinguished to make the coding more specific. I systematically summarized students' participation behaviours into four forms (i.e. TISC, TISNC, TNISC and TNISNC) according to two dimensions: whether the teacher initiated a dialogue, and whether the students contributed when they showed an intention to do so. This division is capable of embracing the main forms of participation proposed in other studies. Further, I included two dimensions to evaluate participation quality: standard level and cognitive level. This invention not only brings in a traditionally common measurement (i.e. standard level), but also shows cognition and reasoning in each participation.

The coding scheme has a satisfactory inter-coder reliability. As regards validity, results using my coding scheme were compatible with those of other studies when ability and gender were tested against participation. In my study, attainment was found to be positively related to participation in classroom dialogue. High attainers were more active and contributed higher quality answers or comments. These findings have also been obtained in other studies, for instance, those of Good, Sikes, and Brophy (1973) and Nystrand, Wu, Gamoran, Zeiser, and Long (2003). Moreover, Burns and Myhill (2004) found that there is no significant difference in participation between boys and girls, which is compatible with the findings of my study. The above suggests that my coding scheme is efficient in measuring participation in classroom dialogue.

5. Conclusion and contributions

This first contribution is that my study will help educators and scholars identify how Chinese secondary students normally participate in classroom dialogue. The major findings are: (1) most students generally talked less and the teachers took the lead in initiating dialogue; (2) students initiated dialogue sometimes by asking questions and discussing problems and (3) accuracy was used as the main criterion for evaluating whether students made a good contribution in class, nevertheless a positive change is that a number of students showed reasoning when contributing to a dialogue. With the large number of students and limited time in each lesson, it is hard to involve most students in classroom dialogue and only a small number of students talk. This, however, does not necessarily mean students' classroom participation has not changed across the decades in China, as students have made use of classroom dialogue to think deeply and critically. This is a positive change of curriculum in secondary schools of mainland China, and may offer a useful implication for future reform—making full use of each contribution of dialogue to train reasoning rather than merely emphasizing the amount of speech. Teachers should allow students to explore knowledge, and give appropriate feedback to a variety of answers and comments, rather than judging all answers according to a pre-existing framework. With a creation of an interactive classroom environment, students may be more likely to make more and higher level contributions in class.

Another main contribution is that I have designed an instrument for use in observing participation in classroom dialogue, which is especially useful for quantitative research. My study has obtained initial evidence of the efficiency of this coding scheme, which suggests that it could be employed in other studies to measure participation in classroom dialogue, and may be useful to test the implications of curriculum reforms designed to spur discussion.

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Notes

1. In mainland China, there are two semesters in schools and universities. One is the Autumn Semester lasting from September to January the following year; the other one is the Spring Semester lasting from March to June.
2. There is no curriculum called "science" in Chinese secondary schools: physics and chemistry are taught separately instead. The chemistry course starts from grade 9, while students learn physics from grade 8, which permits more time for students to become familiar with it. Thus, I selected physics for my study.
3. According to Hartas (2010), observation is reliable when the inter-coder index reaches .65.
4. The results might have been misinterpreted if I had just added the number of times under categories within the range of participation quality. A student might have contributed a lot of incorrect answers and few correct ones. It was inappropriate to state that this student had a high level of participation quality, even though the added number was large. Thus, I assigned a higher value to correct responses than to incorrect ones to differentiate the participation quality.

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Appendix 1

Coding scheme for participation in classroom dialogue

Coding scheme for participation in classroom dialogue									
Student coding number	**Participation frequency**				**Participation quality**				
	Specific participation forms				**Standard level**			**Cognitive level**	
	TISC	**TISNC**	**TNISC**	**TNISNC**	**Incorrect**	**Partially correct**	**Correct**	**Information statement**	**Reasoning**

Notes: TISC denotes teacher initiates a dialogue and student contributes a response; TISNC denotes teacher initiates a dialogue and student does not contribute a response, even though he/she shows an intention; TNISC denotes teacher does not initiate a dialogue, but student contributes a comment or asks a question; and TNISNC denotes teacher does not initiate a dialogue, but student shows an intention to talk, even though he/she does not have an opportunity to contribute.

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