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Mathematics Teacher's Beliefs and Practices towards Collaborative Learning

Maria Shiraz & Shahzada Qaisar

Abstract

This paper has been drawn from the findings of a larger study which explores a mathematics teacher's practices who believes in the use of collaborative learning (CL). It also attempts to identify the extent of consistency between the teacher's beliefs and his practices. Data was collected through questionnaires and classroom observations. The analysis of the questionnaire helped to differentiate the teachers who believed in collaborative learning. The results of the video data showed the extent of alignment of the teacher's beliefs with the patterns of his practices. Analysis of observational data revealed inconsistencies in the practices and beliefs of the teacher towards the use of collaborative learning. The findings of the present study indicated that the teacher seemed unaware in the effective implementation of CL. The nature of the belief- practice relationship amongst mathematics teachers is complex and mediated by external factors.

Keywords: Beliefs; Collaborative Learning; Consistent; Mathematics Teacher's Practices

Research Context

The education system in Pakistan is generally divided into five levels: primary (grades one through five); middle (grades six through eight); high (grades nine and ten, leading to the Secondary School Certificate or SSC); intermediate (grades eleven and twelve, leading to a Higher Secondary (School) Certificate or HSC); and university programs leading to undergraduate and graduate degrees (Qaisar & Butt, 2015). Meaningful and conceptual mathematics education is not being provided to the children in the Pakistani schools (Siddiqui, 2017). One of the causes for the downfall of math education in Pakistan is due to the teachers of mathematics who do not have the right skills to deliver quality instructions to the students (Qaisar, 2011). This situation led the researchers to conduct this study on mathematics teacher's practices.

Rationale of the study

The context of this study consists of the researchers' interest rooted in their own experience as they have been related with math education for ten years as teachers, trainers and evaluators. They have observed mathematics teachers mostly using the traditional approach for teaching of mathematics. In traditional approach, the teachers solve the sum on the board by following the procedure of the example given at the start of the exercise. Students copy the same procedure onto their

notebooks and are then asked to solve similar sums given in the exercise by following the same procedure. Identical questions are given in the exams and students are required to solve the questions using the same procedure. As a result, the students' independent learning skills remain underdeveloped due to the dependence upon the teacher (Kilpatrick, 2014). Hence, the teachers are actively engaged in bringing the content of the lesson to pupils by teaching the whole class directly while students are listening passively. It is generally assumed and observed that many elementary teachers in the Pakistani schools use the traditional approach for teaching of mathematics in their classrooms (Ali, 2011; Tayyaba, 2010). However; Cobb et al. (2009) state that such a teaching approach does not improve students' mathematical reasoning and creativity.

A plethora of research (Harris & Spillane, 2008; Keys, 2007) advocates an alternative to the traditional approach; the collaborative learning that develops the mathematical skills and thinking of the students. Collaborative Learning (CL) refers to methodologies and environments in which learners engage in a common task where everyone depends on and is accountable to each other and may be to the teacher (Gresalfi, 2009). CL facilitates students in actively exchanging, debating and negotiating ideas within their groups which in turn increases students' interest in learning (Qaisar & Butt, 2015). However, research conducted in the Pakistani context show that the collaborative way of teaching is still underused and not implemented effectively in Pakistan (Mirza & Iqbal, 2014; Qaisar & Butt, 2015). According to Wilson et al. (2005) there are a number of factors like content knowledge; pedagogical knowledge and skills; curriculum and textbooks and beliefs of teachers' that influence the teachers' instructional practices. Quintero and Rosario (2016) suggested that teachers' beliefs are an important factor that shape mathematics teaching practices. On the contrary, in Pakistan it is assumed that mathematics teachers do not use collaborative learning although they believe on its effectiveness (Allahyar & Nazari, 2012). Since there is no research in Pakistan that explores specifically mathematics teachers' collaborative learning beliefs with their practices, so it motivated the researchers to carry out this research on beliefs and practices of mathematics teachers of Pakistan towards collaborative learning at elementary level.

Objectives of the study

The objectives of the study are to:

1. Identify such teachers who highly believe in collaborative learning.
2. Explore the relative influence of mathematics teachers' beliefs on their practices.

Research Methods

The approach of the study is qualitative and is utilizing case study as a methodology. It provides the researchers with the insight to explore the phenomenon covering contextual situations and provide in-depth understanding of it (Yin, 2013).

Sampling Technique

The present study adopted 'purposive sampling'. It is "based on the assumption that the investigator wants to discover, understand, and gain insight and therefore must select a sample from which the most can be learned" (Merriam, 2009: 77).

School and Participants: The research process started when we wrote a letter to school principals about the objectives of our study in one of the cities of Pakistan. However, we got the permission from twenty-six schools (public & private). Each school had at least two elementary mathematics teachers. Questionnaires were distributed to fifty elementary mathematics school teachers. The response rate was 100%. The analysis shows that only twelve out of fifty teachers believed in the use of collaborative learning. We selected four teachers out of twelve since their beliefs regarding collaborative learning were higher than the rest. All the teachers agreed to participate in the study. They all had their bachelor's in mathematics and had an average of three years of teaching experience. So, the research study was set in four schools out of which two were public and two were private. Most of the students in the private schools were from middle class families whereas in government schools the students belonged to low-income families. All schools were in the central city having purpose-built buildings. However, each teacher was from a different school and represented a case. Hence four cases make up this multiple case study. For reporting the consistency of teachers' beliefs and practice we are reporting one case of Amjad for the present study who is a public-school teacher.

Data Collection: Data collection spanned 4-month period between August 2014 and December 2014. The study is divided into two phases; in phase 1, teachers were identified by using questionnaire who believed in CL and in Phase 2, their practices were observed to analyse the consistency with their beliefs.

Phase 1: Teachers' Beliefs Questionnaire. According to Lin (2015) questionnaires in research are used to investigate attitudes, beliefs and behavior of the people. Researchers classify teachers' mathematics beliefs into three categories: beliefs about the nature of mathematics, beliefs about mathematics teaching, and beliefs about students' learning (Raymond, 1997). The teachers' beliefs questionnaire comprised of 21 items that aimed to identify the teachers who

believed in CL. Responses and results to the questionnaire served as a spring board for further study.

Phase 2: Observation (Video Recordings). The observation method is very suitable for researches who are concerned in understanding a particular phenomenon (Cohen et al., 2007). A total of 40 formal classroom episodes were video recorded at different times of the four teachers within the whole term to see the alignment of teachers' beliefs and their practices. The researcher observed ten classrooms for each case.

Analysis: For analyzing the data generated through classroom observations; Raymond (1997) analytical framework was employed. It consists of four aspects: Tasks, Discourse, Environment and Evaluation. The framework facilitated to differentiate the pattern of interaction emerging in each classroom by the teacher-students and student-student interaction. Their discourse helped to understand the nature of practices of the teachers and to categorize them as either collaborative or non- collaborative.

The Analytical Framework

As stated earlier the analytical framework consist of four themes; tasks, environment, discourse, and evaluation. For each theme different indicators and their respective categories are given to analyze the emerging practices in the classroom. Below is the detail of criteria used for the analysis of teaching practice.

Table-1:
Criteria for the Categorization of Teachers' Mathematics Teaching Practice

Themes	Indicators	Categories
Tasks	The teacher instructs solely from the textbook	T1
	The teacher instructs primarily from the textbook with occasional diversions from the text	T2
	The teacher teaches equally from textbook and problem-solving activities	T3
	The teacher solely provides problem-solving tasks	T4
	The teacher selects tasks based on students' interest and experience	T5
	The teacher selects tasks that stimulate students to make connections	T6
	The teacher selects tasks that promote communication about mathematics	T7
Discourse	The teacher approaches mathematics topics in isolation	D1

	The teacher approaches mathematics instruction in the same pattern daily	D2
	The teacher primarily encourages teacher-directed discourse, only occasionally allowing for student-directed interactions	D3
	The teacher encourages teacher-directed and student-directed discourse	D4
	The teacher encourages mostly student- directed discourse	D5
	The teacher poses questions that engage and challenge students' thinking	D6
	The teacher has students clarify and justify their ideas orally and in writing	D7
Environment	The teacher creates an environment in which students are passive learners	E1
	The teacher creates an environment in which students are passive learners, occasionally calling on them to play a more active role	E2
	The teacher creates a learning environment that at times allows students to be passive learners and at times active explorers	E3
	The teacher presents an environment in which students are to be active learners, occasionally having them play a more passive role	E4
	The teacher creates an environment that reflects respect for students' ideas and structures the time necessary to grapple with ideas and problems	E5
	The teacher has students work cooperatively, encouraging communication	E6
Evaluation	The teacher poses questions in search of specific, predetermined responses	Ev1
	The teacher evaluates students solely via questions seeking "right answers"	Ev2
	The teacher primarily evaluates students through set questions from the textbook, only occasionally using other means	Ev3
	The teacher evaluates students' learning equally through set questions from the textbook and alternative means, such as observations and writing	Ev4
	The teacher primarily evaluates students using means beyond the textbook	Ev5

	The teacher observes and listens to students to assess learning	Ev6

The Interpretation of scores. For the sake of extraction of meaning from the data, the researchers have used the following criteria for qualification of the categories of the analytical framework to quantification in the form of percentage for the collaborative work in the classroom. We admit that there is no statistical ground for these boundaries. It is a kind of arbitrary common-sense scale.

Table-2:
Categorization of Collaborative Learning against their respective percentages

Categories	Percentage of Collaborative Learning
T1, D1, D2, E1, Ev1, Ev2	0%
T2, D3, E2, Ev3	25%
T3, D4, E3, Ev4	50%
T4, D5, E4, Ev5	75%
T5, T6, T7, D6, D7, E5, E6, Ev6	100%

Trustworthiness of the Study

To ensure the trustworthiness of this study, the categorization of mathematics teachers' beliefs and their practices were adapted from the study of Raymond (1997). Yin (2013) suggests that the specific procedures employed, and the methods of data analysis should be derived, from sources that have been previously utilized successfully. Moreover, the exploratory nature of this study can be considered as a contribution to reinforce its trustworthiness.

Analysis of Amjad's Teaching Practice

Background and Setting: Amjad was a sixth-grade class teacher in government boys' school in Lahore (Pseudonym). Amjad was an experienced teacher in his early thirties. Amjad was teaching mathematics; 30 lessons per week. At elementary level he had a hectic week; like other teachers. When we explained the reason of video recording he was ambitious and a bit scared about the video recording. However, in response to his questions about the nature of our research he agreed and seemed comfortable for video recording. He willingly signed the consent form. He was confident in his teaching and was not distracted by our presence in his classroom. He was also observed several times without video recording.

The classroom size of Amjad was big where students and the teacher could easily move around. The students were seated in rows of threes. However, the students

could change the layout as per needed. There were two big windows and they were a blessing during an electricity breakdown. The windows and door were otherwise kept closed because the noise level coming from the neighbouring classes disturbed the classroom practices. The classroom on the other hand was not equipped with soft boards, student racks and teacher's cupboard.

Amjad said that mathematics was one of the most difficult subjects for students in this school. However, he explained that he chose to teach mathematics because he "loved" mathematics and wanted to 'help' the students in this subject.

Graphically Representation of Amjad's teaching practice

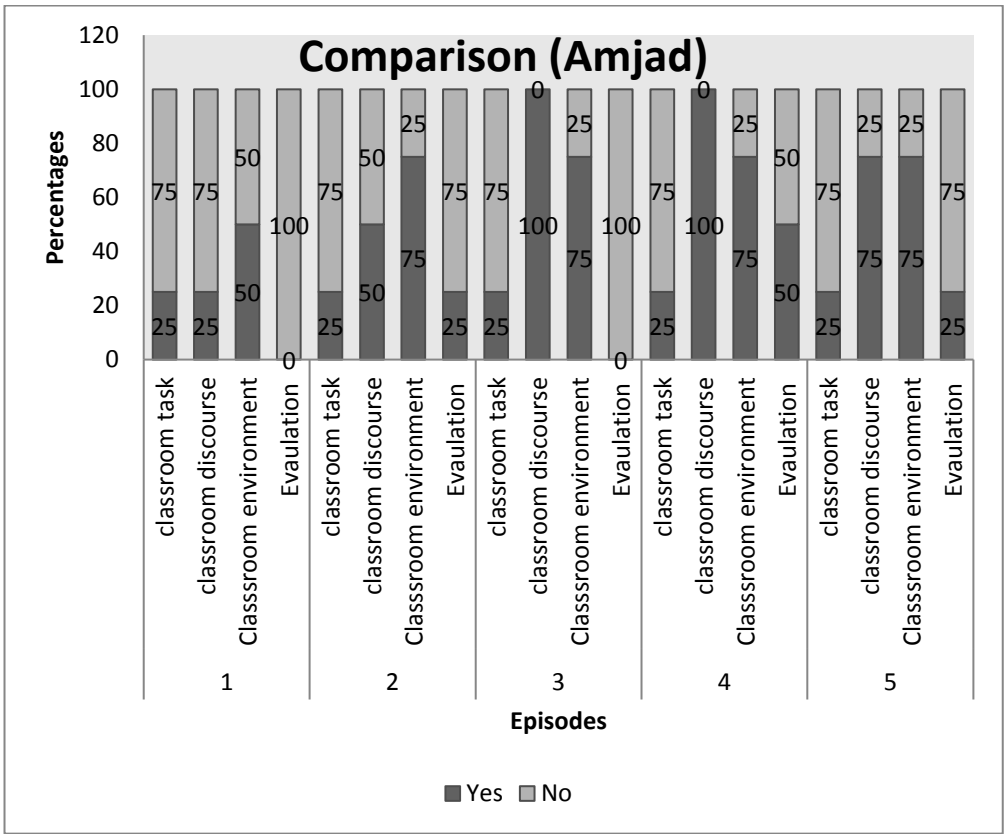

Figure 1. Graphical representation of Amjad's classroom practice (from episode 1 to episode 5)

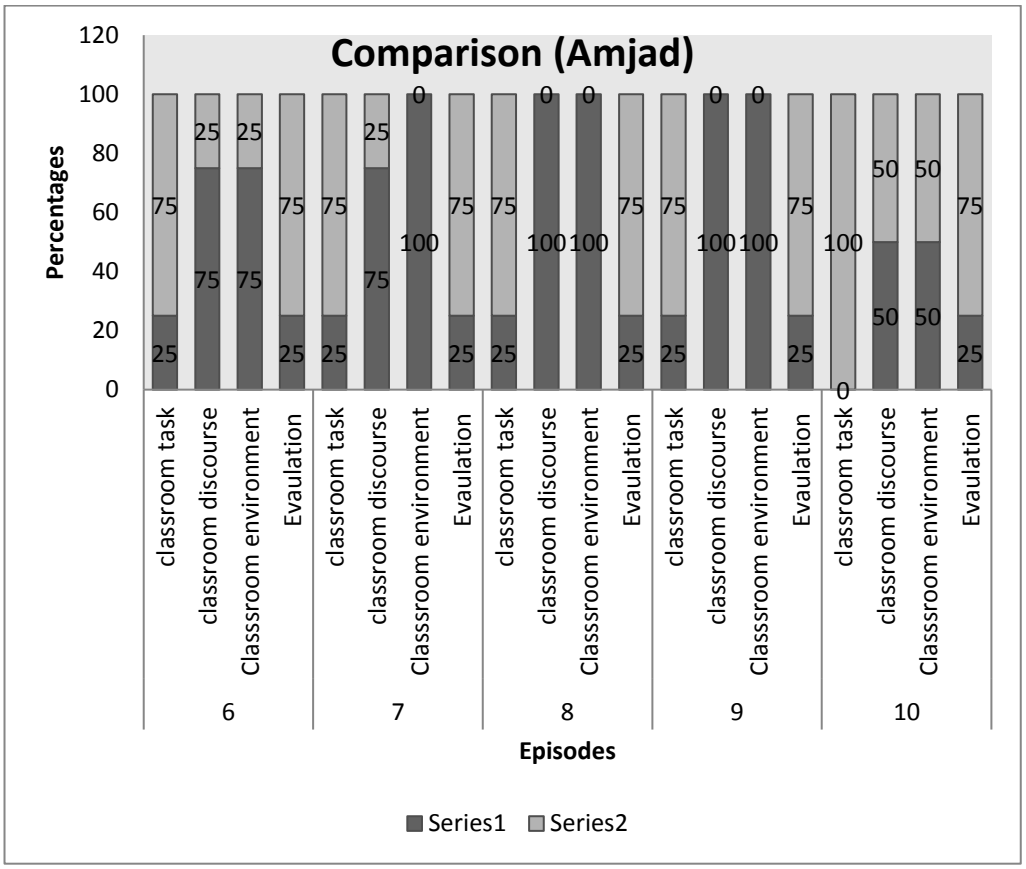

Figure 2. Graphical representation of Amjad's classroom practice (episode from 6 to episode 10)

Qualitative Analysis of Amjad's Teaching Practice: Amjad's teaching practice is categorized into four broad categories (see table-1); the types of classroom tasks he provided to the students, the nature of discourse that took place during mathematics lessons, the classroom environment and the methods of evaluation that he used to assess his students' progress in mathematics.

(i) Classroom Tasks: Almost in all the episodes it was observed that the classroom tasks fell under the category of T1 & T2. All the tasks assigned by the teacher were not collaborative.

Table-3:
Analysis of Classroom Tasks (Amjad's Teaching)

Episode Number	Category
Epi-10	T-1
Epi-1, Epi-2, Epi-3, Epi-4, Epi-5, Epi-6, Epi-7, Epi-8 & Epi-9	T-2

Evidence from the context

a) Textbook tasks. In episode 1, the teacher started the lesson by explaining the procedure of the example from the textbook. He discussed the rules of "*quotient law*"; a mathematical concept and solved a few relevant questions from the textbook on the board. He gave some similar types of tasks to the students to practice individually with the expectation that students will follow the teacher's procedure. The tasks used by Amjad were mostly taken from the textbook. He regularly selected and adhered to the textbooks tasks. However one of the indicators of analytical framework tells that the tasks chosen from the textbook are considered non-collaborative. Here, the researchers are not challenging whether the nature of tasks given in the textbooks is collaborative or vice versa. Likewise, the teacher explained the concept from the textbook. Even the examples that he used to explain the concept of the lesson (quotient law) and definitions (concept of square) shared with the students were from the textbook. Moreover, the tasks for homework were non-collaborative since they were given from the textbook. Following extract from episode 8 is an example of a non- collaborative homework task.

8.54	Teacher	*(quickly tells them) Q 3* should be done as home work. Try the questions that I asked you to circle.
8.55	Teacher	*(asks)*Will everybody do them?
8.56	Students	*(loudly & together)* Yes

Amjad at one or two occasions used collaborative learning tasks. The response of the students was very encouraging. They were very participative. The following segment shows that after doing a few questions from the exercise on 'squares', the teacher writes some numbers (not from the textbook) (line 4.34) on the board and asks them to 'look up' and answer the questions written on the board. It is observed that the whole class was encouraged to discuss and solve these sums (line 4.32).

4.32	Teacher	*(Writes & asks)* $1^2 = 1$; $2^2 = 4$; $3^2 = 9$...till $20^2 = 400$ *(Students are answering with a lot of interest).*
4.33	Teacher	Test whether the following are perfect square. *(loudly)*
4.34	Teacher	*(writes)* (i)59 (ii)625 (iii)225 (iv)196 (v) 425 (vi)81 (vii)121 (viii)25000

		(*students have enthusiastically started discussing with their group members*)
4.35	Teacher	*(Reminds them)* please don't be so loud and quickly let me know which number perfect square is?

This indicates that Amjad knew how to formulate questions; however, this type of practice was very rarely observed in his classroom. It may be because of the short duration of each class. As Philipp (2007) points out one of the necessary skills required for teaching is to develop the relevant tasks according to the context.

b) Manipulative. Amjad did not use manipulative in teaching mathematics. The teachers do not always need specially designed manipulative, but they can use low cost, no cost manipulative like buttons, tooth picks and paperclips etc. Similarly, many other tools like cuisiner rods, bead, bars, abacus, GeoGebra, 3D objects etc. can facilitate meaningful learning in the classroom as Shaw & Marlow (1999) find that tools served as foundations and helped students to move from concrete experiences to abstract reasoning. The tools may help the students to build deeper mathematics understanding and gain the benefits of a healthy attitude toward mathematics.

c) Procedural Non-Collaborative Learning Tasks. Amjad's video recordings show that students preferred to sit in groups rather individually. This behavior facilitated them to work on their tasks collaboratively (Mercer, 2008). The teacher believed that working together is productive, but he adopted a procedural method of solving tasks. In procedural instruction only, surface-level knowledge is developed. This implies that knowledge is linked with rote learning and inflexibility. Hence, these tasks can be termed as Interactive/ Authoritative. We would call the tasks authoritative since the nature of the tasks was controlled by the teacher; however, the method of solving the tasks was interactive. There was monologic instruction regarding the tasks, in which the tasks are controlled by the teacher. In other words, the teachers had a verbal authority rather than an intellectual one. The National Professional Standards of Teaching of Pakistan on the other hand, have high expectations from both the teachers and the administration towards the implementation of the constructivist approach. However, in terms of collaborative tasks Amjad is unaware of the various aspects of this teaching approach.

(ii) Classroom Discourse: The table given below depicts the classroom discourse of Amjad.

Table-4:
Analysis of Classroom Discourse (Amjad's Teaching)

Episode Number	Category
Epi-1	D-3
Epi-2 & Epi-10	D-4
Epi-5, Epi-6 & Epi-7	D-5
Epi-3, Epi-4, Epi-8 & Epi-9	D-6

Data analysis shows that in the beginning of each lesson classroom discourse was more teacher directed since it fell in the categories D3 & D4 (see table-4). However, the classroom discourse was non-collaborative in 3 episodes; i.e. 1, 2 and 10.

Evidence from the context

a) Teachers focus on mathematical definitions. Amjad strictly adhered to the definitions given in the textbooks. We agree with the mathematics educators like Sfard (2012) that mathematical definitions have a privileged place during the teaching practices. However, mathematical definitions are different from 'ordinary' definitions because they are based on logical derivation for a concept. We problematize that mathematical definitions may capture the richness of the mathematical thinking if it is derived and given to the students for discussion. By doing so, it can work as a skeleton of the understudy concept. Analysis of the case shows that although Amjad knew the importance of mathematics definitions, but he did have the pedagogical knowledge of how to use the definition by establishing the constructivist context in an effective and efficient way. Evidences show that actually Amjad promoted rote-memorization but on the other hand he was the one who believed highly in the use of collaborative learning.

b) Ritualized discourse followed by collaborative discourse. Analysis shows that Amjad favoured teacher's talk over students' talk at the start of new topic. So, the classroom discourse was non-collaborative.

Amjad followed a ritualized discourse whenever he introduced a new concept. The pupils participated only when the teacher desired for them to participate, otherwise they were seen listening quietly to the teacher's explanation. The whole process of discourse was controlled by the teacher, rather it looked very mechanical. There was complete silence in their classroom except for the teacher's voice. Hence, the discourse that turned up; became a part of meaningless ritual of classroom life, rather than a tool for learning. The teacher controlled the classroom behaviour so he did not invite collaborative discourse with the fear that it can create management problems for him. As Howe and Abedin (2013) view that classroom management

issues that arise due to classroom discourse can be handled if teachers have the relevant management skills. However Amjad's classroom discourse is collaborative in the sense that he gave the controlled autonomy to the students to adopt any method for doing mathematics. The researchers are saying controlled because the students adopted but did not develop their own method.

In Episode 10, the teacher told the class that today they would do a '*difficult concept*' of finding square roots using the division method. In this episode the teacher while explaining the steps of the question on the board used different coloured markers. The students were seen listening quietly yet attentively to the teacher's explanation.

10.4	Teacher	(writes) Q. 1. Find the square root by division method
10.5	Teacher	(i) 729
10.6		27 2 | 7 29 ← (1) (*Explains*) Select pairs from right side +2 | 4 47 | 329 329 ← (2) Then select same no for left side *Explains*) x
10.7		So $\sqrt{729}$ = 27 Ans.

While in other episodes it was observed that the discourse pattern would fall between categories D5 & D6 which indicated more student-directed discourse. In Episode 3, it was noted that the classroom discourse was highly collaborative. Here, it is observed that as soon as the teacher gave the students 'autonomy' to the choose any method they wanted to; the students became very 'excited'. Again, in episode 6, the classroom talk was very 'collaborative'. Students were participating actively and asking a lot of questions from one another and the teacher to clear their confusions.

(iii) Classroom Environment. The table-5 shows the status of Amjad's classroom environment analysis.

Table-5:
Analysis of Classroom Environment (Amjad's Teaching)

Episode Number	Category
Epi-1, Epi-10	E-3
Epi-2, Epi-3, Epi-4, Epi-5 & Epi-6	E-4
Epi-7, Epi-8 & Epi-9	E-5

Evidence from the context

a) Physical environment. The findings of the study indicate that Amjad considers physical layout as one of the important elements for effective collaborative learning. Physical environment means to provide favourable conditions to students to participate, to share their ideas with their fellows, and to remove their confusions of the content. As Hiebert and Grouws (2007) states the physical environment does not determine the relationships among teachers and students rather in collaborative classroom it portrays a responsive classroom where active involvement of students takes place.

The physical conditions of Amjad's classroom were not conducive (poor lighting, less sitting space). Three students were sitting on one desk and desks were placed in 6 rows and 3 columns. He considered three students sitting at one desk as a group. Amjad shared that because of the large class size (57), the students worked exclusively with their desk fellows. Amjad's teaching practices seemed aligned with his beliefs as far as the physical layout of the classrooms is concerned. Amjad's school is located in one of the thickly populated areas of a big city. Amjad's school has a large population of students and this school was working in three shifts.

All teachers are facing problems regarding space and a large number of students. We agree to the fact that one of the unfortunate aspects regarding less physical space of classrooms, is that teachers often have little control over it. On the contrary, Amjad managed to place students in group formations. Hence, the physical environment of Amjad's classroom could not stop him from practicing of 'collaborative learning'. This implies that he was motivated to teach, and his practices are aligned with his belief to teach mathematics to his students collaboratively. The classroom practices of Amjad provided an environment that supported students to work cooperatively as well as encouraged communication.

The analysis indicates that Amjad knows about collaborative learning as a social pedagogy. The role of teacher is very important in developing favourable environment for collaborative learning. A good teacher does not wait for a special

setup for collaboration, but he manages such environment by stimulating and engaging the students for collaborative activities that can support them for better learning and understanding. However, sometimes it was observed that the classroom practices were collaborative in terms of procedural learning. As Hiebert and Grouws (2007) state that procedural learning may lead to increase in the conceptual understanding and facilitate in adoption of conceptual understanding, but only to a limited extent as much as the teacher wants; highlighting the fact that the teacher is still in charge. Procedural learning may be beneficial as long as it is grounded in conceptual understanding.

In Amjad's case the students were given the opportunity to discuss the mathematics problems in groups, but the nature of discussions was controlled by the teacher that did not motivate them to evaluate their understanding and explore their errors on their own. The teacher's intervention rate was very high during collaborative work and based on content help. Although, he provided the opportunity to share the ideas during collaboration but on the other side he did not want to lose his authority. On the contrary, it is essential in a collaborative classroom environment that students have the opportunity to discuss mathematics with one another, refining and critiquing each other's ideas. It was observed that although Amjad knew how to make a layout for collaborative work, but he could not implement the collaborative work in true sense where students construct their knowledge on their own.

The analysis of episodes 1 and 10 shows that in the introduction of a new concept the classroom environment would fall under the category E3; which showed that the teacher created a "learning environment" that makes the students passive learners.

The following extract is taken from episode 1 that explains the case

1.02	Teacher	What do you do in multiply when base is same?
1.03	Students	We plus the exponents (*speak loudly together*)
1.04	Teacher	What do you do in division when base is same? Then what do we do?
1.05	Students	We minus the exponents. (*speak loudly together*)
1.06	Teacher	(*Reconfirms*): What do we do with divide?
1.07	Teacher	(*All*) Minus
1.08	Students	(*Writes*) $2^{7-2} = 2^5$
1.09	Teacher	If we do not have the same base and the exponents are the same; then what do, we do?
1.10	Teacher	We plus
1.11	Student 1	(*He nods his said in no*) No
1.12	Teacher	(*while raising his hand speaks*) We write in whole

1.13	Student 2	(*Repeats*) Yes, we write in whole.
1.14	Teacher	Like example (*writes on board*) $x^a \div y^a$
1.15	Teacher	(*Repeats*) Here exponent is same but base is different so what do we do?
1.16	Teacher	(*together*) We write in whole.
1.17	Students	(*Writes and explains*) $\left(\frac{x}{y}\right)^a$ (*confirms*) instead of divide '÷' sign can we write '—'.

In the above example Amjad probed on the topic of 'exponents' (lines 1.02, 1.04 & 1.07). On the other hand, students responded when asked by the teacher (lines 1.03 & 1.05). Such environment helps the students to facilitate the faculties of abstraction. This results in the development of mathematics language followed by the motivation to learn.

Table-5 shows episodes in which the categories E4 & E5 were observed. This shows that the teacher presented an environment in which students actively participated. The teacher created an educational setting that reflected value for students' ideas; encouraged communication and worked collaboratively.

(iv) Classroom Evaluation. The teacher evaluated the students in all the recorded episodes. The teacher often started his lesson by asking a few questions, from the previous lesson.

Table-6:
Analysis of the Classroom Evaluation (Amjad's Teaching)

Episode Number	Category
Epi-1 & Epi-3	Ev-1
Epi-2, Epi-4, Epi-5, Epi-6, Epi-7, Epi-8, Epi-9 & Epi-10	Ev-3

Evidence from the Context

a) Procedural Questioning at the start of the lesson. At the start of the lesson Amjad used procedural questioning for student's content evaluation. In a traditional classroom context, the teacher usually used lower order questioning for placement evaluation. Students were well aware about such traditional assessment ways used by the teacher. As a result students used two strategies to answer these questions; some of them consulted the textbook and while others used their notebooks to answer these questions.

Amjad in episode 2 asked a basic question to assess the previous knowledge; what are exponents? To respond to the question the students used the textbook. The

teacher wanted to listen to their right answer to validate his successful teaching. In all the classes; the evaluations done by the teacher fall under the category Ev3. The teacher rarely used observations, writings and other techniques to evaluate students' understanding. Overall, Amjad's students' evaluation was non-collaborative. The approach used by Amjad can be termed as "instrumental collaborative learning". This approach is usually quicker to understand. The response of the students is quicker and more visible than relational mathematics. This approach is very much applicable for students to build their self-confidence since they can mostly get the right answers quicker than the relational approach.

On the other side, collaborative evaluation helps the students to develop their own thinking. As once, Amjad in episode 4; at the start of the lesson wrote a question that was a higher order thinking question, and it was not from the textbook; the students got excited. They started discussing in their groups. However, such kind of assessment was very rare in Amjad's class. Although he knew how to ask such questions that may arise discussion, but it seemed that the teacher wanted to control the class.

b) Assessments for learning. The role of evaluation in collaborative learning however should not only aim to reward the students' grades or certifications. It should play an important part in improving students' learning. This implies that evaluation should be considered as an instrument for learning. Stipek et al. (2001) emphasize the importance of creativity as an important consideration for evaluating in a collaborative class. Creativity in a collaborative classroom encourages students to explore mathematics problems whereas in a traditional classroom evaluation is focused on getting the correct answers.

According, to Slavin et al. (2013) the instructor should provide a series of activities with emphasis on the various assessment strategies in mathematics. Student questioning is also included; which is one of the procedures of formative assessment. In episode 4, the teacher assessed students' learning about squares and square roots by asking them to solve the questions other than the textbook. The numbers in the questions were only changed. Following excerpt shows questions (line 4.34) that were given to the students that were not from their textbooks.

4.33	**Teacher**	***(loudly)*Test whether the following are perfect square.**
4.34	Teacher	*(writes)* (i) 400 59 (ii) 625 (iii) 225 (iv) 196
		(v) 425 (vi) 81 (vii) 121 (viii) 25000 (*students have enthusiastically started discussing with their group members*)

4.35	Teacher	*(Reminds them)* please don't be so loud and quickly let me know which number is perfect square?

Here the level of excitement among students increased when they came to know that the questions written by the teacher were not from the textbook (line4.35). In order to solve the questions first and correctly they started discussing with their group fellows.

Discussion

In the Pakistani educational context, mathematics teachers' beliefs & practices towards collaborative learning has not been explored in greater depth. However, this study provided a deep insight of the relationship between teachers' beliefs and their practices with regard to collaborative learning. Graham et al., (2014) claim that beliefs determine the actions. A lot of research on teachers' beliefs is conducted in the recent years; which show that beliefs of teachers have an impact on their teaching practices (Pepin & Roesken-Winter, 2015). Chen (2008) has described the importance of beliefs in order to understand the teacher's behaviour in the classroom. Similarly, Phipps (2009) argues that teachers' beliefs have a strong impact on teachers' instructional practices. Thompson (1992) argues that beliefs of a mathematics teacher are a basis for teaching and learning process. However, the results of current study show that Amjad's beliefs are not completely aligned with his instructional practice. He could not completely implement the collaborative context in his practices. Following observations were made regarding each area of collaborative learning in Amjad's classroom practices.

Tasks: Amjad's close-ended tasks did not foster students' higher-order thinking skills. He used tasks taken from the textbook both for classwork and homework. The purpose of the researchers is not to challenge the nature of tasks given in the textbooks, but the analytical framework used in the current study does not consider text book tasks as collaborative. The findings showed that the procedure of carrying the tasks was Interactive\ Authoritative. The teacher allowed the students to interact in groups but on the other hand, the procedure used to solve the tasks was controlled by the teacher. The teacher did not use any type of manipulatives in all the recorded sessions.

Discourse: The findings indicate that Amjad at the beginning of the lesson used a ritualized discourse. However, as soon as the class settled the classroom discourse turned out to be very interactive.

Environment: The classroom environment provided by Amjad turned out to be favourable for the students to participate. The findings showed that Amjad's implication regarding CL was to place the students in groups. Amjad's classroom

conditions did not allow the students to sit freely. In spite of this constraint he encouraged the students to sit together and interact.

Evaluation: The evaluation procedure used by Amjad was not collaborative. He used simple and basic questions that were based on recall. He used textbook questions to evaluate students understanding regarding the topic. Hence, there was no creativity found in any of his evaluations.

As Allahyar and Nazari (2012) argue that there may be factors other than teachers' beliefs that influence on their practice which seem to play an important role in 'modulating' teachers' practices. Therefore, it may not always be true that the teachers' practices are shaped by their beliefs or vice versa. Hence, in order to bring any reform in the teaching practices of mathematics teachers in Pakistan it is necessary to find the influence of other factors other than teachers' beliefs that influence the teaching learning process.

Conclusion

This study has presented in-depth insights into the understanding of the belief\practice relationship towards CL. Amjad's classroom practices demonstrated that his beliefs were not wholly consistent with his teaching practices. To make the students sit in groups and to allow them to interact does not make a teacher's classroom practices collaborative. In order to practice CL in the real sense there are other factors that are important in a mathematics classroom like collaborative tasks and collaborative evaluations. Although this study was done on a small scale, it raises significant issues related to the teaching of elementary mathematics in Pakistan. It seems to the researchers that it would be worth investigating the nature and direction of the influence of schools on teachers' practices and their beliefs. Specifically, a study needs to be done in finding the constraints and the extent to which they directly influence the instructional practices decisions that teachers take against their beliefs.

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