

**Mathematics Teachers' Beliefs towards Collaborative Context and Practices**

- i. Maria Shiraz
- ii. Shahzada Qaisar,
- iii. Muhammad Saleem
- iv. Hafiza Sadiya Iqbal

- i. Assistant Professor University of Education, Lahore
- ii. Associate Professor University of Education, Lahore qaisarshahzada@yahoo.com
- iii. Assistant Professor Govt. Islamiya College, Civil lines, Lahore Saleemrose25@gmail.com
- iv. Lecturer Lahore College for Women University, Lahore Saleemrose25@gmail.com

Abstract

This study aims to explore the beliefs and practices of Pakistani elementary mathematics teachers towards collaborative learning. The present study has used an exploratory approach and provides a detailed understanding of the mathematics teachers' belief-practice relationship towards collaborative learning (CL). A questionnaire was used to select four mathematics teachers who highly believed in the use of CL. Next, classroom observations of the selected teachers were recorded for a period of almost four months (ten recordings of each teacher). Each teacher was observed against four different areas of collaborative learning; tasks, environment, discourse and evaluation. The analysis of the filmed data showed inconsistencies between the beliefs and practices of the selected mathematics teachers. The results show that many factors other than teachers' beliefs also influence on their teaching practices which are necessary to consider for productive interaction.

Keywords: Beliefs, Collaborative learning, Mathematics & Teachers Practices

Rationale of the Study

Pakistani public schools are producing unacceptable low levels of learning outcomes in mathematics. Meaningful and conceptual mathematics education is not being provided to the children (Siddiqui, 2017). One of the causes for the downfall of maths education in Pakistan is teachers of mathematics who do not have the right skills to deliver quality instructions to the students (Qaisar, 2011). As a mathematics teacher, the researchers have always been curious to know why traditional types of teaching methods are being practices in the Pakistani classroom. There might be many factors which may influence but we assumed here teacher's beliefs. As many researchers for example; Leatham (2006) and Phipps (2009) have pointed out that teachers' instructional practices should be perceived in relation to their beliefs. With the acceptance of the significance of the belief practice connection, there was a plethora of research (Beswick, 2007; Ertmer, 2005) conducted to analyse the connection between beliefs and practice. However, there is no confined study of this domain in the Pakistani context. So, the researchers desired to explore this area further with a perspective that would satisfy their inclination for research which might ultimately be of practical worth. Besides the researchers' personal interest in this topic, the literature also suggests that teachers are not simply implementers of educational innovations that are handed down to them by policy makers, but they interpret, modify, and implement these innovations according to their beliefs and the circumstances where these teachers work (Harris & Spillane, 2008; Keys, 2007).

Mathematics education in Pakistan is in its early stages of development but there is an increase in interest in this area as time passes. Yet, there are still several fundamental questions left unanswered. One of them is regarding mathematics teachers' classroom practices. Our review of literature on mathematics teachers' classroom practices in Pakistan yielded very little information. This situation has led us to focus on elementary school mathematics teachers' classroom practices in Pakistan. These institutions teach the mathematics topics to their students whereby focusing only on students' preparation of examination in terms of mathematical knowledge. In Pakistan, since teaching of mathematics is conservative, with didactic teaching (and passive pupils), collaborative learning is still very limited. One of the factors that contribute to its limited application in schools is that the teachers in Pakistan are not aware of its effectiveness. So it is assumed that the teachers of Pakistan might not have the knowledge about what collaborative learning is or they might not believe in the effectiveness of this method. Research suggested that both teacher knowledge (Ball, Phillips, Wade, & Quayle, 2006) and teacher beliefs (Jacobs, Yoshida, Stigler, & Fernandez, 1997) structures the practices of the mathematics teachers. In the past, the influence of both teachers' knowledge as well as the beliefs on their mathematics instruction was examined separately. However, in this study on the basis of the teachers' knowledge about collaborative learning we will find out the impact of teachers' beliefs towards this teaching methodology in their classroom practices.

Despite the widespread continuation of the private institutions in Pakistan and the amount of the discussions upon the methodologies related to mathematics classroom teachings, there is a need of research on mathematics education in general. The extent of research does not seem to go beyond a survey of student demographics and student attitudes. Though collaborative learning has been investigated in Pakistan, no research has been done to explain or explore collaborative learning with relation to teachers' beliefs in mathematics teaching. Moreover, studies regarding the alignment of collaborative learning beliefs and practices among Pakistani mathematics teachers do not exist at present. This is, perhaps, because mathematics education is a new area of research in Pakistan. Therefore, there is a need for research on mathematics teachers' instructional practices and beliefs towards collaborative learning. This led the researchers to do this exploratory study.

Purpose of the Study: The purpose of this study is twofold. Firstly, the aim of this study is to identify such teachers who highly believe in collaborative learning. The second aim of the study is to explore the relative influence of mathematics teachers' beliefs on their practices. This study would be helpful to the policy makers and teacher trainers to design such professional courses to improve the teaching of the mathematics teachers by working on their beliefs. This study can help the curriculum department and the textbook board to design the curriculum and textbooks tasks that may support collaborative learning.

Research Questions: This research study starts with a preliminary stage where the researchers aimed to sort out two categories of teachers; those who: 1) believe in collaborative learning and 2) do not believe in collaborative learning. So the first question of the study is:

Q. 1. What beliefs Elementary Mathematics Teachers of Pakistan hold concerning the use of collaborative learning.

The following two questions would help the researchers to find the connection between the two factors; that is mathematics teachers' beliefs and their instructional practices.

Q. 2. What are the practices of mathematics teachers who believe in the use of collaborative learning?

Q. 3. Do beliefs about collaborative learning held by elementary mathematics teachers in Pakistan align with their practices?

Methodology

The study has the characteristics of a descriptive and exploratory research which contains qualitative elements. Qualitative approaches are in favour of viewing the social reality based on the experiences of individuals and the way they interpret the social world. Hence research of a qualitative nature is seen as focusing and comprehending upon the interpretations of the individuals about the world around them (Cohen, Manion, & Morrison, 2013). The approach of this study is interpretative and the researchers are using case study methodology because it can provide an insight

to explore the phenomenon covering contextual situations (Yin, 2009). The case study methodology focuses on the process and in-depth understanding of any given phenomenon (Yin, 2013).

Participants Setting: The research study was set in two government and two private schools. The private schools were located in a pleasant residential middle class neighbourhood. Most of the student population comprised of children from working class families. The government schools were located in the centre of the city and had purpose-built campuses. However, the student population was mainly from low-income group families.

Sampling: The present study, therefore, adopted 'purposeful sampling', which 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, p.77) . Four mathematics teachers make up the cases of this multiple-case study. Two teachers were selected from both the public and private sector as they willingly accepted to participate based on the flexibility in their timetables.

Data Collection

The data was collected over a period of five months. The main study is divided into the following three stages:

Stage 1: Teachers' Beliefs Questionnaire. Mathematics researchers have classified teachers' beliefs into three types: beliefs about the nature of mathematics, beliefs about mathematics teaching, and beliefs about students' learning (Thompson, 1992a). The questionnaire of Thompson (1992a) was adapted for the present study. However, for the convenience and understanding of the Pakistani teachers, the questionnaire was translated into the native language, Urdu. The questionnaire was given to fifty teachers of mathematics at elementary level in both public and private schools. The results of the questionnaire helped the researchers to find teachers whose beliefs regarding CL in mathematics were the highest. Four teachers who believed in the use of CL; two teachers each from both private and public sector were purposely selected.

Stage 2: Observations (Video Recordings). To address the research questions 2 & 3; classroom observations were conducted. This method would help the researchers to gather thorough understanding about how the teachers used CL in their classrooms. The researchers observed ten classes of each case (teacher). Hence, 40 formal observations (video recordings) were done altogether at various intervals during the term. The purpose of recording the classroom practices of these cases was to see the alignment of beliefs of teachers and their practices.

Analysis of Data

The analysis of data consists of two phases.

Phase 1. Analysis of questionnaire data showed that 12 teachers believed in collaborative learning and their cumulative score was more than 60%. After that the researchers selected four respondents out of 12 who had the highest cumulative score. Fictitious names were assigned to all in order to assure anonymity.

Phase 2: Observations (video recordings)

In this stage the researchers report the practices of the teachers who believe in the use of collaborative learning. We account the alignment between the teachers' beliefs and their practices.

The analytical framework

The analytical framework consists of four major themes; Tasks, Discourse, Environment and Evaluation and each theme consists of many indicators that helped the researchers to identify the nature of practice of the teacher (see appendix A).

Presentation of the Results (Case Studies)

For an in-depth understanding of the study two cases; one each from public and private sector, have been presented in detail. The other two cases are briefly discussed as the researchers are required to limit themselves in the permissible space.

The case of Akhtar

Akhtar was a sixth-grade class teacher in a government school. He was an experienced teacher in his early thirties. Akhtar was teaching 30 lessons per week. At elementary level he had a hectic schedule like other teachers.

Teaching practice Akhtar's teaching practice is categorized into four broad categories according to the analytical framework.

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

Table 1.1

Analysis of Tasks Used by Akhtar during his Teaching

<i>Episode Number</i>	<i>Category</i>
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: In episode 1, Akhtar started his teaching by explaining the procedure of the example given before the exercise of the textbook. As teaching of the concept quotient law in a very traditional way, he solved a few questions from the exercise on the board. After explaining the procedure, he gave similar types of tasks from the book for practicing individually. He wanted the students to follow the same procedure that he explained on the board. He did not ask for collaborative work, but students took help from each other whenever they required.

Below is the excerpt taken from one of the episodes showing such type of practice.

- 4.03 Teacher Please write definition [of] Square (he is writing the definition on the board and speaking loudly)
Then "The product of a number by itself is called square. Now square of $3 = 3^2 = 3 \times 3 = 9$ "
- 4.04 Teacher Please listen attentively otherwise it will be difficult to understand?
(there was a pin drop silence in the classroom)
- 4.05 Teacher Now we have natural numbers – further divided into 2 parts.(pauses)
- 4.06 Teacher Can someone tell me about natural numbers?
- 4.07 Students 1, 2, 3, ... (loudly)

The analysis of all the observations showed that Akhtar used textbook tasks. He had no concern that the tasks invited collaboration or not. He employed collaborative learning strategy and made the groups of fours or three during mathematics teaching in almost all episodes except three. If anybody asked from him, he provided the 'content help' instead of 'process help' on the board. He provided help to all groups who were not even under the zone of proximal development by writing the answer on the board. Through his practice it seemed that although he believed students learn better when they are placed in groups but he did not consider those factors involved in the productivity of social learning.

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

Table 1.2

Analysis of Discourse Used by Akhtar during His Teaching

<i>Episode Number</i>	<i>Category</i>
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

The analysis shows that the discourse was more teacher directed and non-collaborative in Epi-1, Epi-2 and Epi-10. In these episodes, teacher used traditional pedagogy and focused on procedural learning. Akhtar believed that it is the teacher's duty to present the procedure at the start of each concept.

Evidence from the context: In Episode 10, the teacher was teaching square roots using the division method. He wrote all the steps on the board with different coloured markers. The students were seen listening attentively to the teacher's explanation of each step.

- 10.4 Teacher (writes)Q: 1. Find the square root by division method

10.5 Teacher (i) 729
10.6

10.7

$$\begin{array}{r}
 27 \\
 \hline
 2 \overline{) 729} \\
 +2 \quad 4 \\
 \hline
 47 \quad 329 \\
 \text{So } \sqrt{729} = 27 \text{ Ans.} \\
 \quad \quad 329
 \end{array}$$

(1) (Explains) Select pairs
.....

(2) Then select same no for left side (Explains)

The discourse moved towards dialogic when he provided the agency to the students.

(iii) Classroom Environment. The table 1.3 shows the status of Akhtar's classroom environment analysis.

Table 1.3

Analysis of Classroom Environment Created by Akhtar during his 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: The analysis shows that in Epi-1 and Epi-10, the teacher was active and students were passive. However, in five episodes students were active learners and occasionally played a passive role. But in three episodes; Epi-7, Epi-8 and Epi-9 the environment of Akhtar classroom was very lively and students actively participated. He created such setting that reflected value for students' ideas, encouraged communication and worked collaboratively. Following is an example of such case.

- 7.10 Teacher (directs them) Do 196 on your own.
- 7.11 Teacher Turn around so that you make groups of six
- 7.12 (Teacher goes to the students to see their work. Students helping each other also getting the help of the students)
- 7.13 Teacher (reminds them) Please help your friend and help each other.

The motivation level of students was high (line 7.12). The teacher encouraged the students to participate in classroom discussion. The classroom environment of Akhtar's classes was found to be collaborative in terms of procedural learning. The learners were given the independence to learn and explore under the control of the teacher. In nutshell it is stated that the teacher believed on the authoritative dialogic style of learning.

(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 1.4

Analysis of the Evaluation Used by Akhtar during his 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

The analysis shows that Akhtar primarily evaluated students through a set of questions from the textbook, only occasionally using other means.

Evidence from the context: The following expert is taken from episode 4, which shows that how the teacher used the questioning technique to place the level of students understanding towards the entire concept.

4.33	Teacher	(<i>Pointing towards the questions</i>) are they perfect square?
4.34	Teacher	(i) 400 59 (ii) 625 (iii) 225 (iv) 196 (v) 425 425
4.35	Teacher	(<i>Reminds them</i>) please don't be so loud and quickly let me know which number is perfect square?

The analysis shows that the teacher mostly posed such questions that demanded "right answers". Throughout the lesson the teacher evaluated students' understanding through the questions from the textbook. The teacher rarely used alternative techniques to evaluate students' understanding. Overall, Akhtar's students' evaluation was strongly non-collaborative.

Discussion

It is difficult to say in one line that the beliefs of these teachers are aligning with their practices. The study explores that beliefs analyzed through questionnaire would not show the actual belief which a person has; it superficially tells the type of beliefs. However, when practices were analyzed then the researchers gained insight that the beliefs what the teacher had chosen in the questionnaire were understood differently.

Task: The classroom observations showed that although Akhtar believed in CL but he is not 'aware' of collaborative tasks. He 'believes' that when students are given task from the textbook and asked to 'sit in groups' then there is collaborative learning taking place.

Discourse: It was observed in all the episodes of Akhtar that whenever he had to start a new topic in the class; the nature of interaction would be more teacher-directed. Out of ten episodes that were recorded in three of the episodes new topics were introduced. While in the other classes the concepts of these new topics were practiced which followed a student-directed discourse pattern. Hence, the beliefs and practices regarding discourse were aligned.

Environment: According to the recordings Akhtar's classroom environment was directly related to the type of 'work' to be done in the class. If he had to introduce a new concept the students appeared to be passive. After the preamble of the topic it was noted that the teacher provided them with an environment in which students actively participated.

Evaluation: In all the episodes it was observed that the teacher would only evaluate students understanding of the taught concept through a set of questions from the textbook. Although he believed in collaborative learning but the approach used by him is instrumental collaborative learning.

The case of Sadia

Background and setting. Sadia has been teaching mathematics in a private elementary school for the last three years. She was a graduate in mathematics and had a masters degree in communication.

Ms Sadia's mathematics teaching practice.

(i) Classroom Tasks.

Table 1.5.

Analysis of Tasks Used By Sadia during her Teaching

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

The above table shows that all the tasks used by Ms. Sadia fall under the category T1

Evidence from the context: In almost all the episodes the teacher used the tasks from the textbook and used traditional approach for teaching mathematics. For example, in one of the episodes when the teacher was teaching area of a trapezium, he made a diagram of trapezium on the board and wrote the formula. The teacher put the given values in the formula and explained the procedure. The students listened to the teacher's explanation quietly and noted down the solution of the sum in their notebooks. Sadia waited and walked between the desks for the students to finish copying down from the board into their notebooks.

(ii) Classroom Discourse.

Table 1.6.

Analysis of Discourse Used by Sadia during her Teaching

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

The analysis shows that three episodes fall in each category D-2 and D-3, in which discourse was teacher centred. However, four episodes fall under the D-4 category in which the discourse patterns were teacher-centred as well as student-centred. For example, Sadia used very traditional approach for teaching of 'volume of a cylinder'. There were a total of 30 turns that appeared for teaching of volume of cylinder and it happened only two times when students were involved; once when the teacher asked the students to tell the formula and second time he asked how to put the values in the formula. The teacher did not provide the opportunity to the students to participate during the activity. Dialogue-rich mathematics classroom is only possible if they are encouraged to discuss the concept. Later the students were informed to do the sum in their copies.

As said earlier in four episodes the discourse was teacher-centred as well as student-centred. For example, in one episode the topic for teaching was 'angle'. The teacher made the groups of fours and asked each group to draw all angles given in the textbook exercises. Students actively engaged in helping and assisting their group members. While working in groups the mathematical discourse that takes place during group discussion helps teachers to observe, listen to and monitor students understanding about the content. Such kind of information can be useful for teachers to find out the areas of uncertainty or frustration in order to adjust lesson plans accordingly.

(iii) Classroom Environment.

Table 1.7.

Analysis of Environment Created by Sadia during her Teaching

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

In all the ten episodes of Ms. Sadia the classroom situation can be categorized into E2 and E3. Hence, the classroom environment provided by Sadia was not collaborative.

Evidence from the context: In the E2 category the teacher creates an atmosphere in which students are not active, occasionally asking them to play a more active role. The following excerpt is an example of such context.

32.10	Teacher	(Writes) Discount = M.P – S.P
32.11	Teacher	(Explains) The formula
32.12	Teacher	(Writes and Explains) Q 1 (a) M.P = \$ 100, S.P - & 88
32.13	Teacher	[So] discount = (100 – 88) = \$ 12 (students are attentively looking at the board)
32.14	Teacher	[Now] percentage Discount = $\frac{\text{Discount}}{\text{M.P}} \times 100$
32.15		$= \frac{12}{100} \times 100 = 12\%$
32.16	Teacher	(Elaborates) [So] at \$ 100 he is giving you \$ 12 discount
32.17	Teacher	(tells) (b) Part is also same
32.18		M.P = \$ 580, S.P = \$ 464 (explains)
32.19		Dis = M.P – S.P
32.20		= \$(580 – 464) = \$ 116
32.21		% Dis = $\frac{\text{Discount}}{\text{M.P}} \times 100$
32.22		$= \frac{116}{580} \times 100 \Rightarrow 20\%$
32.23	Teacher	[Asks one of the student to explain] Fatima

As in the above example it is noted that the teacher is doing all the work. She is explaining the process of finding discount while on the other hand students are passively sitting and listening to the teacher. In seven episodes the classroom environment fell under the category of E3 which shows that the teacher created an environment that sometimes allows students to be passive learners.

(iv) Classroom Evaluation. The analysis shows that the classroom evaluation procedure indicates the Ev-1 & Ev-2. It is seen that the teacher presents questions in search of specific, pre-decided responses. She evaluates students solely via questions seeking "right answers".

Table 1.8.

Analysis of Evaluation Used By Sadia during her Teaching

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

Evidence from the context: Following excerpt illustrates the assessment strategies the teacher used

38.2	Teacher	(writes) Ex 14a
38.3	Teacher	(Writes & Explains) example 1
38.4	Teacher	(writes) Q1 (a) $\frac{2}{7} \times 90^\circ = \frac{180^\circ}{7} = 25.7$
38.5	Teacher	(asks) Is it acute, obtuse or right angle?
38.6	Students	It is an acute angle (all)
38.7	Teacher	(directs them) Now look at (d)

Similarly teacher writes few questions on the board and asked whether they are acute or obtuse or right. Sadia asked very basic and low cognitive demanding questions from the students during teaching which could not foster creative and collaborative thinking.

Summary of Nazia's practices.

The researchers analyzed the practices on the basis of four determinants; task, discourse, environment and evaluation.

(i) Task:

The table 5 shows that the tasks used by Ms. Noreen during all the episodes fall under the category T2 according to the analytical framework. She chose all of the tasks from the textbook.

Table 1.9

Analysis of Tasks Used by Nazia during her Teaching

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

The analysis illustrates that although Ms. Nazia believed in the use of collaborative learning but the tasks used by her in almost all the episodes do not promote and prompt collaborative learning. The students had a 'controlled agency' in her classes. The students 'seemed' to have conveniently adjusted to this method of task selection.

(ii) Discourse:

Nazia's classroom discourse was not collaborative.

Table 1.10.

Analysis of Discourse Used by Nazia during her Teaching

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

In Ms. Nazia classroom the discourse was student-directed talk as well as teacher directed. Nazia facilitated the students to meaningful connections with their daily experiences.

(iii) Environment:

Nazia recordings tell us that her classroom environment was collaborative. This can be observed through the following table.

Table 1.11.

Analysis of Environment Created by Nazia during her Teaching

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

The episodes analysis tells us that that the classroom environment is broadly divided into two types; E3 and E4. Her beliefs and practices towards a collaborative learning environment were ahmedgned. The students had the 'autonomy' and 'independence' to discuss their findings with each other.

(iv)Evaluation:

Evaluation done by the teacher fell under the categories of Ev3 & Ev4, which showed that the assessment procedures were highly non collaborative.

Table 1.1.

Analysis of Evaluation Used by Nazia during her Teaching

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

The table 1.12 shows that mostly the evaluations conducted by Nazia fell under the category Ev3. Only two episodes fall under the Ev4 category. Nazia's beliefs towards collaborative learning did not show in her evaluation process. Her assessment procedures were highly non-collaborative since she evaluated the students on the basis of a set of questions which checked knowledge level.

Summary of Ahmed's practices.

The researchers analyzed the practices on the basis of four determinants; task, discourse, environment and evaluation.

(i) Task:

Following findings were made:

Table 1.13.

Analysis of Tasks Used By Ahmed during his Teaching

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

The table 1.13 shows that Ahmed adopted all the tasks from the textbook and were close ended. So they fall under the category T1 and T2 and are non-collaborative. Ahmed's collaborative learning beliefs and his choice of tasks were highly non collaborative. The analysis shows that the approach of Ahmed's teaching was very traditional, he solved the question from the textbook on the board and explained the procedure.

(ii) Discourse:

Ahmed's classroom discourse was found to be ranging between the categories D3 and D4.

Table 1.14.

Analysis of Discourse Used by Ahmed during his Teaching

<i>Episode Number</i>	<i>Category</i>
Epi-2, Epi-6 & Epi-8	D-3
Epi-1, Epi-3, Epi-4 Epi-5, Epi-7 & Epi-9 and Epi-10	D-4

In three episodes (Epi-2, Epi-6& Epi-8) the discourse was mostly student directed. However, in the other seven episodes the teacher encouraged both teacher-directed and student-directed discourse. Ahmed's classroom discourse was collaborative to some extent when he provided the opportunity to the students for discussion. Beliefs and practices were ahmedgned in the case of classroom discourse. The analysis show that the students were found daring while asking questions from the teacher.

(iii) Environment: The analysis show that the teaching practice of Ahmed comes under the category of E2 and E3. Hence the classroom environment provided by Ahmed was not collaborative.

Table 1.15

Analysis of Tasks Created by Ahmed during his Teaching

<i>Episode Number</i>	<i>Category</i>
Epi-1 Epi-3	E-2
Epi-2, Epi-4, Epi-5, Epi-6, Epi-7, Epi-8, Epi-9 and Epi-10	E-3

The teachers created such an environment in which students were sitting quietly, occasionally calling on them to play a more active role. Teacher's beliefs and practices were not ahmedgned in terms of the environment. The observations show that the teacher did not know what type of environment is required for productive collaborative learning.

Evaluation:

There was continuous assessment done by the teacher. However, the researcher reported that the teacher primarily evaluates students through set questions that require specific, predetermined responses from the students. It was very rarely observed that the teacher evaluated using other means.

Table 1.16.

Analysis of Evaluation Used by Ahmed during his Teaching

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

All the episodes followed the path of the **Ev1** and **Ev3** indicator. Evaluation done by the teacher showed that the assessment procedures were highly non collaborative. Eight out of ten classroom episodes showed that the classroom evaluations belonged to the Ev1 category. Teacher posed such questions that aimed at finding specific, predetermined responses. Ahmed used continuous assessment in the class but the nature of these evaluation was non collaborative.

Discussion and conclusion**Belief-Practice Consistency**

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, Sewornoo (2016) argues that teachers' beliefs have a strong impact on teachers' instructional practices. The results of current study show that project teachers' beliefs are not completely aligned with their instructional practices and they could not completely implement the collaborative context in their practices. So they all had a discrepancy between their beliefs and practices towards collaborative learning. Such types of discrepancies are also reported by many other researchers (Thompson, 1992). Pehkonen (2009) states that the link between teachers' beliefs and their practices is of a weak nature. Similarly, a study conducted by Akbar and Mumtaz (2013) in the Pakistani context but not specifically collaborative learning revealed that the practices of teacher educators in Pakistan are not ahmedgned with their beliefs.

The study reports that a person having actual beliefs cannot be understood by other person commonly perceived. His beliefs are considered either consistent or not with his practices. Suppose the teacher's practices are different from the assessor point of view but ahmedgn with his beliefs. The literature is saying his beliefs are consistent with his practices. If one is using criteria to analyse the practices and then he/she is understanding beliefs then it is third tool between the practices and beliefs, which is necessary to understand before saying that beliefs are either consistent or not. For example, Akhtar believes that collaborative learning is an effective strategy for teaching learning process. When his classroom practices were observed the reseachers came to know that he believes sitting together is collaborative learning and his practices advocate what type of beliefs he has regarding collaborative learning. However, on the other side if he believes collaborative learning is an effective strategy and he is managing the students to sit together in groups. Then it is an evidence for the assessor that his beliefs are consistent with his practices. If assessor knows about the real spirit of collaborative

learning and how it facilitates the learning and teaching process. Then Akhtar's practices are not aligned with his practices. So for understanding either beliefs are consistent with practices are linked with the criteria defined to analyse practices or the theoretical perspective regarding learning. In this study the researchers adopted the framework that is working as a criterion to analyse the practices. The results demonstrated some degree of mismatch between the project teachers' beliefs and their instructional practices. Although, the classroom observation data showed the level of mismatch between the beliefs and practices of the teachers. As Allahyar & 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. 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 can influence the teachers' level of awareness about his own beliefs. This is because it could possibly lead to a change in the teachers' beliefs or the teachers' practices, which many reform movements failed to do. Although there is disagreement among researchers as to which (belief vs. practice) would (and therefore should be focused on) change first, most of the teacher researchers in mathematics education assume a cyclical relationship between changing beliefs and changing practice (Lerman, 2001). Yet, it seems that research on belief-practice consistency has not focused enough on the awareness aspect of the issue. Neither Thompson (1992) report on Lynn, nor Raymond (1997) report on Joanna indicate that the teachers who are reported to have beliefs inconsistent with their instructional practice were fully aware of the situation. Thompson (1992, p.123) interpreted these discrepancies in relation to the extent to which teachers reflect upon their actions, their belief or the subject matter. She called this the 'integratedness of the teacher's conceptual system'. She seems to view that consistency of beliefs meant a change in the teacher's instructional practice. But it is possible that when teachers are aware of the inconsistency it has a significant effect on their instructional practices.

Conclusion

Teachers' classroom practices were to be observed against four different areas of collaborative learning; tasks, environment, discourse and evaluation. The findings for each teacher showed different results for each area regarding collaborative learning.

The findings of the video recordings unveiled the nature of practices of each teacher towards collaborative learning. None of the teachers' classroom practices were found to be wholly consistent with their beliefs. Following observations were made regarding each area of collaborative learning.

Task: Mostly the tasks used by all the teachers were close-ended that did not engage students in higher order thinking skills. The findings reveal that almost all of the tasks that were used by the teachers were taken from the textbooks. Even the tasks given as homework were chosen from the textbooks. The researchers have not challenged the nature of the tasks given in the textbooks. However, the analytical framework does not consider the tasks taken from the textbook as collaborative tasks. Hence, the researchers can conclude that the teachers selected non-collaborative tasks. The findings revealed that the procedure of carrying out the tasks was Interactive\Authoritative. This is due to the fact that although the teachers allowed them to work on the tasks in groups interacting with each other; but the tasks were authoritative since the nature of the tasks were controlled by the teacher. One of the elements of Collaborative Learning; is use of manipulative; which were not used by any of the teachers during all the sessions that were recorded.

Discourse: The findings show that majority of the teachers at the start of their lessons especially when introducing a new concept, would adopt a rationalized discourse whereby they could control the class management problems. But as soon as the class settled then the discourse turned out to be interactive. However, in the case of Sadia she seldom initiated any collaborative discourse in her classroom while teaching mathematics.

Environment. Classroom environment means to provide favourable conditions to participate thereby showing a responsive classroom with students actively participating. Akhtar's classroom environment was the more collaborative than all the other teachers.

Evaluation: The findings of this research indicate that none of teachers used collaborative approach for evaluation of their students. The textbook questions were the main source of evaluation. Teachers asked very low cognitive demanding tasks for evaluation.

References

- Akbar, R. A., Akhtar, M., & Hussaian, A. (2013). Beliefs and Practices of Teacher Educators Teaching B. Ed (Hons) and ADE in Universities and Affiliated Colleges in Punjab. *Bulletin of Education and Research*, 35(2), 45-52.
- Allahyar, N., & Nazari, A. (2012). Potentiality of Vygotsky's sociocultural theory in exploring the role of teacher perceptions, expectations and interaction strategies. *WoPaLP*, 6, 79-92.
- Ball, L. J., Phillips, P., Wade, C. N., & Quayle, J. D. (2006). Effects of belief and logic on syllogistic reasoning. *Experimental Psychology*, 53(1), 77-86.
- Beswick, K. (2007). Teachers' beliefs that matter in secondary mathematics classrooms. *Educational Studies in Mathematics*, 65(1), 95-120.
- Chen, C.H. (2008). Why do Teachers not practice what they believe regarding Technology Integration? *The Journal of Educational Research*, 102(1), 65-75.
- Cohen, L., Manion, L., & Morrison, K. (2013). *Research methods in education*. USA: Routledge.
- Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration. *Educational Technology Research and Development*, 53(4), 25-39.
- Harris, A., & Spillane, J. (2008). Distributed leadership through the looking glass. *Management in education*, 22(1), 31-34.
- Jacobs, J. K., Yoshida, M., Stigler, J. W., & Fernandez, C. (1997). Japanese and American teachers' evaluations of mathematics lessons: A new technique for exploring beliefs. *The Journal of Mathematical Behavior*, 16(1), 7-24.
- Keys, P. M. (2007). A knowledge filter model for observing and facilitating change in teachers' beliefs. *Journal of Educational Change*, 8(1), 41-60.
- Leatham, K. R. (2006). Viewing mathematics teachers' beliefs as sensible systems. *Journal of Mathematics Teacher Education*, 9(1), 91-102.
- Lerman, S. (2001). A review of research perspectives on mathematics teacher education *Making sense of mathematics teacher education*; Springer, 3, 33-52.
- Merriam, S. (2009). *Qualitative research: A guide to design and implementation (Revised and expanded from 'Qualitative research and case study applications in education')*. Hoboken, NJ: Jossey-Bass.
- Pehkonen, E. (2009). How Finns learn mathematics: What is the influence of 25 years of research in mathematics education. *Teaching mathematics: Retrospectives and perspectives*, 3(5), 71-101.
- Pepin, B., & Roesken-Winter, B. (2015). *From beliefs to dynamic affect systems in mathematics education*, Switzerland: Springer.
- Phipps, S. (2009). *The relationship between teacher education, teacher cognition and classroom practice in language teaching: a case study of MA students beliefs about grammar teaching*, University of Leeds:UK.
- Qaisar, S. (2011). *The effect of collaborative group work lessons in mathematics as an alternative method for concept development of the students at upper primary level in Pakistan*, UK: University of Leeds.
- Raymond, A. M. (1997). Inconsistency between a beginning elementary school teacher's mathematics beliefs and teaching practice. *Journal for Research in Mathematics Education*, 28(5), 550-576.

- Sewornoo, Seyram. (2016). *Assessment literacy of Mathematics teachers and challenges in the implementation of the schoolior high schools of Ghana*. University of Education, Winneba.
- Siddiqui, N. (2017). Socio-economic segregation of disadvantaged children between schools in Pakistan: comparing the state and private sector. *Educational Studies*, 4, 1-19.
- Thompson, A. G. (1992). *Teachers' beliefs and conceptions: A synthesis of the research*. UK: Macmillan Publishing Company.
- Yin, R. K. (2013). *Case study research : design and methods*. Thousand Oaks, Cahmedf, New York: Sage Publications.

Appendix A: The Analytical Framework

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