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Developing Critical Thinking through Questioning Strategy among Fourth Grade Students

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Abstract

Researchers all over the world unanimously agree upon the idea that teaching students to think critically is principal aim of all level education. The researchers observed as student and teacher that in Pakistani elementary public schools, teachers are overly emphasized the coverage of content through transferring factual information and rote memorization. Usually, in an English classroom they use drill methods and grammar translation methods to facilitate students which do little to foster critical thinking. They do not promote other teaching strategies such as questioning, role play, debate and pair work which are essential for developing critical thinking among students. The focus of this research was to examine the effectiveness of teaching strategy 'questioning' in the development of critical thinking among elementary students. This study used case study methodology and design experiment approach. Evidence was collected in a usual classroom context in the form of observation (audio video recording), questionnaire and field notes. The focus was evaluated through students discourse emerged during student-student and teacher-student interaction and change of their critical thinking by pre and post questionnaire analysis. Findings suggest that questioning is a productive teaching approach in promoting critical thinking among students in Pakistani context.

Keywords: Critical thinking, questioning, design experiment approach, case study

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Introduction

Researchers across the world, generally agree upon the pivotal role of critical thinking in individuals in general as well as in academic life (Clark, 2011)**.** In the field of education, it is generally accepted that critical thinking skills are essential for an individual's success in meeting with new challenges in ever-changing world where rational and evaluative skills are considered crucial for sound judgment. There is a debate regarding development of critical thinking skills through general curriculum or through specific subject. As Paul (2008) states that critical thinking is not limited to any subject, content or area rather it serves as a means of improvement in thinking by avoiding irrational and illogical thoughts.

Novak (2002) suggests that formal education system should expand critical thinking through formal curricula. Accordingly, Butler (2012) emphasizes the cultivation of critical thinking in all disciplines. Robson (2003) favors the development of critical thinking in specific disciplines such as English, Math and in engineering. Indeed, critical thinking is considered an essential skill in all language classrooms where the purpose of curricula is to foster individual centeredness and development of critical pedagogy. Although, the relevance of embedding critical thinking skills in curriculum is inevitable, however, countries such as Pakistan where English is taught as a second language, students face many challenges in presenting CT skills. They lack in analyzing complex matter into its simple elements, adoption of critical thinking attitude by questioning and assessment and presentation of logical and reasoned arguments (Chen, 2001).

Jilani (2004) explained that in the Pakistani institutions the failure rate of students in English is noticeable. Gillani (2000) stated that many students give up their study because of poor results in English. He opined that the most significant reason of unsatisfactory results at elementary, secondary and higher level was student failure in achieving their set targets especially in English. Malik (2005) portrays some common methods mostly used for teaching English in Pakistan. These are direct method through which students are taught directly without using mother tongue. Secondly grammar translation method is very much common in Pakistani institutions in which translation exercises are given to students in their mother tongue. Moreover, some other popular methods are humanistic method, structural method, natural method and reading method. Warsi (2004) suggests that in Pakistani school classrooms teachers are most concerned in transfer of factual knowledge rather than development and assessment of critical thinking skills. Teachers mainly focus on structured grammatical patterns which strictly focus on bookish knowledge. Such approach emphasizes students to produce correct sentences in terms of skill and is more focused on reading and writing.

Role of Questioning in Critical Thinking

Questioning is the heart of CT as, "thinking is question driven" (Paul &Elder, 2002). One of the best ways to approach teaching is to foster questions (Elder, 2002). Johns (2007) says that

> There are many different kinds of questions and that each is important. Balance needs to be achieved between the basic knowledge level, right/wrong answer questions and the divergent questions. She sees the most flexible and practical teaching technique as questioning. "Teachers who are good questioners motivate their students, stimulate high level thinking, encourage creativity, and enhance self concept in their students and themselves.

It is most important to ask challenging questions to satisfy the critical learning quest. Moreover, questioning is a skill to bridge the unknown to known knowledge routes (Farmer, 2006; McKenzie, 1997; Rop, 2003).

However, researcher has experienced as a student and teacher that generally in all classroom instructions and particularly in the common Pakistani classrooms questioning is not encouraged. Most of the teaching and learning move around the centrality of the text books and class teacher which discourage students to be engaged in learning tasks from multiple perspectives (Hasil, 2012). The Pakistani class room teacher usually uses series of set factual, low level information based questions that hardly challenge student's critical thinking skills because answers can be easily available from the text. In Literature Socrates opined that true thinking is driven by rational questions. If the answers of questions do not generate more questions the questions are useless. Socrates stated that dead questions always create dead minds and they never develop productive and intellectual brains. Socrates used dialectal method in the class room, he used to ask questions and draw an answer from the students through dialogues.

By considering all these factors, keeping the significance of critical thinking, and the scarcity of research in the critical thinking area in Pakistan, there is a need to adopt such type of teaching approach that may help to develop CT among elementary students. Although, traditional methods used in Pakistani class rooms are not facilitating critical thinking , this research has been carried out by adopting some other methods such as questioning to develop critical thinking in English subject students.

This study can be helpful to elementary teachers to teach and evaluate their students' critical thinking skills. This research introduced a new critical thinking pedagogy that can be implemented in elementary schools to enhance student's critical thinking skills. There is worldwide consensus that in order to produce innovative and challenging students in this demanding world then there is a need to equip them with rational and sound knowledge to question preconceived realities and to take their own decisions justified and supported by strong proofs.

The focus of this study is to develop students' critical thinking through questioning. One of the assumptions is that questioning being as productive teaching strategy can bring change in student's CT skills. Paul model (2001) was used to analyze the behavior of students as it helps in the assessment of critical thinking cognitively. Can 'Questioning as a teaching technique' in upper primary lessons in Pakistan result in productive forms of critical thinking?

Method

The following method was adopted:

Research Design

The present study was qualitative in nature and used case study approach. Design Based Research (DBR) (Cob, Confrey, Disessa, Lehrer & Schauble, 2003; Kelly, 2003) was used for intervention because it can lead the researcher to better understand the complex and real situation more appropriately than experimental approaches. It not only helps to understand, document and interpret the educational phenomenon but also changes and improves educational practice and opportunities (DBR, 2003). The productivity of this intervention is studied in the form of the change in student thinking cognitively through the observation of dynamic student-student and teacher-student interaction and through pre and post questionnaire data comparison in experimental classes.

In this article, change in thinking of students which is an evidence for the productivity of intervention is reported. In this study class room as a case was studied and investigated in relation to critical thinking. Case study was employed not for the purpose of making generalizations for some population. It brings well designed interventions so it provides the opportunities for teachers and researchers and other stakeholders for collaboration which facilitate them to be actively involved in a real context.

Selection of Participants

Myers (2000) argued that "qualitative sampling can provide the opportunity to select and examine observations of generic processes which are key to our understanding of new or existing theory about the phenomenon being studied". Purposive sampling technique was used.

4th grade elementary students from three class rooms of one Public school of Lahore were selected for the study. The rationale behind taking Public school is the convenience of the researcher to conduct the present research. According to Paul (2006) children at age eleven (grade four) have acquired the cognitive abilities and elements required to base their thinking upon and the foundations for critical thinking have been set.

Tasks*:* Tasks were developed from 4th grade syllabus book for Intervention.

Data Collection Instruments

This study is of interpretive nature so the data collection methods are needed to be in accordance with this position. Since the goal of the interpretive research is to "understand the inner perspectives and meanings of actions and events of those being studied" (Anderson & Bums, 1989) and words not numbers are considered as the primary source of data (Dornyei, 2007). Data was collected from class room discourse through video recording and pre and post questionnaire were filled by students from three classrooms.

Description of Critical Thinking Questionnaire

A critical thinking questionnaire was adapted from Paul (1994) model. The purpose of the questionnaire was to analyze the change in thinking of the students if any because of the intervention. Therefore, role-playing can be productive strategy in teaching of English in Pakistani schools at elementary level if these bring change in students' critical thinking. The questionnaire consists of 15 items. It was required by students to select one option at least. One rubric was used to score for each response. This rubric was based on intellectual standards of Paul model's standards (1994) clarity, accuracy, relevance, logic and fairness.

The questionnaire was given to the students to answer twice, before and after the intervention and difference between their responses is used to measure the critical thinking change of the students. The research process was started by filling the pre-questionnaire from all students of three classrooms in order to know their level of critical thinking before intervention. After the intervention, the post- questionnaire was given to students in order to know the change in their critical thinking. However, the researcher was present at the time of filling the questionnaires to avoid students' confusion and misunderstanding about items that may affect the reliability of scores.

Piloting of Instruments

A pilot study was conducted in order to know the application of methods, their practical implications, some possible problems and complexities of the real context. During piloting the researcher investigated the authenticity and reliability of research tools, specifically. Pre- and post- questioners were used in order to know the response of children, and to make any modification if it is required. Piloting helped the researcher to practice the intervention in real life situations. Finally, this piloting guided the researcher to make the schedule of training interventions, time, space and order of the activities and the content for the actual research procedure.

Data Analysis

In the section, the findings of the quantitative and qualitative data collected for the study were presented. In the qualitative section, discourse analysis of class room tasks is presented. In the study, Paul (1994) intellectual standards were used to analyze the quality of critical thinking of students. Findings were explained in terms of significant mean score differences gained by students of one classroom on critical thinking questionnaires pre and post intervention. The difference of scores of students in pre and post questionnaires was presented by employing descriptive statistics and comparative analysis of questionnaires used in the study. This was followed by percentages and a non-parametric Wilcoxon Signed Rank Test.

Quantitative Analysis of Critical Thinking Questionnaire

In this section, mean difference of students in pre and post CT questionnaires was presented. The researcher used intellectual standards of Paul's model as rubric to assess CT of students. The Graph below is showing the difference of scores of students in different standards used in the CT pre and post questionnaires.

Quantitative Analysis

In this section**,** mean differences in pre and post CT questionnaires are given. An intellectual standard of Paul's model was used as rubric to assess critical thinking of students.

Mean Difference of Pre and Post Scores of Students

The Graph below is showing the difference of scores of students in different standards used in the CT pre and post questionnaires.

Mean difference of student's performance in pre and post test of CT intellectual standards

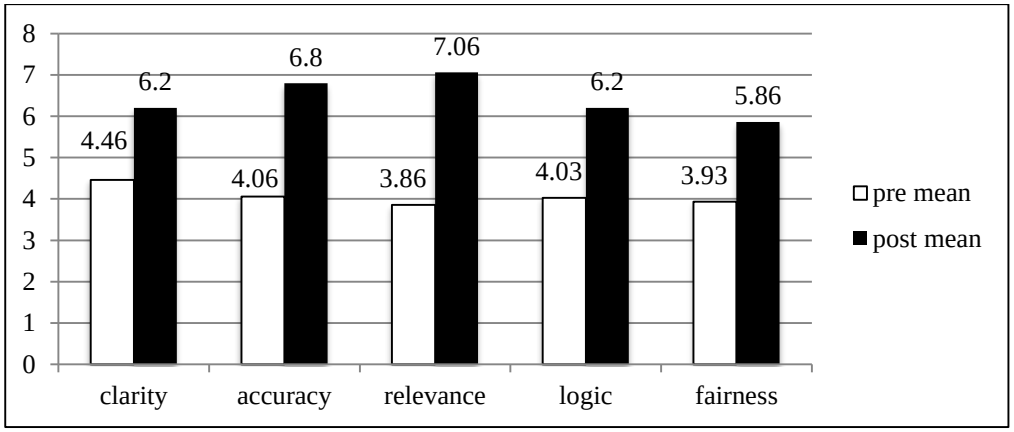

Figure 1 Mean difference of student's performance in pre and post test of CT intellectual standards

The mean scores of students showed an improvement in their critical thinking skills as they improved in all intellectual standards and it can be considered an evidence of the effectiveness of the intervention**.**

A Comparative Analysis by using a Non Parametric Test

In the study, multiple statistical techniques were employed to explore the difference between pre and post critical thinking skills of students. Differences between pre and post questionnaires were explained through mean difference, percentage change and a nonparametric Willcoxon *Signed Rank Test*. The purpose of using these techniques was to make the understanding towards difference of CT scores commendable.

Table 1

Mean, Standard Deviation and Wilcoxon Signed Rank Test of Critical Thinking Scores at Pre (n=15) and Post (n=15) Assessment Level, Within Groups

Variable	Assessment level	M	SD	Z
CT	Pre	23.53	2.669	
				-3.417*
	Post	39.80	3.858	

*p <.05

The results of Wilcoxon Signed Rank Test showed that there is significant within group difference at pre and post assessment on the scores of CT as calculated p-value is smaller than 0.05. The difference in the mean shows that CT scores trend is higher at post (M=15.93) than pre (M=8.80) assessment level .The difference in the mean scores showed that students improved their CT scores after the implementation of intervention. These results also showed the effectiveness of the questioning and role play techniques in promoting CT among 4th graders. A Wilcoxon Signed Rank Test was chosen because it assesses whether the mean (average) of pre and post scores of students are statistically different from each other.

Discourse Analysis

In this section, the findings of qualitative data are explained collected through discourse analysis of one class room of 4th grade elementary students**.** Only those findings were included in which discourse analysis of one class room was used containing teaching strategy of Questioning. First, the classification of discourse, interpretation of discourse and criteria of discourse analysis were described**.** Further, initial analysis and deep analysis of selected episodes of the intervention are presented.

Classification of Discourse

For the present study Paul (1994) model was adapted as an analytical framework to serve the purpose of the study to examine the critical thinking change among 4th grade students. This framework helped to understand the nature of different discourse used by children during the intervention.

Interpretation

It is reported in the study earlier, that discourse of development of critical thinking skills among students is an intellectual activity. The aim is to know about the student's cognitive involvement in CT activities through the discourse and the change in student's CT skills that can also be an evidence of the success of the intervention. The analytical framework consists of adapted version of intellectual standards of Paul's model (1994). These standards are clarity, accuracy, logic, relevance and fairness. This discourse describes how students move from in clarity to clarity, inaccuracy to accuracy, illogic to logic and unfairness to fairness due to the intervention. The difference of scores of students in these standards showed their progress towards critical thinking.

It is worth sharing that the main purpose of the study here is not only children's engagement with CT activities but it also took other discourse into custody used by the students during the intervention. When students interact with each other, they make relationship, refine social boundaries and do other off task activities instead of being merely involved in designed classroom task activities. It is also a uniqueness of qualitative research to capture all activities done in a natural setting with the help of a broader lens.

Discourse Analysis Criteria

For the purpose of discourse analysis, responses of students were analyzed with the direction of 4 point likert scale ranging from 1-4 with the direction of strong critical thinking, fair CT, moderate CT and weak CT.

For the purpose of generation of the meaning from the data, following criteria were used. It has also been described the way differentiation of CT is done through intervention. Moreover, it has no strong scientific and statistical background. It is simply a kind of arbitrary explanation of the scores.

The students have a weak CT, if the scores ranged between 0- 25

The students have a fair CT, if the scores ranged between 26-50.

The students have a moderate CT, if the scores ranged between 51-75.

The students have a strong CT, if the scores ranged between 76-100

The episode will be considered weak, fair, moderate and strong if three out of five standards meet the specific score range.

Initial Analysis

Initial analysis comprises of quantitative and graphical presentation of results by classifying all episodes into different categories according to the analytical framework used in the study.

Initial Analysis of the District Government High School

Figure 1.2 shows the percentage of the types of discourse with different categories of CT skills in the school in all episodes with the series of their incidence over the whole period of the intervention.

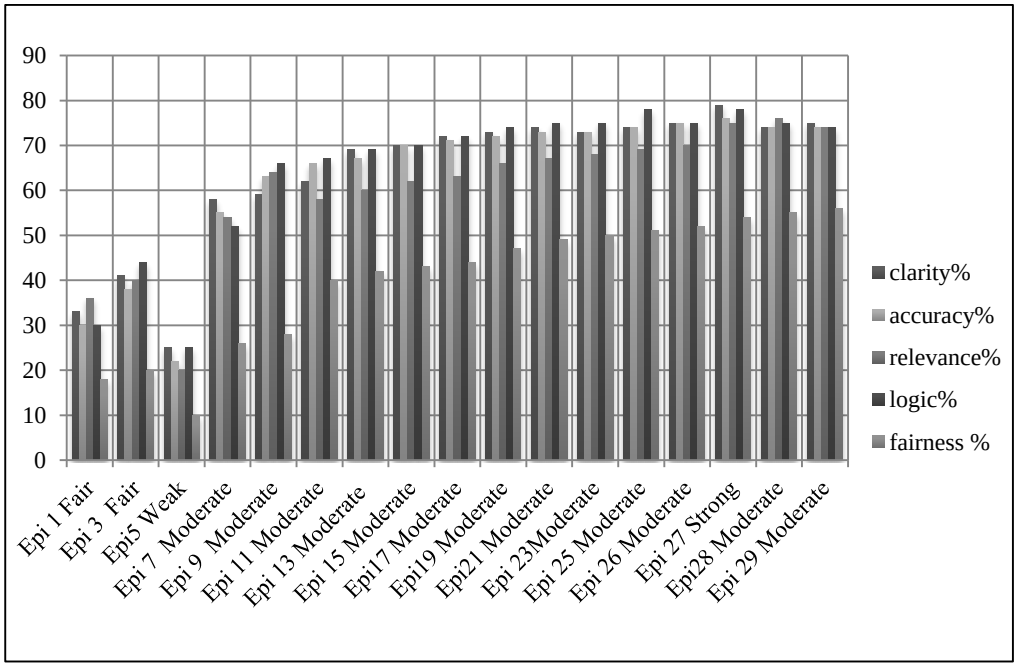

Figure 2 Proportions of discourse types in analyzed episodes in the school

Fig 2 shows that only one episode E-5 was considered weak according to the framework. This episode was about the grammar rules. Questioning technique was used as teaching strategy in the class room. Students showed poor performance in all intellectual standards. They provided inaccurate, irrelevant and illogical examples to the question at issue. They could not relate their answers with real life context. They

scored low in all intellectual standards due to some reasons that may be assumed for their poor performance in the class activities. As mostly students belong to lower social class where fluently spoken languages are Urdu and Punjabi and very less use of English language in these families, therefore, language barrier hindered the development of critical thinking among students. If they were provided an opportunity to express in their own mother language they may show more clarity, accuracy and logic in their answers. Although, they showed weak performance in the application of grammar rules but this kind of attitude was seen changed during the course of intervention. For example the last two episodes *E-17* and *E-18* were about grammar rules. In these two episodes students showed moderate CT that is considered a shift from weak to moderate trend. The comparison of the students CT skills in the early episodes with the last episodes proved that although students did not showed strong critical thinking skills but they improved their CT skills by getting more clarity of the grammar concepts. The overall trend showed the change in CT of students as they moved from weak CT to moderate CT skills. It showed the effectiveness of the intervention to promote CT among students.

The Episodes E-1 and E-3 showed fair CT skills of the students. Students scored low in all intellectual standards. They appeared confused and scared in answering the questions. This situation would be their first interaction with the teacher. Teacher has to scaffolds the students to move forward. However, student's responses are observed without deep/ rational thinking. Their answers were not clear in accordance to the context. They do not express as much as they can do. Although students appeared confused and ambiguous in answering different questions in the first episode; however, teacher's encouragement and persuasion, to some extent, helped them to remove their ambiguity towards the nature of discipline. In these episodes students showed lack of fair-mindedness as they failed to consider, in good faith, viewpoint that contradict with their own viewpoint.

The Episodes E-7 to E-26 comprised of moderate critical thinking skills of students. Students explain their point of view by giving different relevant examples from different sources. It is an improvement in their accuracy skills that they do not share only superficial information but tried to prove it with authentic resources.

The Episode E27 is showing strong CT of students. The topic of this Episode was "Aero plane". In this Episode students get fully involved in the class discussion. Everyone was trying to give answers. Moreover, these questions provided an opportunity to the students to explore their ideas. It is observed that challenging questioning engage students in the work at hand. Students showed great interest in the

topic. They put relevant examples to the questions. They shared their previous knowledge about aero plane. Students wished to travel by aero plane but they know the fact that they could not afford the charges of airplane. They were clear about the difference of fare of airplane and other transport means .They appeared with logical explanations of the answers for example when they were asked about that " why do cars not fly like airplane" one student replied 'because cars have no wings to fly and its features are not alike the airplane". The other question teacher asked the student to make the connection with the previous question "why do we use aero plane " one of the students answered "because we need to reach fast to long distance areas", the other question teacher asked " why do we not cover the long distance by car?, student replied " because cars are small and have limited speed". Teacher tried to capable students to connect one concept with other concept to make a hierarchy from small to large concept. By doing this level of thinking, students learn to connect to what they already know, and to create a web of concepts that help them gain more clarity and understanding. Moreover , this question answer relationship enable students to make decisions about to which appropriate strategy they need to use to seek answer of different questions. However, student's performance was not good in all intellectual standards but it was assumed that with the passage of time by consistent interaction with questioning students may need less time to understand the meaning of new ideas, to draw connections to other ideas, to apply what they are learning to real tasks, to determine patterns of relationships, and to practice new skills

Discussion

This study has explored that, the questioning strategy is viable and productive teaching strategy in fostering critical thinking among 4th grade elementary students of Pakistan. The approach used provides an indirect evidence of its effects on student's learning .The study focuses on one classroom of one Public school of Pakistan and the class room was taken as case study where intervention was implemented to see the effects of teaching strategy on student's learning by studying their discourse as it emerged during the intervention.

The intervention was implemented in a normal classroom context and the same school timetable and scheme of work defined by the school was followed. Therefore, the activities were taken from student's textbook and the objective behind was to get the data in as normal as possible classroom conditions. The intervention and its implications for Pakistani elementary schools to promote critical thinking are discussed.

The Impact of Questioning Strategy

The findings of analysis showed that the intervention proved effective in promoting Critical thinking among students but strong critical thinking skill could not develop among students in most of episodes. Therefore, its potential productivity is evident in the form of moderate critical thinking. The apparent impact of the questioning strategy is encouraging for supporting the use of probing questioning in Pakistani elementary schools to promote critical thinking among students.

The analysis shows that one episode was weak throughout the intervention (see graph epi-5). The reason of weak critical thinking can be language barrier because students showed great difficulty in understanding and implementing the grammar rules in the class room. Students showed improved performance in the form of moderate critical thinking skills in the middle and in the last episodes, when grammar rules were again practiced in the classroom. It is an evidence of effectiveness of the intervention that helped to promote critical thinking among students and improvement in their language skills as well .An interplay was observed between improvement in CT and the language skill. It is in line with) who advocated that the children can improve their cognitive development and inculcate critical thinking by getting education in their mother tongue.

Furthermore, teacher scaffolds students through persuasion and feedback when they appeared confused and reluctant in answering the questions.

As Elder and Paul (1998) strongly advocated that "thinking is driven by questions, not answers"," questions define tasks, express problems and delineate issues", on the other hand the answer is considered useful if it generates other questions otherwise it poses a full stop on thought (Paul & Elder, 2007). Students appeared weak critical thinker in the early episodes of the intervention when their CT skills were not developed. Gradually, by consistent interaction with probing questions they showed more clarity, accuracy, logic, relevance and fairness to the question at issue. Students showed strong CT in only one episode (see graph Epi 27), the topic of the lesson in the episode was "Aero plane". Students shared their ideas clearly and accurately. They presented logical examples while answering Questions. They showed great interest in the topic .Teacher initiate the idea and students connect one idea to another idea to make a meaningful whole. They need less help in identification and finding the solution of the problem .They learnt from their context and peers experience as well. Haynes (2007) advocated that although content is important, learning from the process is at the heart of experiential learning.

It is observed that probing questions of the teacher motivated the students to participate lively in classroom discussion, and students not only answer the questions openly but they contradict the answers of each other. The trend of alternative views encouraged discussions among students and increased their level of confidence. It showed the ability of students who confronted with challenging situation and tried to look reality in a new way. This alternative view trend may assumed an evidence of critical thinking and that they were now thinking about a concept from their own, new perspective. The overall trend in this episode was directed towards strong CT.

Over all the progress of students in all intellectual standards looked an improvement in their thinking as critical thinking can't just be switched on but it can be developed and nurtured through constant interaction of students with meaningful thinking exercises in accordance with questioning. The trend of improvement in CT of students was observed a shift from weak to moderate CT skills. Although students do not exhibit strong sense of CT in most of the episodes, yet they showed weak performance in only one episode.

Conclusion

The results showed that questioning strategy was productive in promoting CT among elementary students, however, they appeared weak critical thinkers in the start but moderate in the middle and last of intervention. They seemed unclear and inaccurate while answering different questions in the first half of the intervention as compared to the other half of the intervention when students used more relevant, clear and logical answers. One of the most obvious hurdle students faced in the earlier episodes was language barrier as their subject was English. Students demonstrated moderate critical thinking with an improvement in their English language skills in later episodes. However, they presented strong critical thinking in only one episode. Analysis revealed that students enhanced their confidence by interacting with class room activities and with teacher and their peers. They developed critical thinking attitude to critically examine the opinions of other students during intervention and did not move next until all other students of the class became fully satisfied with alternative views.

The Potential productivity of intervention is evident in the form of critical thinking in which students attained more clarity, accuracy, relevance, logic and fairness of concepts through probing and challenging questions. It proved that questioning is a viable and productive teaching strategy in promoting critical thinking of elementary students. The obvious impact of questioning strategy in promoting critical thinking among students provides encouragement to use questioning technique in elementary schools of Pakistan.

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