Why Critical Thinking Skills Interventions Fail: Role Of Teacher Interventionist And Implementation Fidelity For Critical Thinking (CT) Skills Provision In Education

Shumaila Mahmood
shumaila.mahmood@ue.edu.pk
PhD, University of Southampton, UK. Division of Education, University of Education, College Road, Township, Lahore.

Abstract

Critical thinking skills are most sought after learning outcomes for students at all education levels and especially for teachers in 21st century. Practical efforts for teaching CT skills e.g. intervention studies for students have shown inconclusive results on the effectiveness of such interventions. This research paper determines the reasons behind an ineffective CT skills intervention by identifying the impact and role of teacher as an interventionist, and the rigor of intervention implementation. Where not only teacher impacts the implementation process of a critical thinking skills intervention- via curriculum and instruction in the classroom. But also the fidelity of implementation and teacher’s role as constructionist of learning environment was found crucial for the success or failure of the CT skills interventions. The research setting was a teacher education university in Lahore where participants included two groups of students (experimental and control) and one teacher. Teacher’s role was studied during the implementation phase using quantitative tools questionnaire, structured observations and interviews of the participants. Data findings showed that classroom learning environment was non-significantly predicting students gain in CT skills in all the aspects of learning environment; teaching presence, social presence, and cognitive presence. Rather it was negatively associated with students’ scores on critical thinking skills. The major themes from observational and interview data clearly indicated the importance of teacher’s role in constructing classroom learning environment towards teaching critical thinking skills, on implementation of intervention and construction of learning environment. These findings explain why critical thinking skills are hard to teach and produces useful data for interested audiences where future research might focus to improve intervention outcomes.

Keywords: critical thinking skills interventions, teacher interventionist, intervention implementation fidelity, curriculum and instruction, learning environment

Introduction and background

Teacher education programs have explicit and implicit commitment to teach critical thinking skills e.g. Teachers National Professional Standards state the provision of critical thinking skills through curriculum and instruction as well as a disposition of teachers. However, practical efforts are found few in literature to test various methods to develop critical thinking skills in teacher education. Along with this, for educational
intervention studies including critical thinking skills intervention studies much has remained unexplained when results are only reported on quantitative or qualitative aspects. Many studies have been conducted around the globe to increase or develop students’ critical thinking skills through curriculum and instruction (Ko, Ho, Hau & Lai, 2014; Fung, 2014; López, Jiménez, Martín-Gil, Fernández-Castro, Cao, Frutos & Castro, 2020), however few studies have reported on unsuccessful intervention results and have investigated this by design (Mahmood, 2017).

To improve Pakistan’s education, quality of teachers in their basic professional competencies, skills and knowledge about the profession must be raised first. This requires fundamental paradigmatic changes in the ways preservice and inservice teacher education is currently perceived (Iqbal and Arif 2011). Research has also shown that teacher’s professional performance and quality is likely to be affected by teacher’s qualification, recruitment/merit, teacher accreditation, incentives and inservice professional development for growth (Malik et al., 2014). Importance of quality teacher supply in low income countries was addressed in a teacher supply, training and cost report in the context of rapidly expanding enrolment in developing countries especially Tanzania and Ethiopia are facing same problem. Therefore, to not only meet the need of high numbers of teachers in coming years, these countries also have to work on improving the quality and effectiveness of existing and new teachers (Nordstrum 2013). Therefore, initial teacher education and fostering critical thinking skill can be a way to address both problems.

For the purpose of gaining complete insight into plan, processes and outcomes of critical thinking skills intervention so that a rich insight into why and how of teaching and learning of CT skills can be developed. A mixed method intervention study was conducted using a sequential mixed methods design where QUANT phase was a quasi-experimental and QUAL phase was classroom case study. The data was collected in sequential manner during and after the intervention implementation. Experimental phase showed no improvement in the CT skills of the experimental group rather a negative association with learning environment quality and teacher’s commitment and role in the implementation of the instructional programme. This research paper explains why the intervention was unsuccessful to increase students’ critical thinking skills with the help of data findings on teacher’s role in constructing the learning environment and implementation fidelity of the intervention plan.

**Literature review**

**Critical thinking skills**

The philosophers looked at the critical thinking concept as an essential human mind dimension that relies on principles of good thinking and mainly see critical thinking as a judgment and decision-making ability. For example, Ennis (1985) a renowned American scholar in the field of philosophy defined CT as “[r]eflective and reasonable thinking that is focused on deciding what to believe or do” (p.45). In this definition thinking with an end in mind is promoted where the thinker decides what he/she does or believes. Ultimately decision making process can be about a belief or an action. This means that thinking should be focused and aligned in such a way (mental processes) that it should lead to deciding in believing and doing something. According to Bailin et al. (1999) “[T]hinking that is goal-directed and purposive, where the thinking itself meets standards of adequacy and accuracy” (p.287). These definitions encompass the same meaning related to thinking that is aimed at judgement as if one has a goal to achieve or a conclusion to draw. It can also be asserted that adequate and accurate evidence can decide or judge what to believe or not
Critical thinking is purposive judgement that needs criteria or adequate evidence for example; Facione (1990) definition is similar to Ennis and Bailin et al. that critical thinking is goal oriented/purposeful judgment. He defines CT as "[p]urposefull, self-regulatory judgement which results in interpretation, analysis, evaluation, and inference, as well as explanation of evidential, conceptual, methodological, criteriological, or conceptual considerations upon which that judgement is based" (p.3). However, Facione enlisted the mental process as skills of thinking into elaborated actions such as analysis, evaluation, inference and explanation that is the criteria on which judgement is based on. Critical thinking is the active application of skills of thinking. According to Fisher and Scriven (1997) skilled active interpretation and evaluation are the key concepts that denominate the nature of CT: “[CT] is the skilled and active interpretation and evaluation of observations and communications, information and argumentation” (p.21). It is likely that the active application will be based on certain observations and evaluations of situated information. In this regard consideration of situation, places and the physical realities seems to be of importance to the criteria for formulation of judgement.

**Role of Teacher and Learning Environment for critical thinking skills**

Teachers’ Involvement in intervention studies has immense effect on the success or failure of intervention studies. Teacher’s involvement, attitude and participation, for intervention implementation context also provides complexity for the unsuccessful implementation of interventions. One aspect that is not discussed much in CT intervention studies is the relativeness of learning environment, study features and CT measurement to the instruction and improvement of CT development among students at post-secondary education level (Higgins et al., 2005). Tiruneh, Verburgh and Elen 2014 provided with a systematic research review (thirty studies spread on a time span from 1995 to 2012) on the effectiveness of CT instruction in higher education. The analysis captured two important aspects of CT instructional interventions at higher education level. One “the study features” specifically related to 1) instructional approach, 2) teaching strategy, 3) student related characteristics, 4) teacher related characteristics, and two “the effect of CT measurement” used. Their analysis results revealed with regards to study features that among approaches to teach CT (Typology by Ennis 1989) general approach was significant, in second place was mixed approach studies and in third place was infusion approaches respectively. For teaching strategies Tiruneh et al., 2014 divided studies into two categories: direct and implicit teaching strategies for CT skills. Direct teaching strategies commonly included teacher led explanation of thinking procedures, rules, guidelines and followed by instructional activities focusing more on student involved deep discussions and increased practice of thinking skills. Implicit instruction was where studies used various teaching strategies that embed CT but no explicit emphasis on teaching-learning CT skills was employed. The results showed that evidence on implicit teaching strategies was inconsistence, only PBL teaching strategy appeared to have positive effect on CT improvement. The effect of direct instruction was greater on CT improvement.

For finding student related characteristics associated with CT development, analysis was limited due the lack of information reported in review studies; effect of academic performance and educational level (year level) was examined. There was limited evidence of students’ previous academic performance (GPA); this could conceal the effect of instructional intervention when students in control/experiment group have different previous scores. Year level analysis revealed that first year student benefit more from CT instruction when direct instruction was employed, immersion approach was more successful with second year students but no data on CT approach and year level variance was available for senior year students.
Effect of teacher characteristics on CT development was analysed under three conditions as such: trained or experienced, researcher implemented intervention, or classroom teachers with no previous experience or training assigned to teach CT. The analysis showed most improvement in CT outcomes when instructional intervention was taught by the researcher/researchers (60%, 9 out of 15 studies), for studies where regular classroom teachers were involved improvement was moderate (41%, 5 out of 12 studies). There was no data available on if the teachers had previous training on CT instruction or not. Interestingly, the influence of teacher characteristics on success or failure was null across mixed or general type approach and prior/previous training of teachers had some association in case of infusion or immersion approach.

Snyder and Snyder (2008) asserted that CT is a skill that can be learned, and that in order to learn the skill there are three important steps that need to be taken, first focusing on instructional strategies to actively engage student in learning process, second, focusing on instruction of the process of learning rather than on content coverage, and three, use of assessment techniques that provide students with intellectual challenges. However, Snyder and Snyder (2008) identify several barriers to CT instruction such as lack of training, limited resources, biased perceptions and time constraints which negate learning environments. In addition they suggest that actively engaging students in collaborative activities can encourage students’ CT skills.

Several researchers (e.g. Volkwein, 1991 and Volkwein and Lorang, 1996, cited in Cabrera et al., 2001) have linked learning outcomes to teaching methodologies, but it is classroom experiences[learning environment] which appear to have a stronger and more varied effect on student learning outcomes both short term and long term. The quest for a way to teach CT skills therefore has two sides of theoretical underpinnings: one is the importance of improving student learning outcomes and achievements; the other is the importance of teacher effectiveness and learner-centered teaching methodologies. This argues for the idea that teaching CT to students has to be a two-way reflective process on the part of teachers and students both. It is perhaps more due to teachers’ personal beliefs that their students are improving than anything else, which means that teachers' beliefs may need to change, and problematically in most cases teachers are resistant to change of their beliefs (Richardson, 1998).

The most motivating factor that helps teachers change their teaching is an improvement in student learning outcomes, and the most influential and motivating factor for students to improve their learning is classroom experience. Thus, unless teachers consider an improvement in student learning to be a priority, the instruction of CT in teaching/learning may not be successful. ITE students will most likely replicate what they learned in their own classrooms as students, thus any change in their teaching methods can be seen as the starting point of a long-term change of future teachers’ beliefs - one can thus assert that pedagogical experiences and practices provided in pre-service teacher education are effective for improving teacher education and quality of education in general.

Modelling and problem solving involving CT activities based on a framework of thinking about thinking, use of questioning for teaching CT, and the learning environment is suggested by researchers such as Hemming (2000), Broadbear (2003), and Lundquist (1999). Students learn more by the active involvement in learning process, research suggests creating such situation can be a chance to cultivating CT among students (Brown and Kelly, 1986). Ladyshewsky (2006) and Facione (2007) also suggest that peer coaching and working in teams can encourage active learning and opportunities to think critically. Hou, Chang and
Sung (2007) suggest that problem-solving and collaborative project-based learning activities with the addition of peer assessments facilitate students’ CT and meta-cognitive skills (seen in Snyder and Snyder, 2008). Mathew and Lowe (2011) discuss the work of various researchers on the importance of CT dispositions, and in their conclusions advocate developing a classroom environment suited for CT dispositions. They stress the importance of identifying, discussing and overcoming environmental factors that inhibit the development of a generalizable disposition for critical thought, and support their ideas with empirical evidence from classroom practices where the classroom environment actually helped to foster a disposition for CT - according to them, CT dispositions in a classroom “lead to learning environments that support not only the development of CT skills, but also a disposition among students and potentially teachers to think critically” (Mathews and Lowe 2011, p. 71). On the contrary, other researchers, while they agree that the dispositions are an important aspect, disagree on the exact role of dispositions in the definition of CT - they tend to assert that dispositions can be an important aspect in improving or perfecting CT skills and abilities, but that it is unlikely that CT will no longer have a definition if dispositions are separated (APA, 1990; Facione, 1990).

Role of implementation fidelity for critical thinking skills instruction

One of the most significant discussions in CT skills intervention research is the scarcity of research data on the implementation procedures, factors influencing implementation or simply what happens when CT skills interventions interaction happens with teacher, students and learning environment. Higgins et al., 2005 also vocalized the limitations of included studies lacking in reporting on the characteristics of selected programmes or aspects of implementation and use in classrooms for example, changes in teaching and learning processes, therefore for Higgins et al., 2005 extending on the common positive features of intervention programmes “how it is taught” was not possible. Despite the positive effect sizes this area of characteristics of the executed programmes and the execution record is grey. Information on implementation fidelity aspects might help in explaining the variance, the curricular reactivity within classroom context in different parts of the world. (Research question 1.3)

Abrami et al., 2008 (meta-analysis of 177 studies) found that CT teaching brought largest effects when it was taught using mixed approach, where CT instruction was a part- as an independent track- within the course and the least effective was the immersion approach. Design wise little variation was found among studies however, heterogeneity was high in “type of intervention and pedagogical groundings” ,count for 32% of the variance (p. 1119). This means that for CT instruction and learning, theoretical and pedagogical objectives must be made explicit. They also recommended that for successful provision of CT skills in mainstream education these must be included and pre-service and in-service teacher training.

Mixed instructional approaches merging the content and CT instruction (Typology by Ennis 1989) appeared to have significant effect on development of critical thinking skills. Negative effects of CT skills interventions could not be explained fully however, Abrami et al., 2008 asserted that in all positive results the improved CT skills and dispositions were associated with how the instruction is provided (p.1120). Variables that largely associated with the effectiveness of CT studies were course content/ curriculum and pedagogy and how it was instructed. Moreover the researchers expressed that there were still pending question that needed to be further explored and answered. These are related to methodological and
substantive features e.g. student characteristics, teacher characteristics, duration of treatment and quality of intervention e.g. relationship of implementation fidelity to effectiveness (Abrami et al., 2008).

Abrami et al., 2015 focused on aspects of teaching critical thinking and explored if student achievement can be student learning can be positively affected by integration of CT-linked content (Abrami et. al., 2015 p.305) however strong effects of use of effective instructional techniques were further required to achieve this goal. Abrami et al., 2015 explored mixed moderator variables e.g. educational level, subject matter (Health education, STEM subjects and non-STEM subjects) and duration of treatment, no significant effect at course level was found. Positive effects of three types of instruction 1) authentic instruction 2) dialogue, and 3) mentoring were found and the effect sizes were higher when a combination of instruction types was used. This is consistent with Hattie et al. 1996 and Marzano 1998 analysis in which relational, direct and metacognitive instructional strategies had positive effects.

Another way to measure the effectiveness of an instruction (Halpern 1993) i.e. intervention can be assessing the fidelity of implementation. Educational research that is detached from practice may not account for the influence of the emerging and complex nature of context and outcomes, and may not contribute in the completeness of knowledge about factors that are relevant for prediction (Robinson, 1998; Burden 2015; Williams and Burden 1997). Intervention fidelity is an important aspect to be considered while designing and conducting rigorous intervention studies. It helps to increase the external and internal validity of the research undertaken. The research gap in the field of critical thinking skill in terms of implementation fidelity is voiced by many researchers e.g. (Abrami et al., 2008; Burden 2015). The instructional intervention for CT skills in this study is integrated into the curriculum design. A study programme was prepared for CT skills and educational psychology, and the instructional programme was then handed over to the class teacher for delivery. To answer the question as to what extent the intervention was effective or ineffective, it is important to observe how it was implemented or delivered.

Research literature on the efficacy or effectiveness of studies has noted that fidelity of intervention is likely to be related with research outcomes (NRC 2004; US Department of Education, 2003). The fidelity of implementation can be a moderator for curriculum effectiveness as well (O’Donnell and Lynch, 2008). Most of the work on fidelity of implementation is available from the field of health sciences, and the concept is relatively new for intervention research in general and fairly scarce in CT skills learning and instruction (Burden 2015; Williams and Burden 1997). However, the history of programme evaluation as such goes back three decades (O’Donnell 2008; for a rigorous review of the subject and its literature see O’Donnell, 2008a).

The concept of fidelity of intervention is broad and has been well-researched in the field of health sciences, where it is possible to find a number of definitions and measures of fidelity implementation across studies; a number of reviewers suggest defining and establishing a definition of fidelity and criteria prior to measuring fidelity (O’Donnell, 2008). The research literature conceptualizes that fidelity of implementation is important for both efficacy and effectiveness studies, and stresses that there are both overlaps and differences between the term fidelity of implementation and other educational constructs such as curriculum evaluation, curriculum potential, teaching, and adaptation.

The fidelity of implementation in curriculum interventions can be thus defined as “the extent to which the project was implemented as proposed” (Loucks, 1983, p.5) and “[t]he extent to which teachers enact
innovations in ways that either follow designers’ intentions or replicate practices developed elsewhere," or "the extent to which the user’s current practice matched the developer’s ‘ideal’” (Loucks, 1983, p.4).

Intervention fidelity is close to the construct of intervention integrity as well. Intervention integrity data determines whether a programme was ineffective because it was weak, poorly conceptualised/designed or poorly implemented, if for example the main elements were not implemented as intended (Leff, Hoffman and Gullan, 2009). Thus systematically monitoring the integrity/fidelity with which interventions are implemented especially in interventions for teaching complex constructs provides insights into what does not lead to positive effects (Leff, Hofmann and Gullan, 2009). The meaning of fidelity of intervention in this research study is close to that of instructional quality (how the elements of instructional plan are implemented) and received by the teacher from a teaching perspective (the amount of change that occurred in the teacher’s practice and student learning after the CT intervention) (O’Donnell, 2008). In addition it is argued that the statistical power of a study depends on reliable and valid measures, appropriate design and sampling, and careful assessment of fidelity that decreases as research moves from laboratory toward the field (O’Donnell, 2008). This becomes important when a researcher needs to establish whether poor outcomes are due to structure, complexity, dynamics of the programme, and lack of implementation or misaligned designed intervention with programme theory (Rog, 2012; Summefelt, 2003).

Problem statement and Research Questions:

Methodology

This research paper uses mixed methods approach where quant+ qual sequential study design was used. The data collection tools included a learning environment questionnaire, structured observations of implementation fidelity and student interviews to answer the research questions asked. The goal of the multiple data collection tools were used for the analysis of the above said role of the teacher that has been less likely discusses in CT skills intervention research studies. This study was part of the doctoral thesis study “testing the effectiveness of a critical thinking skills intervention for initial teacher education students in Pakistan”. Where an intervention for developing critical thinking skills was implemented and aspects of implantation, role of the teacher as an interventionist, and in engineering the learning environment was also studied. A sequential mixed methods approach was used. For this research paper, data collected through a questionnaire and structured observations and participant interviews is used.

Findings

The data analysis is presented sequentially to present both quantitative and qualitative findings so that a counter validity can be achieved from both types of data and conclusion may be derived for specific purpose of this research paper. In the analysis the questionnaire, observations and interview data were separately analyzed. The questionnaire data for measuring classroom learning environment were calculated through median and interquartile range (IQR) to check what students believed about the learning environment and the variability of responses in the questionnaire data. It is useful for indicating, based upon on and related to median, the extent to which the central 50% of the values within the data set are distributed (Field 2013). The interquartile range provided a clear picture of the overall data set by adjusting for the outliers, showing the likeliest average response to each item. An IQR is the difference between first and third quartile. Relatively small IQR indicates consensus for or against the said statement whereas larger IQR shows respondents hold strong opinions either for or against the topic/item. The analysis showed a robust picture
of what participants believed about the classroom learning environment that on the contrary reflects on the ineffective role of the teacher as implementer of the curriculum and interventionist for enhancing CT skills learning.

Firstly, the item scale analysis of classroom learning environment questionnaire clearly indicated that the opinions of the students indicated a low level of teacher presences, social presence and cognitive presence. The following section presents the results.

Teaching presence
The students’ responses showed that the experimental group had high agreement that teaching presence was very low in this class. The overall teaching presence scale IQR = 0-1, in this sample.

Table 1: Students’ perceptions of teaching presence in classroom learning environment
Social presence

The students’ responses showed that the experimental group had high agreement that social presence was very low in this class. The overall peer learning scale IQR = 1-2 in this sample.
Table 2: Students’ perceptions of social presence in classroom learning environment

<table>
<thead>
<tr>
<th>Scale item</th>
<th>Item analysis of social presence in classroom scale</th>
<th>Median &amp; interquartile range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 14</td>
<td>Most respondents indicated high disagreement with the idea that getting to know other course participants gave me a sense of belonging in the course</td>
<td>(Md:4) (IQR = 1)</td>
</tr>
<tr>
<td>Item 15</td>
<td>Most respondents indicated high disagreement with the idea that I was able to form distinct impressions of some course participants</td>
<td>(Md:3) (IQR = 1)</td>
</tr>
<tr>
<td>Item 16</td>
<td>Most respondents indicated disagreement with the idea that classroom discussion in form of discussion in groups is an excellent medium for social interaction</td>
<td>(Md:4) (IQR = 2)</td>
</tr>
<tr>
<td>Item 17</td>
<td>Most respondents indicated high disagreement with the idea that I felt comfortable conversing through the mapping software medium</td>
<td>(Md:3) (IQR = 1)</td>
</tr>
<tr>
<td>Item 18</td>
<td>Most respondents indicated high disagreement with the idea that felt comfortable participating in the course discussions</td>
<td>(Md:4) (IQR = 1)</td>
</tr>
<tr>
<td>Item 19</td>
<td>Most respondents indicated high disagreement with the idea that I felt comfortable interacting with other course participants</td>
<td>(Md:4) (IQR = 1)</td>
</tr>
<tr>
<td>Item 20</td>
<td>Most respondents indicated high disagreement with the idea that I felt comfortable disagreeing with other course participants while still maintaining a sense of trust</td>
<td>(Md:4) (IQR = 1)</td>
</tr>
<tr>
<td>Item 21</td>
<td>Most respondents indicated high disagreement with the idea that I felt that my point of view was acknowledged by other course participants</td>
<td>(Md:4) (IQR = 1)</td>
</tr>
<tr>
<td>Item 22</td>
<td>Most respondents indicated disagreement with the idea that classroom discussions help me to develop a sense of collaboration</td>
<td>(Md:4) (IQR = 2)</td>
</tr>
</tbody>
</table>

Cognitive presence

The students’ responses showed that the experimental group had high agreement that social presence was very low in this class. The overall peer learning scale IQR = .75-1 in this sample.
Table 3: cognitive presence in classroom learning environment

<table>
<thead>
<tr>
<th>Scale item</th>
<th>Item analysis of cognitive presence in classroom scale</th>
<th>Median &amp; interquartile range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 23</td>
<td>Most respondents indicated high disagreement with the idea that problems posed increased my interest in course issues</td>
<td>(Md=4) (IQR = .75)</td>
</tr>
<tr>
<td>Item 24</td>
<td>Most respondents indicated high disagreement with the idea that course activities piqued my curiosity</td>
<td>(Md=3) (IQR = 1)</td>
</tr>
<tr>
<td>Item 25</td>
<td>Most respondents indicated high disagreement with the idea that I felt motivated to explore content related questions</td>
<td>(Md=4) (IQR = 1)</td>
</tr>
<tr>
<td>Item 26</td>
<td>Most respondents indicated high disagreement with the idea that I utilized a variety of information sources to explore problems posed in this course</td>
<td>(Md=4) (IQR = 1)</td>
</tr>
<tr>
<td>Item 27</td>
<td>Most respondents indicated high disagreement with the idea that brainstorming and finding relevant information helped me resolve content related questions</td>
<td>(Md=4) (IQR = 1)</td>
</tr>
<tr>
<td>Item 28</td>
<td>Most respondents indicated high disagreement with the idea that classroom discussions were valuable in helping me appreciate different perspectives</td>
<td>(Md=4) (IQR = 0)</td>
</tr>
<tr>
<td>Item 29</td>
<td>Most respondents indicated disagreement high with the idea that combining new information helped me answer questions raised in course activities</td>
<td>(Md=4) (IQR = 1)</td>
</tr>
<tr>
<td>Item 30</td>
<td>Most respondents indicated high disagreement with the idea that learning activities helped me construct explanations/solutions</td>
<td>(Md=4) (IQR = .75)</td>
</tr>
<tr>
<td>Item 31</td>
<td>Most respondents indicated high disagreement with the idea that reflection on course content and discussions helped me understand fundamental concepts in this class</td>
<td>(Md=4) (IQR = .75)</td>
</tr>
<tr>
<td>Item 32</td>
<td>Most respondents indicated high disagreement with the idea that I can describe ways to test and apply the knowledge created in this course</td>
<td>(Md=3.50) (IQR = 1)</td>
</tr>
<tr>
<td>Item 33</td>
<td>Most respondents indicated high disagreement with the idea that I can apply the knowledge created in this course to my work or other non-class related activities</td>
<td>(Md=4) (IQR = 1)</td>
</tr>
<tr>
<td>Item 34</td>
<td>Most respondents indicated high disagreement with the idea that I can apply the knowledge created in this course to my work or other non-class related activities</td>
<td>(Md=4) (IQR = 1)</td>
</tr>
</tbody>
</table>

Implementation Fidelity of the intervention

Secondly, the observations related to intervention implementation were selectively looking at the adherence, exposure, quality of delivery, and programme specification and student responsiveness for the CT skills intervention implementation. Along with that additional field notes focused on the general flow in the same reign of implementation and teacher’s role of lesson plan delivery and record of what the researcher observed as interactions of teacher, students and learning materials only during the lesson delivery. The overall flow of the lesson and activities was observed, and how much of the plan was actually implemented was recorded. A total of six observations were made of the intervention implementation. The
researcher recorded the overall quality of each lesson by rating it on the observation sheets on five aspects: adherence; exposure; quality of delivery; programme specification; and student responsiveness. The data were analysed by a single count of occurring or non-occurring elements of intervention implementation. For example, if adherence to the intervention implementation was present, it was marked with an asterisk (*), and any examples written on the sheets. Similarly, if it was not present or not clear enough to be determined, the same mark as fidelity aspect was used on the observation sheet. At the end, a total count of evident and not evident instances was conducted and conclusions drawn about the fidelity of implementation, keeping a balanced, rational approach to the circumstances. The analysis of structured observational data revealed that most of the time the element of implementation fidelity was not present in this classroom.

Adherence

The teacher’s ability to make learning objectives clear and evident to students, effective use of programme materials during instruction/intervention and achieving the objectives of the lesson was poor. Of six observations, in three lessons it was evident to some extent, and in the other three it was not evident at all, as in the following table:

Table 4: Observation record of adherence to instructional intervention programme

<table>
<thead>
<tr>
<th>Adherence</th>
<th>Evident ***</th>
<th>Not evident***</th>
</tr>
</thead>
</table>

Exposure

The teacher lacked the ability to manage the time spent on the delivery of instruction and intervention lessons and any extra to optimize their delivery. There was only modest exposure of the intervention programme to the students; often, it could not be determined because the teacher did not used the provided materials effectively in instruction. Overall, in six observations, four times the exposure could not be determined at all, as there was unsystematic, haphazard lesson execution in this classroom. The following table shows an example of the ‘unable to determine’ exposure aspect of the instructional intervention.

Table 5: Observation record of exposure of instructional intervention programme

<table>
<thead>
<tr>
<th>Observation Target</th>
<th>Rating over all for six observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning objective is evident to students</td>
<td>Unable to determine****</td>
</tr>
<tr>
<td>Teacher uses programme materials effectively during instruction/intervention</td>
<td>Unable to determine****</td>
</tr>
</tbody>
</table>

Supporting examples:

1. Students were giving feedback and answering teacher’s introductory question.
Quality of delivery

This implementation fidelity aspect was to determine how adequately the teacher appeared to have prepared to deliver the instruction, how far the teacher’s interaction with student reflected encouragement and enthusiasm, how far the teacher provided clear, explicit instruction, or positive, constructive feedback, and to what extent the pacing and transitions of his delivery were effective. With regards to quality of delivery the intervention, of six observations, in three instances the teacher to some extent provided an acceptable quality of delivery.

Table 6: Observation record of the quality of delivery of instructional intervention programme

<table>
<thead>
<tr>
<th>Quality of delivery</th>
<th>Evident</th>
<th>Not evident</th>
</tr>
</thead>
</table>

Programme specification

The programme specification aspect of the fidelity observations relates to the extent to which the teacher supported the instructional components as designed, demonstrating knowledge of content and intervention strategy. This was frequently violated and the teacher struggled to keep up with lesson planning and programme specific delivery for the intervention. Of six observations, four times the programme specification of lessons was not present at all and once it could not be determined, because only half of the lesson was on the specified programme plan. There was only one instance when it could be said that the teacher was demonstrating knowledge of both the content and the intervention lesson plan delivery strategy.

Table 7: Observation record of programme specification of instructional intervention programme

<table>
<thead>
<tr>
<th>Programme specification</th>
<th>Yes</th>
<th>No</th>
<th>Unable to determine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher demonstrates knowledge of content and intervention strategy.</td>
<td>Yes*</td>
<td>No****</td>
<td>Unable to determine*</td>
</tr>
<tr>
<td>Supporting examples:</td>
<td>1: lack of preparation and interest</td>
<td>2: reinforces, gives feedback</td>
<td>3: confused everyday on what to do and how to do it. Spontaneously changes the strategy or teaching plan.</td>
</tr>
</tbody>
</table>

Student responsiveness

The final structured observation of for implementation fidelity was the student responsiveness during the intervention implementation. This section observed student engagement as it appeared during the implementation of the intervention/instruction at certain times. Of six observations, the students appeared moderately engaged four times and not at all engaged twice. When they were noted as moderately engaged, there were instances when students attended well, listening attentively and discussing the class and work tasks and so on. In the table below, the student responsiveness observation count is given with supporting
In terms of exposure, the quality of delivery and the integrity of programme specification was best compromised and often poor. Although the teacher was trying to state the objectives of the lesson and students seem to be moderately engaged during this time, this was not coordinated due to major flaws in the time management of the delivery of the instruction/intervention, the preparation to deliver instruction, the interactions with students to reflect encouragement and enthusiasm, the provision of clear, explicit instruction, and positive, constructive feedback, with pacing and transitions. Moreover, the teacher’s support of the instructional components as designed was low, and he could not demonstrate knowledge of either the content or the intervention strategy.

**Participant Interviews on teachers role and intervention implementation**

Thirdly, the interview from intervention participants about the role of teacher and implementation of intervention plan. The following themes emerged from the data. The students experience is presented with quotes.

**Clear instructions and preparation**

The students provided feedback on the implementation of the intervention. This revealed certain contextual factors affecting its effectiveness. Students reported on the teacher’s lack of communication and preparation in various ways, for example saying that there was no clear communication, no reinforcement and no preparation on the teacher’s side. The class teacher’s performance seemed to be a major influence on students’ learning and performance and the failure of intervention.

**Lack of clear instructions**

An intervention student thought that the teacher needed to be clear when teaching and providing instruction, and that he felt that they would have given much better results if there was a better teacher.

Okay, teacher has to be or needed to tell us clearly, a proper instructor I feel there were to be a better teacher and we would have given much better results than this. (SI 2)
Lack of reinforcement from class teacher
Students identified why there was less interest from some students. She observed that due to much work but no evaluation marks, the students did not take the class task seriously. Students were not coming to the class because of all the work that they had to do, but if they came to know that the assignments and classwork were to be marked, they would become focused. This student suggested that giving marks for class activities could have made students keen and attentive.

I have observed that many students would sit outside in the ground when there was this CT class, and they did not do the assignment but one assignment had marks and when they come to know it had marks, everybody was in the class. So, I think if the class teacher had communicated well beforehand about the tasks and that they have 4 or 5 marks, everybody would have been more keen and attentive. (SI 1)

Teacher’s lack of preparation
Students expressed that the teacher’s unplanned lesson and lack of clear instructions seemed to be a barrier even to implementing the CT skills programme properly. The class teacher did not only lack preparation but interest and reinforcement skills. The students remained under pressure during the entire time of the intervention, as the exam dates were being changed constantly, there was uncertainty, and time and exam pressure were hanging over them.

It could have been implemented better. Over all the results of our class have improved and secondly the teacher could not convey to us easily and he was very strict. And student did not like the strictness and then personally the studies pressure was there, exams pressure. (SI 5)

Intervention Student 4 said that lack of planning and the teacher not being prepared for lessons were issues. The student did not elaborate on this point, even when prompted.

lack of few things, yes teacher must be preparing for lecture or proper time management, lack of meaning, proper pre-planned, it needed to be pre-planned and prepared, meaning it was not at all pre-planned by the teacher (SI 4).

Discussion
The careful design of this study included classroom learning environment and CT skills learning and instruction design as its core focus, where understanding teacher as merely the communicator of that careful design. The careful design was thought of to be sufficient enough to produce the desired effect of the intervention on increasing students CT skills learning. On the contrary, it appeared that only care design principles for curriculum planning are not enough but a mutual effect of the intervention, teacher and teacher characteristics as part of the careful design needs to be studied in future studies. Studies must include teacher as a key variable of the careful design of CT skills interventions. In terms of the concept of CT (skills + dispositions), we need to modify our conceptual understanding of careful design. From the empirical observations of this study, it seems that the critical thinking skills cannot be put on track without the cognitive, social and teaching presence where teacher is constructing an effective learning environment or at least is trying. The role of “teacher interventionist”, “implementation fidelity” are crucial for careful design as well as implementation of critical thinking skills interventions for students as well as teachers.
On a wider level, if the teacher education standards policies are there for decorative purposes and are not communicated and ingrained in practice, in teaching/learning environment, no outside effort such as this study would be successful or sufficient to modify individual especially classroom practices or institutional culture in a context like Pakistan. The current research study indicated on the role of teacher as interventionist where not only the implementation fidelity, teacher preparation for learning materials, interest, reinforcement and feedback of CT intervention but also the personal beliefs, years of experience, quality of teaching and finding an effective way of teaching and learning of critical thinking skills. For years academics, scholars and researcher have been trying to find a way out for impactful interventions for teaching and learning of critical thinking skills especially among young learners and university students.

**Conclusions**

From this study’s findings the undetected connections can be pointed out as follows

- Teacher interventionist as facilitator for the delivery of curriculum and instruction, for implementation of intervention plan is central. And lack of specialized training for teaching critical thinking skills is an important aspect for teacher education programs and policy makers to consider and discuss.

- The key results obtained through methodological corroboration (i.e. questionnaire data and observational data and interview data) provided a rich manifestation of arguments posed in this research. Therefore, studies should consider holistic designs using mixed methods.

- Structured observations, learning environment questionnaire for measuring quality of learning environment to predict critical thinking skills were used. To collect data on teacher’s role as interventionist for the implementation of curriculum and instruction designed for the development of critical thinking skills. Furthermore, interviews were used to get participants’ voices both of the [teacher interventionist and students] about the intervention experience. The no gain among learners in learning critical thinking skills is explained via the negative correlation of classroom learning environment. In this research paper, the role of teacher as interventionist for teaching critical thinking skills is highlighted upon.

- Furthermore, students learning experience as well as the implementation fidelity of the CT skills intervention was a major challenge for the teacher interventionist. The challenges of teaching a ready-made interventions, not having personal interest, lack of professional training/interest in the subject as well as years of experience had major influence on the quality of implementation and teaching and learning of critical thinking skills. The learning environment was measured through questionnaire and structured observations, field notes and the perceptions of students and teacher through interviews. The use of quantitative and qualitative both type of data is a strong evidence to capture the complete picture.

- The structured observations and interview data both revealed that the role of the teacher in implementation of the intervention, providing/creating conducive environment for teaching critical thinking skills was crucial.

**References**


Ennis, R.H. (1992). The degree to which critical thinking is subject specific: clarification and needed research. In S. Norris (Ed.), The Generalizability of Critical Thinking: Multiple Perspectives on an


