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Enhancing Educators' Skills for Promoting Critical Thinking in Their Classroom Discourses: A Randomized Control Trial

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The literature reveals that educators find it challenging to foster critical thinking (CT) in their students if they have not learned how to use CT in their educational system or training. This paper reports findings from a national research project that was undertaken to enhance the educators' ability to promote CT in their teaching practices. Using a randomized control trial design with a pre- and post-test, 91 educators from 14 of the 17 schools of nursing in Pakistan consented to enroll in the study and 72 completed the study. The intervention included 40 hours of learning experience during two workshops that focused on CT. Data were collected, pre- and post-intervention, via observations and audiotaping of the participants teaching sessions for 60-90 minutes. The data obtained was assessed for the educators' level of questioning, teaching strategies, and facilitation skills. Data were analyzed using descriptive and inferential statistics. Compared with the pre-intervention data, findings from the post-intervention data in the experimental group revealed positive changes in their pedagogical skills, including a significant increase in the number of higher order questions that are considered important for developing students' CT skills. This study affirms that educators must have structured training to use and foster CT in their teaching practices.

As critical thinking (CT) is an important attribute in intellectual development, knowledge acquisition, and knowledge utilization in individuals, teachers are expected to nurture students' critical thinking skills (Kong, 2006; Loving & Wilson, 2000; Wangensteen, Johansson, Bjorkstrom, & Nordstrom, 2010). It is assumed that teachers know what CT is and how it can be promoted in their teaching practices, but this may not be true (Choy & Cheah, 2009; Mangena & Chabeli, 2005) unless they have learned it in their pre-service or in-service training (Kong, 2006). This is particularly true for a country like Pakistan where the focus of education for students is predominantly rote learning rather than acquiring CT skills, and for teachers as the givers of knowledge rather than facilitators of students' knowledge development (Davies & Iqbal, 1997; Dean, 2005; Gul et al., 2010; Siddiqui, 2007). Teachers must emulate CT if they expect their students to do so. In addition to having a command over the subject to be taught, teachers should understand the "conceptual, strategic, epistemological, and educational ramifications of critical thinking" (Mangena & Chabeli, 2005, p. 293). To promote students' CT, teachers need to select appropriate content and instructional strategies to address the learning objectives, and they should facilitate teacher-student interaction, encourage students to ask thought-provoking questions, and respond to their questions without bias (Ijaiya, Alabi, & Fasasi, 2010; Zygmont & Schaeffer, 2006).

The literature on higher education reveals an increasing interest in investigating faculty understanding of CT (Cassum, Profetto-McGrath, Gul, Ashraf, & Kauser, 2013; Moore, 2011) or their dispositions towards CT (Choy & Cheah, 2009; Duron, Limbach, & Waugh, 2006; Emir, 2009; Hsu, 2007; Mangena & Chabeli, 2005; Ovais, 2007; Profetto-McGrath, Smith, Hugo, Patel, & Dussault, 2009; Zygmont & Schaeffer, 2006). Several researchers have also investigated the questioning skills of teaching faculty. Findings from most of the studies suggest that faculty members need to improve their pedagogical skills (Ball & Garton, 2005; Choy & Cheah, 2009; Mundy & Denham, 2008; Nicholl & Tracey, 2007; Zygmont & Schaeffer, 2006). However, limited research is available detailing how to improve the teachers' pedagogical skills to foster the students' CT.

This paper reports findings from a research project that was undertaken in Pakistan at the national level to enhance the CT skills of educators in the planning and delivery of their curriculum. This paper focuses on the results pertinent to the following questions:

1. Do educators, after attending the intervention as part of the experimental group, ask higher level questions in their classroom discourses than those who are in the control group?
2. Do educators, after attending the intervention as part of the experimental group, use more active teaching methods compared to educators in the control group?
3. Is there any difference in the educators' facilitation skills before and after the intervention?

Literature Review

Description and Significance of Critical Thinking

Literature is replete with various descriptions of CT because it can be explained from different

paradigms such as analytical philosophy and logic, scientific method (testing hypothesis), pragmatism, psychoanalysis, and critical theory (Brookfield, 2012). Moreover, CT is a multidimensional concept that can be viewed as a tool, set of skills, process or outcome (Cassum et al., 2013; Moore, 2011). However, CT is generally considered a subset of the reflective process that helps individuals make sound judgments because it involves thorough assessment and scrutiny of information before arriving at conclusions (Daly, 1998; Dewey, 1916). Critical thinking helps the individual to identify and check one's own assumptions and those of others (Brookfield, 2012; Paul, 1993) and thus "represents a major qualification for people in deciding what to do or believe" (Yang & Chou, 2008, p. 683). Similarly, CT is useful to analyze complex data, evaluate situations and actions, and implement the most appropriate actions; hence, it is a must have skills for effective problem-solving and decision-making in all walks of life—social, clinical, ethical, managerial, or political (Simpson & Courtney, 2002).

Because of its importance in knowledge development, assessment and utilization (Paul, 1993), CT is considered vital in modern education especially in higher education (Brookfield, 2012; Kong, 2010). Moreover, CT is expected to be an integral component of teaching pedagogies in every discipline, particularly the health care disciplines (Behar-Horenstein & Niu, 2011; Cassum et al., 2013; Daly, 1998; Paul, 1993; Velde, Wittman, & Vos, 2006). Ethical, efficient and effective care requires sound clinical judgment that is not only grounded in thorough knowledge, but also requires one's ability for critical thinking, analytical reasoning, decision-making, and reflective practice (Moeti, van Niekerk, & van Velden, 2004).

Development and Facilitation of Critical Thinking

Although there is no one right way to teach or assess critical thinking, literature suggests that teaching approaches requiring active students' involvement instead of didactic teaching practices are critical to promote and facilitate CT (Simpson & Courtney, 2002; Velde et al., 2006). Teaching approaches that focus on content instead of process (Sellappah, Hussey, Blackmore, & McMurray, 1998) or, in other words, on *what* to think instead of *how* to think, do not facilitate CT. Teaching strategies such as problem-based learning, writing reflective journals, role-playing, concept-mapping, and debates are reported to help (Simpson & Courtney; Velde et al., 2006; Yang & Chou, 2008) because these strategies help engage students in their learning process and can foster their CT dispositions (e.g., inquisitiveness, analytical abilities, reasoning skills, self-confidence, and open-mindedness; Chan, 2012; Ennis, 1993; Paul, 1993; Vacek, 2009; Velde et al., 2006).

Clasen and Bonk (1990) posited that although there are many strategies that can impact students' thinking, it is the teachers' questions that have the greatest impact. Research evidence consistently suggests a direct relationship between the types of questions posed by faculty and the students' ability to develop CT (Redfield & Rousseau, 1981; Rossignol, 2000; Shim & Walczak, 2012). Higher level cognitive questions require learners to manipulate information to create and support responses, while lower level cognitive questions are answered through recall, recognition, and simple application of information. Therefore, the former is considered congruent with CT (Redfield & Rousseau, 1981). Several descriptive studies in nursing suggest that many teachers use factual and lower level questioning which does not promote CT (Myrick & Cpsych, 2002; Nicholl & Tracey, 2007; Phillips & Duke, 2001; Profetto-McGrath, Bulmer, Day, & Yonge, 2004; Sellappah et al., 1998). However, there is some evidence in the literature that a specific module pertinent to CT and questioning skills can enhance the educators' ability to ask higher level questions (Craig & Page, 1981; Wink, 1993).

Since CT is a social learning process, students can learn it from their peers and faculty modeling (Brookfield, 2012). However, the demonstration of CT necessitates intellectual discipline, self-evaluation, counter thinking, opposition, challenge, and support (Paul, 1993). Empirical evidence suggests that teacher-student interaction and interaction among students influence the students' cognitive and affective learning outcomes (Dorman, 2012; Gul, Barolia, & Moez, 2013). A learning environment that is affirmative, constructive and rewarding is likely to foster thinking (Billings & Halstead, 2009). Developing the students' ability to think critically is influenced by the teachers' competence and approach to teaching (Simpson & Courtney, 2002). A positive gain in students' CT is reported by Smith (1977) when "faculty members encouraged, praised, or used students' ideas" (Shim & Walczak, 2012, p. 16). The educators' own values, interest, and dispositions towards CT can also influence students' thinking and learning (Kong, 2006; Mangena & Chabeli, 2005; Ovais, 2007; Profetto-McGrath et al., 2009). If teachers aim to prepare students at a higher level of cognitive thinking, "they must first emulate higher level thinking in their instructional practices" (Ball & Garton, 2005, p. 59). Likewise, Facione and Facione (1996) asserted that CT needs to be demonstrated and that demands constant metacognitive reflection on "what one is doing and why" (p. 133). Thus, the educators' role modeling and mentoring are necessary to promote CT (Brookfield, 2012). Explanation of abstract concepts and well organized presentations are found to impact students' CT as well (Shim & Walczak, 2012).

Contrary to the required teaching practices, didactic teaching and rote learning are still prevalent in

most teaching institutions and disciplines in Pakistan, and nursing education is no exception (Davies & Iqbal, 1997; Kamal, 1999; Khalid & Khan, 2006). Moreover, considering the socio-cultural dimension of CT, Pakistani learners may be viewed as members of a culture that does not encourage questioning people who, by virtue of their age or position, are in authority. In their study on teacher education, Davies and Iqbal (1997) reported that the majority of teaching was lecture based, and notes were dictated to students. In certain cases, some students did not take any notes, but just listened to the lectures and then used the textbooks to prepare for the examinations. Similarly, in 1998, a nationwide study of nursing schools in Pakistan indicated that nursing students were not encouraged to think and question (Kamal, 1999). A comment made by a student reflects this state of affairs: "If I say, 'I have not understood', I am told, 'No need to understand, just remember it'" (Kamal, 1999, p. 43).

In view of the above literature, the research intervention was proposed to enhance the educators' pedagogical skills for promoting CT in their students. The following assumptions were identified as part of the design and implementation of this study:

- Critical thinking skills can be developed with practice.
- Educators can promote students' CT if they know how to promote it.
- Students' critical thinking can be developed if educators ask higher level questions, use active teaching strategies, and demonstrate good facilitation skills.
- Educators' attitude and knowledge of CT are reflected in their teaching practices.

Methodology

Study Design

In pursuit of a better quality of evidence (Polit & Beck, 2008), we employed a randomized control trial design with a pre- and post-test after the intervention. The independent variable was teachers' training and the dependent variables were their level of questions, teaching strategies and facilitation skills. The study was completed over a 2-year period (February 2009 to March 2011) in three phases—pre-test, intervention, and the post-test—as illustrated in Figure 1.

Definition of Terms

For the purpose of this study, the term educators meant teachers or faculty members regardless of their disciplines, but who were teaching in Bachelor of Science in Nursing (BSN) programs in Pakistan. Based on the hierarchy of Bloom's (1956) taxonomy of cognitive thinking, questions requiring knowledge recall, comprehension, and simple application were considered lower level questions while questions requiring complex thinking (e.g., analysis, synthesis, and evaluation skills) were considered as higher level questions. Based on the work done by Van Amburgh, Devlin, Kirwin, and Qualters (2007), "active teaching methods" referred to any teaching strategy that involved active engagement of students for a specific purpose; the activity began with some instructions by the teacher (context, process, and timings) and ended with students' reflections on the learning from the activity. "Facilitation skills" referred to the teachers' behavior that had the potential to affect students' motivation for participation in the class (Van Amburgh et al., 2007).

Population and Sampling

The study population comprised all full-time nursing and non-nursing faculty members who taught in BSN programs in Pakistan. Following a universal sampling technique, the 148 faculty members who were eligible from 17 schools of nursing in the country were invited to participate in the study. Part-time teachers were excluded from the study to avoid envisaged complexities with regard to seeking permission and

Figure 1
Study Design

<table>
<tr><td rowspan="2">Experimental Group</td><td rowspan="3">Pre-test:
Assessed level of questions, teaching strategies, and facilitation skills</td><td colspan="4">Intervention</td><td rowspan="3">Post test:
Assessed level of questions, teaching strategies, and facilitation skills</td></tr>
<tr><td>Held 1st workshop (3 days)</td><td>14 week interval</td><td>Held 2nd workshop (2 days)</td><td>12 week interval</td></tr>
<tr><td>Control Group</td><td colspan="4">No intervention</td></tr>
</table>

commitment from their institutions. Ninety-one teachers (61%) from 14 schools of nursing consented to participate; of these, 44 participants were randomly allocated to the intervention group and 47 to the control group. All 91 participants were available for the first observation. However, as illustrated in Figure 2, 19 participants (nearly 21%) were lost from both groups over the course of the study while 72 participants completed the study and were included in the analysis. The attrition rate and reasons did not differ between the intervention and control groups.

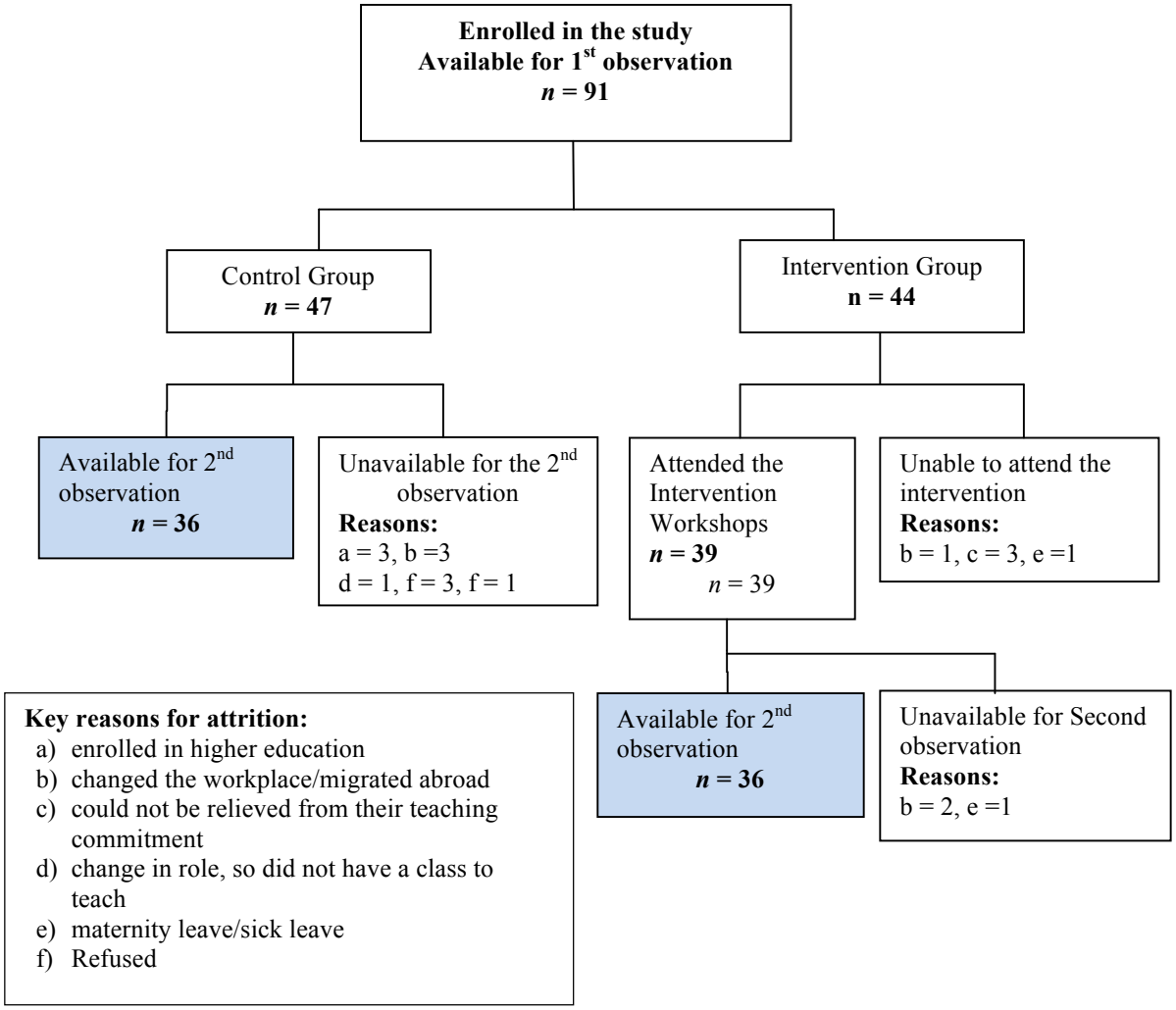
Recruitment of the Participants

The list of schools offering a BSN was obtained from the Pakistan Nursing Council. After approval of the institutional review board (1064-SON-ERC-08), a letter of information about the study was sent to the head or principal of each school. A written consent and a list of full-time faculty members were requested if the Head of the schools supported their faculty participation in the study. An informed consent was obtained from each participant before the first point (see Figure 1) of data collection.

Intervention

The intervention consisted of two learning workshops (total 40 hours of direct contact) that were conducted 14 weeks apart as illustrated in Figure 1. The intervention was developed and implemented by the research team, which consisted of three educators from nursing, two from basic sciences, and one from English Language. Although not identified at the outset

Figure 2
Recruitment and Retention of the Study Participants



of our study, our approach to intervention closely resembled the DASK (dispositions, attitudes, skills and knowledge) model of teaching thinking skills by Kong (2006, 2010). Guided by the three dimensions of critical thinking—knowledge, skills, and attitude (Paul, 1993; Rubenfeld & Scheffer, 2006; Staib, 2003)—the following learning outcomes were set for the intervention:

- Appreciate the significance of practicing and promoting CT in nursing.
- Identify skills and attitudes required of critical thinkers.
- Write instructional objectives for each level of Bloom's taxonomy.
- Differentiate between active and passive learning strategies.
- Identify characteristics of effective questioning in teaching.
- Generate questions at each level of Bloom's taxonomy.
- Convert lower order questions into higher order questions.
- Identify ways to mitigate the barriers to teaching critical thinking.
- Identify ways and strategies necessary to promote CT in students.

Teaching content and its delivery (Appendix A) to facilitate the above outcomes were selected based on a thorough literature review on critical thinking, the team members' experience as educators and the pedagogical skills of teachers observed in Phase I of the study (Gul et al., 2010). A folder including the learning objectives, teaching strategies and related readings was given to each participant on day one of the workshop. The focus of the first workshop was to explore the educators' understanding and attitude about CT, clarify misperceptions, and help them recognize the contextual factors that could affect one's ability to think in a learning environment. Moreover, types, levels, and effective questioning techniques were addressed. The importance of questioning by faculty and students was emphasized. Bloom's (1956) taxonomy of educational objectives was used to develop the participants' skills in writing behavioral objectives and in asking higher order questions. In addition, the concept of alignment between objectives, teaching strategies, and assessment strategies was included in the first workshop. Active teaching and learning strategies (Van Amburgh et al., 2007; Rubenfeld & Scheffer, 2006) including group work, games, concept maps, debate, and reflections were used to address the selected content.

At the end of the first workshop, the participants were instructed that during their regular work, they reflect on what they learned in the workshop and whether they could apply their learning in their teaching practice. They were asked to submit a one-page summary of their reflections to the primary investigator two weeks prior to the second workshop. Information obtained from the participants' reflections, especially the obstacles they may have faced in promoting CT, were addressed in the second workshop. In addition, they were asked to bring a course syllabus/grid of any course they had recently taught or were currently teaching. After removal of the institutions and instructors' identifying information, these course grids were critiqued to understand/learn curriculum alignment: the objectives, teaching strategies, and assessment strategies. At the end of the workshop, the participants were asked to evaluate the intervention workshops based on the identified learning outcomes. The post-intervention data were collected 12 weeks after the second workshop. Considering the nature of our research questions, we did not aim to follow teachers in a specific course, or for them to be with the same students as at the first point of data collection (pre-intervention), but teaching a course in the same program was the criteria.

No training was offered to the control group until the second set of data was collected. A three day condensed workshop of similar content as was offered to the experimental group was held for the participants in the control group in order to provide them with necessary knowledge and skills pertaining to CT. Considering the expected number of participants (more than 40) in each workshop (both in the experimental and control groups), each workshop was offered twice. Based on the logistic consideration and the number of participants from different cities, one set of workshops was conducted at a nursing college in Islamabad, and another set of workshops was offered at a nursing school in Karachi. Therefore, the total number of participants was almost equally divided between the two venues.

Data Collection

Data were collected pre- and post-intervention through classroom observation of the participants' teaching sessions, which lasted from 60 to 90 minutes. Moreover, proceedings of their classes were audiotaped to obtain data on the teachers' questions. A structured checklist was used to record contextual information on the class (e.g., class size, duration, and physical environment), types of teaching strategies, and the teachers' facilitation skills (see Appendix B). Field notes were recorded to substantiate the ratings on the structured list and anything that could have impacted the

students' thinking. The field notes were helpful in capturing the teacher-student interaction and other behaviors related to questioning, for example, several questions were self-answered by the teachers (see Gul et al., 2010 for more details). Demographic information of each participant was obtained at the time of their consent.

The research team developed the observation checklist based on the literature about teachers' pedagogical skills affecting students' thinking and class participation. The facilitation skills included five items: (a) teacher-student interaction (e.g., eye contact, listening), (b) attitude of mutual respect (e.g., language, interaction tone), (c) responsiveness to students' concerns (e.g., clarifying a concept, identifying a resource), (d) encouragement given to students for asking questions (e.g., acknowledgement, appreciation), (e) and dictation of notes to students. The first four items were considered desirable for promoting students' thinking and participation, while the last item was considered undesirable for developing students' CT skills. The items were in question format and were measured using an ordinal scale from *not at all* to *some extent* to *a great extent*. The research team members established content validity of the checklist. The observation process was pilot tested before the actual data collection. Some tweaking of the checklist, including identification of behaviors for each item of facilitation skills and issues that related to clarity of the recordings, was done based on the pilot testing.

Data Analysis

The recorded participants' data on questioning was transcribed verbatim and verified with the recordings by the research assistant. Based on Bloom's (1956) taxonomy for cognitive thinking and the questioning framework offered by Profetto-McGrath et al. (2004), the teachers' questions were coded for types and levels of thinking (i.e., knowledge, comprehension, application, analysis, synthesis, and evaluation; see Appendix C). Questions that lacked clarity or had multiple interpretations were coded as vague. Rhetorical questions or those that posed for probing, facilitation, or determining students' reactions to a situation were categorized as "other types." A question posed and then instantly answered by the teachers without giving any chance to the students to respond, or questions with answers written on the same slide of a PowerPoint presentation were coded as rhetoric questions. If for any reason, the teacher repeated a question, it was counted only once.

After coding, data were entered into an SPSS database. For each participant, we entered the number of questions in each of the categories: high order, low order, other types, and vague. The coded data from the observation checklists were also entered.

Descriptive statistics were computed for participants' characteristics, data obtained through the structured checklist on classroom observation and the teachers' questioning. Pearson product moment correlations were used to examine the relationships between the variables. To control for the effect of class duration on the number of questions, the number-of-questions variables were re-expressed by dividing questions on the duration. To test for finding differences between pre-and post-intervention and between the intervention and control group, we conducted a mixed between-within analysis of variance (ANOVA), $\alpha = 0.05$.

Results

Characteristics of the Participants

As shown in Table 1, most (67%) of the participants were females. Their ages ranged between 20 to 55 years; however, the majority was between 26 and 30 years of age. Their teaching experience ranged from .5 to 16 years with a mean of 4.5 and a median of 2.6 years. As expected, most (83%) of the participants were nurse educators, and 61% had a BSN degree, while 30% were prepared at the master's level. Although all 12 non-nurse participants had a master's degree, only 10 (13.9%) of the nurse participants had a master's degree. There were no significant differences between the participants in the intervention and control groups on any of these variables.

Contextual Factors

As shown in Tables 2 and 3, the distribution of the class sizes and their physical environment were almost identical on the first and second observation; however, the mean time for class duration was 65 (SD = 24) and 59 (SD = 21) minutes, respectively. To control the effect of the class time on the number of questions asked pre- and post-intervention, the number of questions variables were re-expressed by dividing questions on the duration.

Intervention Outcome

An ANOVA for the total number of questions showed no overall difference from the first to the second observation period (pre-post main effect $F_{1,70} = .055$, $p > 0.05$), and there was no overall difference between the intervention and control groups (between group main effect $F_{1,70} = .005$, $p > 0.05$). As depicted in Table 4, the mean for the total number of questions in the intervention group increased from the first (25.91) to second (32.45) observation, but decreased in the control group (33.17 to 24.43). However, this

Table 1
Characteristics of Participants

Variables		*n*	%
Gender	Female	48	66.7
	Male	24	33.3
Age in years	Up to 25	5	7.0
	26-30	27	38.0
	31-35	17	23.6
	36-40	17	23.9
	41-50	6	8.4
Professional qualification	Master's	22	30.6
	BSN	44	61.1
	Diploma in nursing and midwifery with post-basic teaching diploma	4	5.6
	Diploma in nursing specialty diploma	2	2.8
Faculty type	Nursing	60	83.3
	Non nursing	12	16.7
Teaching experience in years	1-1.5	8	11.1
	2-4	8	11.1
	5-10	32	44.4
	11-16	12	16.9
	>16	8	11.2
Formal training in CT	Yes	0	0.0
	No	72	100.0

Table 2
Contextual Information of Observed Classes: Duration

	1st observation				2nd observation			
	Intervention group		Control group		Intervention group		Control group	
Variables	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Duration of the Class (Hour: minutes)	1:04	0:25	1:07	0:24	0:56	0:20	1:02	0:23
Overall	1:05				0:55			

Note. Group *n* = 36 for all four observations.

Table 3
Contextual Information of the Observed Classes: Number of Students and Conduciveness of the Physical Environment

	1st observation		2nd observation	
	Intervention group	Control group	Intervention group	Control group
Variables	*n* (%)	*n* (%)	*n* (%)	*n* (%)
Number of Students in the Class				
< 20	11 (30.6)	9 (25.0)	13 (36.1)	12 (33.4)
21-30	10 (27.8)	12 (33.3)	5 (13.9)	10 (27.8)
31-40	7 (19.4)	8 (22.2)	10 (27.8)	5 (13.9)
> 40	8 (22.2)	7 (19.4)	8 (22.2)	9 (25)
Conduciveness of the Physical Environment				
Not at all	2 (5.6)	1 (2.8)	3 (8.3)	1 (2.8)
To some extent	14 (38.9)	19 (52.8)	15 (41.7)	16 (44.4)
To great extent	20 (55.6)	16 (44.4)	18 (50)	19 (52.8)

Note. Group *n* = 36 for all four observations.

Table 4
Descriptive Statistics: Types and Levels of Questions (Per Hour)

		1st observation (pre-intervention)			2nd observation (post-intervention)		
Variables	Group	*n*	*M*	*SD*	*n*	*M*	*SD*
Total number of questions	Intervention	36	25.9	29.5	36	32.5	29.4
	Control	36	33.2	33.2	36	24.4	30.3
	Total	72	29.5	31.4	72	28.4	29.9
Higher order questions	Intervention	36	2.8	2.9	36	6.0	5.2
	Control	36	2.1	2.8	36	2.0	2.3
	Total	72	2.4	2.9	72	4.0	4.5
Lower order questions	Intervention	36	18.4	23.4	36	19.8	19.7
	Control	36	22.7	19.2	36	16.5	22.0
	Total	72	20.5	21.3	72	18.2	20.8
Other types (e.g., facilitative: probing, clarifying, rhetoric)	Intervention	36	3.4	4.7	36	4.9	7.5
	Control	36	6.5	9.7	36	4.3	5.8
	Total	72	4.9	7.7	72	4.6	6.7
Vague questions	Intervention	36	1.5	2.2	36	1.4	3.4
	Control	36	2.3	6.5	36	1.5	2.3
	Total	72	1.9	4.8	72	1.4	2.9

interaction effect was not statistically significant (interaction effect $F_{1,70} = 2.656$, $p = >0.05$).

In an ANOVA for the number of higher-order questions, the number increased from the first to the second observation period (pre-post main effect $F_{1,70} = 7.874$, $p = 0.006$). However, that increase occurred only in the intervention group (interaction effect $F_{1,\ 70} = 8.265$, $p = 0.005$), though this resulted in an overall difference between the intervention and control groups (between group main effect $F_{1,70} = 15.173$, $p < 0.001$).

As depicted in Table 5, the means for the educators' teaching strategies reflect a positive change from the first to second observation in both the groups. The ANOVA for the use of lecturing with a slide presentation indicated that the overall difference from the first to second observation was statistically significant (pre-post main effect $F_{1,70} = 8.294$, $p = 0.005$). Although the overall difference between the intervention and control groups was not significant (between group main effect $F_{1,70} = 0.674$, $p > .05$), there was an interaction indicating that the increase from the first to the second observation period was statistically higher in the intervention group (interaction effect $F_{1,70} = 5.308$, $p = 0.042$). Field notes supported that most teachers, who used a PowerPoint presentation, identified objectives for their class and were better organized to address the required content of their topic. However, those teachers who did not use a PowerPoint presentation usually began with the topic of the class and used personal notes to elaborate on the content relevant to the topic. Consequently, the teacher-student interaction was affected because the students had to concentrate more on listening and taking notes than on reflecting and internalizing the content.

In the ANOVA for teachers' use of active teaching strategies, the overall number of strategies increased from the first to the second observation period (pre-post main effect $F_{1,70} = 4.310$, $p = .042$). However, there was no overall difference between the intervention and control groups (between group main effect $F_{1,70} = .464$, $p > 0.05$). Likewise, the use of active teaching strategies by the intervention group in the second observation was not significantly higher than the control group (interaction effect $F_{1,70} = .172$, $p > 0.05$).

The mean scores with standard deviations and frequencies for each item on the educators' facilitation skills have been provided in Table 6. Accordingly, the mean score for teacher-student interaction in the intervention group increased slightly from the first to the second observation as compared to that of the control group. Similarly, the mean for the teachers' attitude for mutual respect increased from the first to the second observation. However, these differences were not statistically significant. Moreover, the mean for the teachers' response to the students' needs or concerns did not change from the first to the second observation.

Unlike the first three items, an ANOVA for teachers' encouragement to students for asking questions showed a significant interaction (interaction effect $F_{1,66} = 4.554$, $p = .037$) such that the increase from the first to the second observation period occurred only in the intervention group.

The dictation of notes was significantly reduced in the intervention group at the second (post intervention)

Table 5
Descriptive Statistics: Teaching Strategies

	1st observation		2nd observation	
Teaching strategies	Intervention group *M* (*SD*)	Control group *M* (*SD*)	Intervention group *M* (*SD*)	Control group *M* (*SD*)
Lecture with slides presentation	20 (55.6) 0.56 (0.50)	21 (58.3) 0.58 (0.50)	29 (80.6) 0.81 (0.40)	22 (61.41) 0.61 (0.49)
Lecture without slides presentation	16 (44.4)	15 (41.7)	7 (19.4)	14 (38.9)
Use active teaching strategies*	6 (16.7) 0.17 (0.37)	3 (11.1) 0.14 (0.42)	10 (27.8) 0.33 (0.54)	9 (25.0) 0.25 (0.45)
Did not use active teaching strategies	30 (83.3)	33 (88.9)	26 (72.2)	27 (75.0)

Note. Group $n = 36$ for all four observations. *Only one teacher (2.8) in the first observation (control group) and another teacher (intervention group) in the second observation used two active teaching strategies.

Table 6
Descriptive Statistics: Educators' Facilitation Skills

	1st observation		2nd observation	
Variables	Intervention group *M* (*SD*)	Control group *M* (*SD*)	Intervention group *M* (*SD*)	Control group *M* (*SD*)
Promote teacher-student interaction	1.44 (0.56)	1.50 (0.56)	1.61 (0.49)	1.47 (0.65)
Demonstrates attitude of mutual respect	1.69 (0.47)	1.67 (0.53)	1.72 (0.51)	1.56 (0.61)
Responsive to students' needs and concern	1.41 (0.50)	1.44 (0.56)	1.41 (0.62)	1. 34 (0 .65)
Encourages students when they ask questions	1.44 (0.61)	1.53 (0.58)	1.61 (0.49)	1.31 (0.64)
Instructor dictate notes	0.25 (0.55)	0.28 (0.62)	0.03 (0.17)	0.31 (0.62)

Note. Group $n = 36$ for all four observations.

observation. Similarly, an ANOVA yielded a significant interaction (interaction effect $F_{1,70} = 4.103$, $p = .047$) for teachers' behavior of dictating notes to their students. This behavior decreased from the first to the second observation period only in the intervention group.

Discussion

This study was conducted to determine whether teachers' pedagogical skills for the promotion of students' CT could be enhanced by providing them with formal training about the ontology and epistemology of CT. The results of this study are very encouraging as several positive changes were noted in the educators' classroom teaching practices post intervention. Similar to the existing literature (Craig & Page, 1981; Hsu, 2007; Ijaiya et al., 2010; Phillips & Duke, 2001; Profetto-McGrath et al., 2004; Sellappah et al., 1998; Wink, 1993), pre-intervention findings in this study also indicate that on average the educators' asked fewer high level questions than lower level questions. However, a statistically significant increase was noted in the educators' ability to pose higher order cognitive questions after they had completed the intervention. These findings coupled with the results from some previous studies (e.g., Craig & Page, 1981; Wink, 1993) affirm that educators need to improve their questioning skills. Formal training and coaching sessions can help them improve these skills. Though the level of questions has to be appropriate with the learners' level of familiarity with the content (Phillips & Duke, 2001), it is the higher level questions that promote students' CT (Redfield & Rousseau, 1981).

In a recent study focusing on the impact of teaching practices on students' CT skills, Shim and Walczak (2012) reported that in addition to asking challenging questions, well-organized presentations by

faculty were also associated with the students' gain in CT. In our study, we observed a significant increase in the teachers' use of a PowerPoint presentation by the intervention group during their second observation. Moreover, some increase, albeit not statistically significant, was observed in their use of active teaching strategies compared with that of the control group. The inability to reach a significant level of difference could have resulted from several factors. Many participants in our workshop had highlighted that their students and administration expected faculty to teach extensive amounts of content in a given time. Moreover, except for one school, 70% of the students' assessments in the nursing degree programs in Pakistan are centralized by their respective universities. The centralized assessments usually consist of paper and pencil examinations. Therefore, teachers may be reluctant to increasingly rely on active teaching strategies, but may be more inclined to cover the content through interactive lectures. Faculty workload may well be another reason because in addition to the knowledge of active teaching strategies, faculty need time to plan, prepare and use such strategies (Shell, 2001). Concurrent with the recommendation of other researchers (Cassum et al., 2013; Mangena & Chabeli, 2005; Zygmont & Schaeffer, 2006), a shared philosophy with coordinated efforts among faculty, students and administration would be required to change the entire culture of higher education in Pakistani universities.

Shim and Walczak (2012) asserted that the development of CT in students requires the teachers to balance the cognitive challenges with support, which necessitates good facilitation skills. With regards to change in the educators' facilitation skills after the intervention, we noted a desirable change in four items (Table 6). However, when compared with the control group, the change was statistically significant for two items: "encouragement to students for asking question" and "reduction in dictation of notes."

Most study participants were fairly young and had limited teaching experience (M = 4.4, SD = 4.07). It was disconcerting to learn that none of the participants had any formal preparation (course, seminar, or workshop) in CT before their participation in the current study. In their assessment of faculty CT in the USA, Zygmont and Schaefer (2006) also noted that most (78.4 %) of their participants had no education in CT while their average teaching experience was 14.47 years.

As noted in the standard deviation of items scores (Table 4), data for both groups and points of measurement indicate extensive variability in the teachers' questioning skills, which is not a new phenomenon or surprising. What is important to note is that the desired skills, albeit at varying levels, can be enhanced in most teachers. Empirical evidence consistently suggests that learning skills develop faster if they are taught explicitly along with the relevant content (Weimer, 2002). In agreement with the recommendations of other scholars and researchers from different parts of the world (Behar-Horenstein & Niu, 2011; Choy & Cheah, 2009; Zygmont & Schaefer, 2006), findings from this study affirm the need for a formal and structured training for teachers' CT, so that they can develop, appreciate and apply teaching practices that are known to promote students' critical thinking.

Drawing on the work of renowned scholars (e.g., Broofield, Lipman), Behar-Horenstein and Niu (2011) maintained that to emulate CT in their teaching practices, teachers must be able to differentiate ordinary thinking from critical thinking, and they must be able to "understand process that constitute critical thinking" (p. 27), and employ instructional strategies aimed at developing these processes. In addition to the knowledge and skills about CT, our intervention with the teachers in this study suggests that teachers must be given the opportunity to explore/externalize their own attitude about CT and address the myths that may preclude them from changing their practices. For instance, a number of participants in our interventional workshops identified several cultural and institutional barriers, such as limited resources (e.g., books, space, budget for teaching and learning material) and the expectations to just complete the content, which generally prevented them from using more active teaching strategies. However, with deeper reflections and discussion on those barriers and the demonstration of several active teaching strategies, the participants were able to realize and dispel such myths. Zygmont and Schaefer (2006) maintained that "the transition from being inclined to thinking critically and actually having the skill" (p. 260) requires a combination of time, experience and mentorship.

Limitations

This study has several limitations. Block randomization would have been a better option to prevent contamination of the participants in the control group, but block randomization was not implemented for two reasons. First, the faculty size in one school was four times larger than other schools. Second, it would have been very difficult for any school to allow all of their enrolled faculty members to attend the intervention workshops at the same time. To minimize the risk of contamination, participants in the intervention group were briefed about the study design, and they were asked not to share what they learned with colleagues assigned to the control group at their institution. Although the possibility of the Hawthorne

effect during the second observation could not be ruled out as the participants were not blinded to their assignment, they were not aware of the assessment parameters. Another limitation was that data from various cities were collected by different members of the research team or by a local data collector. However, to control the variations among data collectors, members of the team were involved in a detailed discussion about the data collection process before and after the pilot testing, and the data collectors were properly trained for the same process. Moreover, all the recorded questions were transcribed and coded by the research assistant; the coding was verified by a member of the team. Although Bloom's (1956) taxonomy for six levels is well established, in our experience, the differentiation between the last three levels (i.e., analysis, synthesis, and evaluation) was found challenging, especially when we had hundreds of questions to evalutate. To overcome this issue, we analyzed the questions for high and low order, which was appropriate for our study question.

Conclusion

This study adds to the knowledge of faculty development to foster CT in their teaching discourses. Previous research on this topic was more focused on the teachers' ability to ask higher order questions after an educational intervention. This study offers an example of extending training efforts beyond the teachers' questioning skills and the need for exploring contextual factors that may be inhibiting students' thinking. Moreover, training endeavors to enhance CT could be more beneficial when a multidisciplinary approach is employed. Although further research is needed, this study affirms the plea that some formal training is necessary to enhance educators' CT skills if they are expected to enhance CT in their teaching practices.

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Appendix-A
Intervention Workshops on Critical Thinking

Topic/Content	Strategies
• Definitions and descriptions of CT • Multidimensionality of CT as an attitude, skill, art, outcome, process, reflection • Characteristics of a critical thinker: Knowledge, skills, and attitudes/disposition • Clarifying of perceptions, and accepting diverse opinions, avoiding stereotypes • CT/problem-solving/decision-making/creative thinking	• PowerPoint interactive presentation • Reflections on pictures & images to explore varied perceptions, thoughts, and ideas about concepts related to thinking and CT. • Questioning • Debate on CT skills vs. CT dispositions • Small group exercise (e.g., fish bowl) • Large group discussion
• Importance of critical thinking in nursing practice and education • Challenges and barriers in teaching CT • Difference between active and passive strategies • Learning environment and student engagement • Teaching strategies to promote critical thinking in students	• Role play depicting traditional classroom where teacher does one way teaching and overload content on slides, passive learning, poor questioning followed by reflection on the role play • Reflection: Think of past and recall your favorite teacher • Small groups activity for development of concept map on barriers to CT • Development of Pros/Cons Grid by Think pair & share activity • Jigsaw for active teaching strategies
• Importance of questioning in nursing • Bloom's taxonomy • Types, Quality, and levels of questions • Research findings on questioning skills amongst educators • Instructional objectives for each level of blooms taxonomy • Writing instructional objectives; Cognitive domains ladder (6 levels)	• Interactive discussion using PowerPoint presentation; Questioning • Muddiest point; clarification of major points related to Blooms taxonomy • Develop questions in small groups, present and critique in large group. • Modify the given questions (closed to open, low to high order) • Think pair & share; Activity on identifying correct or incorrect objectives and modifying the latter
• Importance and Purpose of a course grid and its components • The concept of alignment in class plan, course, and curriculum • Steps and skills for identifying coherence in various component of a course • Curricular alignment Triangle framework (Article by Lorin Anderson) • Take home assignment briefing and expectations • Participants experience of the workshop	• Interactive discussion using PowerPoint presentation; • Planned and unplanned questions • Application of alignment exercise in small group activity-participants required to develop a class plan including objectives, content and teaching strategies. • Critique of class plan in large group for alignment • CT Survey questionnaire; workshop evaluation
The learners returned after 14 weeks for the second workshop	
• Share experiences and challenges of completing assigned task • Sharing of personal experience in application of knowledge and skills in learned in the first workshop. • Barriers to application and ways to overcome the identified barriers • Facilitators of CT Reflections and reflective • Evaluate selective course grid for alignment • Conclusion & Workshop Evaluation	• Interactive discussion using PowerPoint presentation • Sharing synopsis of the experience • Planned and unplanned questions • Synthesis of literature on Reflection and presentation of synthesis in a concept map • Discussion on the presentation of concept maps. • Reflections on the quality of discussion • Small group exercise to critique for alignment and presentation of the finding

Appendix B
Checklist for Classroom Observations

Code: _____

Topic of the Class: _____
Code of the school: _____; City:_____
Duration of the class: Start time: _____ End time: _____
Break: ☐ Yes ☐ No ; Total class duration excluding break time: _____
Observed class is of which programme: 4-year BSN ☐ Post-RN BSN ☐

Note: *circle the appropriate response and write comments in the field notes as appropriate.*

1.	**What was number of students in the class?**	1. < 20 2. 21-30 3. 31-40 4. > 50
2.	**Was the Physical Environment of the class conducive to learning?** **Descriptors:** seating arrangement, comfortable seating, adequate light and ventilation, free of distractions (noise)	1. Not at all 2. To some extent 3. To great extent
3.	**Did the instructor promote teacher-student interaction?** **Descriptors:** verbal and non-verbal: level of distance between teacher and students, attentive (eye contact, listening, nodding) when students are talking, approachable, non-threating, but welcoming approach to students, invites questions or participations.	1. Not at all 2. To some extent 3. To great extent
4.	**Did the instructor demonstrate an attitude of mutual respect towards the students?** **Descriptors:** Verbal (language and tone of communication) and non-verbal gestures reflecting respect, open mindedness-acceptance of different views. Students appears to feel safe to express their feelings, as their ideas and opinions are valued	1. Not at all 2. To some extent 3. To great extent
5.	**Was the instructor responsive to students' needs and concerns?** **Descriptors:** Teacher responds to student's questions; provides clarification, explanation as needed; demonstrates flexibility- make changes on the students' request, e.g. need for a break.	1. Not at all 2. To some extent 3. To great extent 4. Not applicable
6.	**Did the instructor encourage students if they asked questions?** **Descriptors:** Compliment students for asking questions e.g. good question! Thanks for asking/raising this issue. When the question is not clear, doesn't ridicule, but probe to understand the question.	1. Not at all 2. To some extent 3. To great extent 4. Not Applicable
7.	**Did the instructor dictate notes to the students?** **Descriptors:** Teacher's emphasizes on noting down of content, e.g. copy/note what is on the board/slide; write it…	1. Not at all 2. To some extent 3. To great extent
9.	**Did the instructor use any teaching aids/resources?** **Descriptors:** Board (white/black), Models, Charts, video etc.	1. Multi Media (PP-slides) 2. Others:

10.	**Did the instructor use any active teaching strategies? (circle all that are appropriate)** **Descriptors:** Teachers direct students for an activity, explains the context and process, make the student reflect on what they did and learn.	1. Group work 2. Role Play 3. Debate 4. Concept mapping 5. Others

Field Notes: (any observation that may facilitate or inhibit students thinking)

_____

_____

_____

_____

_____

_____

_____

_____

_____

Recorder name and signature: _____ Date: _____

Appendix C
The Types and Levels of Questions

Types of Questions	Levels of Questions: Required Cognitive Activity	Examples
Lower order	Knowledge: the lowest level of cognitive thinking that entails remembering or recalling factual information, it includes memorization of definitions, formulae or procedures.	Which organ in the body produces insulin? What is peritonitis?
	Comprehension: understanding of information, usually restating the information with some reorganizing, but without relating it to other concepts.	How conduction system of the heart works? What is done to a patient blood in plasmapheresis?
	Application: Problem solving or application of learned material in new situations with minimal prompting of the appropriate rules, principles, or concepts.	What are some possible Nursing diagnoses for patient with Acute renal failure?
Higher order	Analysis: Breaking an idea into its component or parts for logical analysis or reasoning to support a conclusion.	How would you confirm that whether it is respiratory or metabolic acidosis?
	Synthesis: Combining ideas into a statement, plan, product, etc.	What is the role of diet and exercise in health?
	Evaluation: Evaluating or making a judgment about something using some criteria or standard.	Which is the most appropriate nursing management for an elderly patient having stroke?
Vague	Questions that are difficult to interpret, because the given information is incomplete or asked in an illogical order.	What is the intake of a normal person? What do you think about personal development?