Exploring Teacher Educators' Knowledge about Critical Thinking: A Case from Pakistan

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Abstract: In Pakistan, it is aimed at both national and international levels to promote and develop critical thinking among students and teachers at all educational levels (sustainable development goals, VISION 2025, national standards for teachers, national educational policies, etc.). However, little research has investigated teachers' critical thinking knowledge. The present study explored critical thinking knowledge of teacher educators from teacher training institutes. The teacher training institutes of the most populous and developed province of Pakistan were taken as the sample of the study. Exploratory survey method was used for data collection. The study found that the majority of teacher educators lack critical thinking knowledge. Teaching experience, qualification, job status, and training attended on critical thinking are significant predictors of critical thinking knowledge. The critical thinking knowledge of prospective teachers and their students is at risk.

Introduction

Education is of fundamental importance for the economic growth of societies. However, education can mainly support economic growth if people can compete in the professional world after completion of their education. In the contemporary world, job markets are highly competitive, and people with certain skills (along with content-specific knowledge) have higher chances of being employed and succeeding than their counterparts. Therefore, presently the world is focusing on 21st-century skills, which mainly include Information and Communication Technology (ICT), creativity, and critical thinking. The National Center for Education Statistics (2019), responsible for collecting educational data in all major economies of the world, has recommended the integration of 21st-century skills, including critical thinking in school curriculum and learning. Moreover, the National Center for Education Statistics (2019) particularly recommended the developing countries (like Pakistan) prioritize teaching of critical thinking in curriculum and teaching.

Pakistan's National Education Policy 2009 (which is presently implemented in Pakistan and is responsible for designing a national strategy to pursue development in education) indicated that the education system in Pakistan (from school to higher education level) is failing to develop skills that are required in the job market for instance, critical thinking skill. It further states that when college and university graduates join the job market, they are unable to understand the dynamics of the job market and workplace and face difficulties in contributing

fully. Therefore, the National Education Policy (2009) has suggested teaching critical thinking skills in a classroom environment and held teachers responsible for imparting critical thinking among students at the classroom level.

The newly introduced Single National Curriculum (SNC) in Pakistan has aligned its aims with the International Sustainable Development Goals (SDG-4), and particularly focused on the development of critical thinking. Along with national policy, supranational bodies suggest advancing the curriculum to bring a change in societies, for instance, UNESCO's aim of sustainable development goals (Barthes, 2018). In order to instill critical thinking skills among students, teachers must have critical thinking ability. Past research in Pakistan has found that, generally, teaching and teachers' behavior in the classroom is unlikely to promote critical thinking (Khan, 2017). Teacher education has always been criticized for its ineffectiveness to develop critical thinking (Shaukat & Chowdhury, 2020). Hence, school teachers are not successful in developing critical thinking skills among students. One reason could be the inability of teacher trainers to develop critical thinking in school teachers which prevents critical thinking development among their students.

Bibi and Akhter (2020) measured critical thinking skills of prospective teachers and found that they lack in critical thinking skills. This might indicate that teacher educators, who train prospective teachers, may possess deficient critical thinking knowledge. No study has been found that has investigated critical thinking knowledge or skills of teacher educators who train prospective teachers. Therefore, the present study aims to explore the critical thinking knowledge of teacher educators.

The significance of the present study is multifold. Firstly, as school teachers are not equipped with the necessary knowledge and skills (Abrami et al., 2008; Li, 2016), an in-depth understanding of teacher educators' critical thinking knowledge will provide a stronger basis to prepare future teachers to implement a thinking-based curriculum. Secondly, unpacking teacher educators' knowledge will inform the researchers and policymakers in identifying classroom challenges. Thirdly, from past research, we know that prospective teachers lack critical thinking skills (Bibi & Akhter, 2020), this study will help to know the root cause of this lack.

Teacher Education System in Pakistan

A brief comparison of teacher education in Australia and Pakistan is presented, followed by the teacher education system in Pakistan. In terms of structure, teacher education in Pakistan is similar to Australian teacher education. Like Australia, a 4-year Bachelor in Education (in Pakistan, B. Ed Honors) is awarded after 12 years of education, or students who have completed a 4-year bachelor's degree in any subject area receive a 2-year diploma (in Pakistan, 1.5-year B. Ed. Secondary). However, the teaching practice offered in teacher education programs is more rigorous in Australia as compared to Pakistan.

The main differences in teacher education between the two countries are not structural; rather, they are differences in quality. Ling (2017) stated that teacher education in Australia is dynamic, facing continuous revisions and changes, and is highly regulated. While teacher education in Pakistan is static, though periodic changes in the scheme of studies are made, by far they are not effective. The most recent reform done in teacher education was in 2008. On the other hand, teacher education in Australia is continuously reconstructed through teaching standards, high accountability, and performance management (Mayer & Mills, 2020).

Higher Education Commission Pakistan has developed the National Accreditation Council for Teacher Education (NACTE), which is responsible for determining the quality of teacher education programs. Both pre-service and in-service teacher training institutes are available at colleges and universities in Pakistan. Teacher education in Pakistan is not in good shape and is facing numerous challenges mainly because of its structure, lack of expertise of teacher educators, and financial resources.

In 2008, the teacher education system was reformed under the Teacher Education Project, initiated by USAID and Pakistan Higher Education Commission. This step was taken to develop knowledge and expertise in teachers to cope with the challenges of teaching in the 21st century. This project introduced two programs: a two-year Associate Degree in Education (ADE) and a four-year Bachelor of Education Honors (B. Ed Hon). The Project developed a curriculum and trained teacher educators to teach that curriculum and practice student-centered teaching, active learning, critical thinking, and Information and Communication Technology in the classroom. Moreover, National Standards for Teacher Education were developed in Pakistan for the first time.

This project substantially improved teacher education by introducing a dynamic curriculum, improved content knowledge, pedagogical knowledge, higher-order learning (like critical thinking skills), professional development of teacher educators, development of infrastructure of teacher education programs, inculcating modern teaching methodologies and linking theoretical knowledge with practical skills needed in real classrooms. Moreover, Shapiro (2012) found that trained teachers received positive feedback from their students in classrooms and observed changes in teachers' knowledge about collaborative teaching and new assessment techniques by increased use of ICT in classrooms. Despite these efforts and improvements contributed by the Teacher Education Project, the teacher education system in Pakistan cannot compete with teacher education in developed countries due to the gaps in the policy and implementation of teacher education programs (Fazal, et al., 2014; Khan, 2017). Fazal, et al. (2014) believed that teacher education and teacher professional development need particular emphasis. There are 1.35 million teachers, 275 teacher education institutes, and 3000 teacher educators in Pakistan which is not enough to fulfill the teacher training needs of teachers (Fazal et al., 2014).

The Teacher Education Project and Higher Education Commission emphasized the development of critical thinking and explicitly mentioned critical thinking skills as an outcome in both ADE and B. Ed Honors programs; yet, the strategies teachers can use to develop it among learners are not clearly explained.

Very few research studies have been done on critical thinking in the context of Pakistan. Generally, critical thinking skills are not supported in Pakistani classrooms because of the challenges involved in their practice. Cassum et al. (2013) interviewed university teachers to identify the barriers to teaching critical thinking skills and found that teachers' background knowledge and their attitude toward using teaching strategies that develop critical thinking are barriers because rote learning is often preferred in Pakistan. In addition, teachers reported that if students equally contribute to classroom discussion, it would be hard for teachers to maintain classroom discipline because of the large class size. Manan and Mehmood (2014) reported that questioning in the classroom is a basic element of teaching critical thinking; however, questioning is not encouraged in Pakistani classrooms. Khan (2017) argued that teaching critical thinking skills is a challenging goal in Pakistani classrooms. It involves effective classroom discussions, well-prepared teachers and active students, and the opportunity for each student to

participate in classroom discussions which are not the norm here. Moreover, a high teacher-student ratio is also a barrier to teaching critical thinking skills.

Rationale of the Study

The world is being digitized with each passing day and in the current era, skills of innovation (critical thinking and creativity) are focused at all levels of education. OECD (2019) has stated that creativity and critical thinking skills are getting most of the importance in the labor market and they also lead to better personal and civic life. One of the main reasons for this importance is that in the digital world, tasks that can be learned easily are being assigned to machines and/or robots and manpower is expected to work on tasks that need critical thinking and innovation. This means the job markets are going to be even more competitive in the near future. According to OECD (2019), OECD countries are aiming to assign most of the low-expertise jobs to robots or to people in those countries that work for lower salaries. OECD countries include 38 countries and most of these countries are the strong economies of the world and are the countries that have high GDP. Furthermore, the OECD (2019) estimated that in the coming years around 14% of the total jobs in the OECD are at risk of being completely automated (assigned to robots, etc.) and 32% of jobs are likely to be changed significantly.

This expected change is particularly important for Pakistan because according to an annual analysis of manpower export, Pakistan is the second highest manpower exporting country in South Asia and most of the jobs are jobs involving labor or low expertise. Therefore, it can be argued that the Pakistan education system is not strong enough to develop critical thinking skills in their graduates, that's why Pakistani immigrants found low-profile jobs in international markets and very few Pakistanis are working at high-profile jobs abroad that require higher-order skills. Furthermore, in case of automation of jobs in the future, Pakistani manpower would lose jobs in the international market and Pakistan would face more crises in economic growth.

National Professional Standards for Teachers in Pakistan (2009) clearly stated that quality teachers can play an instrumental role in quality education and to compete internationally teachers have the responsibility to convert the raw talents of students into productive assets and this responsibility goes to teacher educators, prospective teachers, and teachers. Moreover, the standards mentioned critical thinking and critical judgment skills are essential as quality teaching indicators. National Education Policy 2009 has emphasized the development of critical thinking skills in terms of inculcating the spirit of inquiry, critical thinking, and problem-solving among students, and teachers are suggested to encourage critical thinking skills in the classroom environment. The policy further criticized the present assessment system and suggested that it should be enhanced and higher-order learning including critical thinking should be emphasized in the assessment system. Teacher Education Project (2009) also highlighted the significance of indoctrinating critical thinking skills among teacher educators so they would have the capability to develop it among prospective teachers.

Pakistan VISION 2025 emphasizes the development of critical thinking and higher-order learning among students and has discouraged rote learning, arguing that it could lead the nation toward economic growth. Furthermore, Single National Curriculum (2020) has made an effort to inculcate critical thinking in the curriculum and has appreciated open-ended activities and questions to promote critical thinking among students in each subject matter knowledge. Hence, it can be concluded that at the policy level, the Ministry of Education and the Department of

Policy and Planning have realized the importance of critical thinking development Although the development of critical thinking has been emphasized in national documents such as SDG, Single National Curriculum, Vision 2025, National Educational Policy (2009) and National Professional Standards for Teachers (2009), no study has found that has measured critical thinking skills of teachers, prospective teachers or teacher trainers in the context of Pakistan. The role of schools in critical thinking development and teachers to produce critical thinkers has been emphasized in many research studies (Aliakbari & Sadeghdaghighi, 2013; Khan, 2017). Moreover, stakeholders have criticized the teacher education system in Pakistan (Akram & Zepeda, 2015).

Nauman (2017) argued that even the highly educated people who are working as researchers in Pakistan lack critical thinking skills. The author investigated the research output of Pakistani researchers and argued that although researchers got funding from national research funding bodies, their research contribution lacks critical thinking and is low in quality. This might be one of the reasons that Pakistan is struggling in progress.

Naseer et al, (2020) examined the critical thinking skills incorporated in social studies books of secondary school curriculum in Pakistan and found that textbooks lack in developing critical thinking skills among students. However, little is known about the contribution of teachers in developing critical thinking among students. In order to become a teacher at public schools in Pakistan, one has to get teacher training at teacher training institutes. These teacher training institutes are usually universities where university teachers for instance lecturers, assistant professors, associate professors, and professors train prospective teachers. Following the findings of Nauman (2017), where research done by higher education teachers lacks critical thinking and good quality, it might be expected that university teachers also lack critical thinking skills. In this way, prospective teachers who get training from university teachers might also lack critical thinking ability because Newmann (1990) argued that teachers who intellectualize critical thinking and have the ability to develop it, regularly integrate critical thinking in their teaching.

Classroom environment, predominantly, critical thinking instructional methods practiced by teachers provide an effective track to foster the thinking ability of students (Haynes, 2006; Swartz & Perkins, 1990). However, if teachers themselves lack critical thinking, they won't be able to inculcate critical thinking among prospective teachers. Bouton (2008) stated that it would be difficult for teachers to implement critical thinking and developing strategies without having a clear knowledge of this construct. Khan (2017) measured teacher educators' and prospective teachers' perceptions about their critical thinking in a Functional English course offered in teacher education programs and found that they perceive that their critical thinking has improved. However, no study has been found that has measured the critical thinking knowledge of teacher educators in the context of Pakistan, the present study has aimed to explore the critical thinking skills of teacher educators of teacher training institutes.

Critical Thinking-Defining the Term

A universally accepted definition of the term critical thinking remains elusive despite several attempts to establish a conclusive definition of critical thinking. Psychologists, philosophers, and educationists have approached the term with different interpretations. Widely acknowledged and most frequently cited definitions theorize critical thinking as higher-order skills characterized by thoughtful, reflective, self-directed, responsible, and skillful reasoning that relies on specific criteria (Ennis, 1987; Facione, 1990; Mcpeck, 1981).

However, a number of features and components are common among different definitions of critical thinking. These features are best described by Bloom (1956) in his taxonomy of learning objectives. These include three high-level skills that constitute critical thinking. These are analysis, synthesis, and evaluation. Li (2016) conceptualizes critical thinking from a teacher's perspective as involving higher-order thinking skills and the ability of argumentation and problem-solving, openness, and flexibility. Halpern (2014) refers to critical thinking as 'use of cognitive skills or strategies that increase the probability of a desirable outcome' (p. 8). Hitchcock (2018) described critical thinking as careful, goal-directed thinking with such dispositional characteristics as attentiveness, habit of inquiry, self-confidence, courage, open-mindedness, willingness to suspend judgment, trust in reasoning, and truth-seeking.

Critical thinking is extensively considered important in past research. According to Butler (2012), among all other skills that are fundamental for liberal education, critical thinking is the most important. Similarly, Walsh and Paul (1986) stated that if we anticipate our children to be innovative, logical, thoughtful, and inquisitive, thinking skills must be infused in school and curriculum at all levels of formal education.

He further added critical thinking is the ability to develop links and draw differences, evaluating the given information in an objective way and distinguishing between valid and invalid information. It is particularly important in this era of digitalization when the internet is full of information. Therefore, it is really important that people can distinguish valid and correct information from the wrong information.

Theoretical Framework of the Study

Critical thinking is defined in various ways which have some common aspects, and the crux of these definitions is found in Facione et al. (2020), who defined it as "critical thinking that has a purpose such as providing a point, interpretation what something means, or solving a problem' (p. 4). It means it involves rational thinking to achieve the anticipated outcomes. The framework of critical thinking particularly used for this study has been derived from Facione et al. (2020), who explained critical thinking as "purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference as well as an explanation of the evidential, conceptual, methodological, or contextual consideration upon which that judgment is based" (p. 27).

Facione et al. (2020) presented a comprehensive conceptual framework that also includes a reliable rubric for measuring critical thinking knowledge and, therefore, was used in the present study. The concept comprised six sub-skills of critical thinking, including interpretation, analysis, evaluation, explanation, inference, and self-regulation, and explained each skill in the following way:

Interpretation means "to comprehend and express the meaning or significance of a wide variety of experiences, situations, data, events, judgments, conventions, beliefs, rules, procedures, or criteria" (p.5) and includes "categorization, decoding significance, and clarifying meanings" (p.5). ***Analysis*** has been described as "identifying the intended and actual inferential relationships among statements, questions, concepts, descriptions, or other forms of representation intended to express belief, judgment, experiences, reasons, information, or opinions" (p.5). It has further been categorized as "examining ideas, detecting arguments, and analyzing arguments" (p.5).

The third skill is ***evaluation***, which means "to assess the credibility of statements or other representations which are accounts or descriptions of a person's perception, experience, situation, judgment, belief, or opinion and to assess the logical strength of the actual or intended inferential relationships among statements, descriptions, questions or other forms of representation" (p.6). By ***inference***, experts mean "to identify and secure elements needed to draw reasonable conclusions; to form conjectures and hypotheses; to consider relevant information and to reduce the consequences flowing from data, statements, principles, evidence, judgments, beliefs, opinions, concepts, descriptions, questions, or other forms of representation" (p.6). The sub-categories are "querying evidence, conjecturing alternatives, and drawing conclusions" (p.6).

Explanation means "to state and justify that reasoning in terms of the evidential, conceptual, methodological, criteriological, and contextual considerations upon which one's results are based; and to present one's reasoning in the form of cogent arguments" (p. 6). Subcategories of explanation include "describing methods and results, justifying procedures, proposing and defending one's causal and conceptual explanations of events or points of view with good reasons, and presenting full and well-reasoned arguments in the context of seeking the best understandings possible" (p. 7). The last cognitive skill of critical thinking according to Delphi experts is ***self-regulation***. They describe it as "self-consciously monitoring one's cognitive activities, the elements used in those activities, and the results educed, particularly by applying skills in analysis and evaluation of one's own inferential judgments with a view toward questioning, confirming, validating, or correcting either one's reasoning or one's results" (p. 7). The sub categories which are included in self-regulation are "self-examination and self-correction" (p.7).

The framework for the present study was designed according to this agreed-upon definition to ensure the uniformity of critical thinking conception.

Teacher Educators and Critical Thinking Knowledge

Research on developing critical thinking shows that teachers' beliefs and knowledge about critical thinking greatly influence their practice in the classroom. It would be difficult for teachers to integrate critical thinking skills in the classroom without having a clear understanding of this concept (Elder & Paul, 2008). Moreover, Wright (2002) argued that teachers' understanding of critical thinking would determine their classroom practices and planning to develop it among students. Ismail et al. (2022) stated that teachers who have rigorous knowledge of critical thinking tend to have constructive classroom environments of thoughtfulness, and they are more likely to practice critical thinking strategies. Therefore, in order to investigate teachers' practices about critical thinking, it is important to first measure their knowledge and understanding of critical thinking.

Teachers generally hold a positive attitude toward promoting critical thinking but possess 'fragmented' or deficient knowledge of the concept (Li, 2016; Zhang et al., 2022). Elder and Paul (2010) investigated teachers' knowledge about critical thinking and their practices that foster critical thinking in California teacher education programs. They found that teachers' knowledge of critical thinking and related instructional strategies is alarming. Teachers having vague knowledge of critical thinking skills are unlikely to practice these skills in classroom teaching. Therefore, the research suggests that, in order to foster critical thinking practices, teachers must first be trained in thinking critically. Elder and Paul (2010) found that teachers with sound knowledge of the concept of critical thinking tended to have better classroom environments of thoughtfulness and were more likely to practice these strategies.

Keeping in view the importance of sound critical thinking knowledge for teachers, it becomes crucial for teacher training institutes to inculcate this knowledge among future teachers. Many studies focused on infusing critical thinking courses and related teaching strategies in teacher training programs. Owu-Ewie (2010) advised a shift of teacher training institutes from 'information transmitting factories' to 'knowledge producing centers' and suggested teacher training institutes change the instructional strategies accordingly for producing teachers with higher-order thinking skills.

The development of critical thinking among future teachers demands teacher educators to be skillful in the field. As set before, with literature support, teachers' competency in critical thinking knowledge has a positive influence on students to be good critical thinkers. Similarly, teacher educators' sound knowledge of critical thinking will eventually ensure the cultivation of future teachers equipped with robust critical thinking skills. Clark and Paulsen (2016) measured the critical thinking of prospective teachers and found that students who were taught by teacher educators with low critical thinking skills were less competent than students who were taught with high critical thinking skills. Although studies have suggested the necessity to develop critical thinking among teacher educators, no sufficient research has been done to investigate teacher educators' conceptions and practices of critical thinking (Yuan et al., 2022). As no such study has been done in the context of Pakistan, the current study aimed to explore teacher educators' knowledge about critical thinking.

The study answered the following two research questions:

1. To what extent teacher educators are familiar with the concept of critical thinking (as described in the literature)?
2. Is there any difference in teacher educators' knowledge about critical thinking with respect to gender, age, teaching experience, qualification, status of job, designation, and training attended?

Methodology

Research Design and Sampling

An exploratory survey method was employed for an in-depth understanding of teacher educators' conception of critical thinking. We have drawn the sample from the Punjab province, which is the largest province of Pakistan with respect to population size. It has the highest literacy rate, the most developed educational system, and educational institutes across the country. According to the Education Finance Division (2020), the literacy rate of Punjab is 63%, followed by Sindh at 60%, Khyber Pakhtunkhwa at 53%, and Balochistan at 44%. The sample is composed of all teacher educators of public sector universities and institutions that are offering pre-service teacher training programs in the province of Punjab. In total, ten public sector universities are offering teacher training in Punjab. The authors had the opportunity to collect data from the whole population. Fraenkel (2012) suggested that it is favorable, if possible, to study the whole population of interest. In this case, the population and sample could be identical. The authors collected data from all teacher educators teaching at public sector teacher training universities and institutions in the Punjab province in order to get a clear picture of teacher educators' knowledge about critical thinking.

The details about teacher educator faculty were collected from the official websites of the respective universities and institutions. The authors also contacted the administrative offices of the respective institutions for data verification. Data were collected by personal visits, and where difficult, the questionnaire was sent and received via mailing. The return rate was 80%. The total number of teacher educators was 380, while 304 questionnaires were returned. Twelve questionnaires were discarded due to incompleteness. So, the total sample of the study is counted as 292 teacher educators. The data on the following demographic variables were collected: gender, age, educational qualifications, teaching experience, and professional designation.

The participants' knowledge was also measured on the basis of training attended on critical thinking. Periodically refreshing courses and training are conducted for Teacher educators' professional development, addressing multiple trends and challenges in the field of education; critical thinking is one of them. Though no explicit training was given for this research purpose, the participants were asked to mention if they have received any training on critical thinking during their professional career, and participants' conception of critical thinking was compared.

The participants’ distribution on the basis of demographic characteristics is shown in Table 1.

Demographic Variables		*n*= 292
Gender		
	Male	110 (38%)
	Female	182 (62%)
Age		
	Under 25	10 (3 %)
	25-29	66 (23%)
	30-39	120 (41%)
	40-49	58 (20%)
	50-59	36 (12%)
	60 and above	2 (1%)
Qualification		
	MA/MSc	82 (29%)
	MPhil./MS	136 (46%)
	PhD	72 (25%)
Experience as teacher educator	Less than 5 years	94 (32%)
	5-10	102 (40%)
	10-20	60 (21%)
	20-30	28 (10%)
	More than 30 years	6 (2%)
Job status		
	Permanent	204 (70%)
	Contract	36 (13%)
	Visiting	50 (17%)
Designation		
	Lecturer	158 (55%)
	Assistant professor	108 (37%)
	Associate Professor	18 (6%)
	Professor	6 (2%)
Training on Critical Thinking		
	Yes	170 (59%)
	No	118 (41%)

Table 1: The details about demographic characteristics of participants

Instrument of the Study

The Critical Thinking Knowledge Questionnaire (CTKQ), mainly comprising two parts, was used to collect the data. Part one measured demographic data about teacher educators' age, qualification, teaching experience, job status (contract, permanent, or visiting), designation, and training received on critical thinking. The second part of the questionnaire measured teacher educators' knowledge about critical thinking skills. Following Facione et al. (2020) framework, the details are provided in *Figure 1*, a set of questions related to critical thinking knowledge was prepared by the researchers. For validity, the prepared questionnaire along with the Facione et al. (2020) framework was sent to six professors who were experts in the area. In the light of reflections and suggestions provided, a final version of the questionnaire comprising 22 statements was prepared. To ensure internal consistency, the questionnaire was pilot-tested. The Cronbach alpha reliability of the instrument was recorded as 0.78, which is considered to be a good level of internal consistency, indicating the questionnaire items measure the same underlying concept consistently. This part comprises 22 items, with each item measuring respondents' knowledge regarding whether the skills mentioned in the item are critical thinking skills (or sub-skill) or not. The response format was binary (Yes/ No). Respondents selected yes if they think the item is measuring critical thinking skills, and they selected no if they think the item is not measuring critical thinking skills. Score 1 was given in case of correct answer, and 0 was given in case of wrong answer. The maximum score for CTKQ was 22.

Definition	Categories	Sub-categories	Statements
"purposeful, self-regulatory judgement which results in interpretation, analysis, evaluation, and inference as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual consideration upon which that judgement is based" (Facione et al., 2020. p. 27).	Interpretation	Categorization	Formulating categories for understanding information
		Decoding Significance	Identifying the relationships among concepts and statements
		Clarifying Meanings	Clarifying the meanings and removing confusions or ambiguity
	Analysis	Examining ideas	comparing or contrasting ideas, concepts, or statements
		Detecting Arguments	Identifying the relationships among concepts and statements
		Analysing arguments	Giving reasons to support or challenge a claim, opinion or point of view.
	Evaluation	Assessing claims	Assessing the credibility of the source of information or opinion
		Assessing arguments	Assessing the strength of relationships among statements
	Inference	Querying inference	judging between reasonable and fallacious inferences
		Conjecturing alternatives	formulate multiple alternatives for resolving a problem
		Drawing conclusions	Selecting the best conclusion on the basis of most supported evidence at hand.
	Explanation	Stating results	Stating the results of one's reasoning
		Justifying procedures	Justifying the reasoning upon which one's results were based
		Presenting arguments	Giving reasons for accepting some claim/ Presenting one's reasoning in the form of powerful arguments.
	Self-regulation	Self-examination	Monitoring one's own cognitive activities/ Detecting the deficiencies and errors in one' own thinking
		Self-correction	Designing reasonable procedures to correct errors of one' own thinking

Fig. 1 The study framework for assessing teacher educators' critical thinking knowledge derived from (Facione et al., 2020).

Results and Interpretation

The data was analyzed through SPSS 22. Analysis was performed in order to measure teachers' knowledge about critical thinking. Details about teachers obtained scores are shown in tables.

1. *Research Question 1:* To what extent teacher educators are familiar with the concept of critical thinking (as described in the literature)?

Categories	Range	Frequency	Percentage
Good Knowledge	20-17	66	22
Average Knowledge	16-14	116	40
Poor knowledge	13-8	110	38
Total	22	292	100

Table 2: Categories of Participants on the basis of Obtained Scores on CTKQ

The scores on CTKQ ranged from 8 to 20, and based on achieved scores, the respondents were statistically divided into three categories. Equal cut-points were automatically created by the software. Respondents who scored in the range of 20-17 were put in Category 1 (indicating good knowledge), respondents scoring in the range of 16-14 were put in Category 2 (indicating average knowledge), and the respondents scoring in the range of 13-08 were put in category 3 (indicating poor knowledge). No respondent scored less than 8, which means every teacher educator has at least minimal knowledge about critical thinking.

Sixty-six (22%) teachers had good knowledge of critical thinking, 116 (40%) teachers had average knowledge of critical thinking, and 110 (38%) possessed poor knowledge. It is evident that 78% of teachers had poor or average knowledge of critical thinking, whereas only 22% possessed good knowledge about critical thinking. Further, it is found that the mean score obtained by the participant is 14.27 (SD=2.946). Hence, it is concluded that teacher educators' knowledge of critical thinking skills is low.

Similar results were reported by Kuloğlu and Karabekmez (2022) in their study that teacher educators have low critical thinking knowledge. Some other studies also showed similar results that teacher educators are not familiar with the definition of critical thinking and have low critical thinking knowledge (Saeed, et al., 2012; Barak & Shakhman, 2008). Furthermore, Kuloğlu and Karabekmez (2022) conducted a study to measure teachers' critical thinking skills and reported that the teachers possess a low level of critical thinking knowledge. Similar findings have also been reported by Gürültü, Aslan, and Alcı (2020) who concluded that teachers' critical thinking skills are of medium level.

Contextual factors that may contribute to these findings can be counted as teachers' commitment and willingness to possess profound knowledge. Suhail (2021) reported in his study that as teachers have the pressures of content coverage, time shortage, and limited resources, they are less interested in integrating critical thinking practices in their classrooms and, ultimately, less willing to enhance their knowledge of CT.

Research Question 2: Is there any difference in teacher educators' knowledge about critical thinking with respect to gender, age, teaching experience, qualification, status of job, designation, and training attended?

Variables		N	Mean	SD	t.value	*df*	Sig.
Gender	Male	110	14.49	2.92	.981	290	.328
	Female	182	14.14	2.96			
Training Attended							.002
	Yes	118	14.71	2.98	3.091	286	
	No	170	13.63	2.86			

Table 3: Comparison of Mean Scores on CTKQ on the basis of Gender and Workshops Attended

Table 3 shows the results of the independent sample t-test, which was applied to compare the difference in the mean scores on CTKQ across genders. Results showed an insignificant difference ($p > .05$) with a t-value of .981 concluding that male and female participants do not differ in their knowledge about critical thinking (Mean score, Male= 14.49, Female=14.4).

Previous research on teachers' critical thinking knowledge also has similar findings (Gürültü, Aslan, & Alcı, 2020; Eğmir &, Çengelci, 2020; Kozikoğlu &Özcanlı, 2020; Yalçın-İncik, 2020; Bagheri & Ghanizadeh, 2016). Aligned with this study results, Yalçın-İncik (2020) also found no significant relationship between critical thinking knowledge with gender concluding that it can only be learned through life experiences.

In Pakistan, periodical training of different durations like days, weeks, and months covering critical thinking understanding and practices are conducted for teacher educators. Table 4 shows the results of the t-test which measured the difference between the two groups; one who attended any training on critical thinking and the other who didn't attend any training during their service as teacher educators. A statistically significant difference was found ($p < .05$) with t-value = 3.091, which shows that teachers who have attended any training, scored better (M= 14.71) than teachers who did not attend any training on critical thinking (M= 13.63).

The results are in line with the results of a past study in which Moreno, Lopez, and Vera (2015) gave training on critical thinking and found that participants, after training, showed deeper and wider knowledge of critical thinking. Other related studies have also found that professional training on critical thinking results in better knowledge, skills, and competency of teachers and it also leads to improvement in students' thinking abilities and performance (Kennedy, 2016; Desimone, 2009; Blank et al., 2008).

Variables	Sum of squares	*Df*	Mean square	F	Sig.
Age					
Between Groups	155.641	5	31.128	3.756	.003
Within Groups	2370.441	286	8.288		
Total	2526.082	291			
Teaching experience					
Between Groups	34.754	4	8.688	.995	.410
Within Groups	2488.060	285	8.730		
Total	2522.814	289			
Qualification					
Between Groups	47.669	2	23.835	2.779	.046
Within Groups	2478.413	289	8.576		
Total	2526.082	291			
Status of job					
Between Groups	99.024	3	33.008	3.895	.009
Within Groups	2423.790	286	8.475		
Total	2522.814	289			
Designation					
Between Groups	33.025	4	8.256	.945	.438
Within Groups	2489.789	285	8.736		
Total	2522.814	289			

Table 4: ANOVA for Mean Difference among Groups (Age, Teaching Experience, Qualification, Status of Job, Designation)

Table 4 shows the results of the one-way ANOVA test, applied to measure the mean difference in critical thinking knowledge of teachers with respect to their demographic characteristics including qualification, age, teaching experience, designation, and status of the job. It is found that a significant difference exists in the critical thinking knowledge of the teachers on the basis of age where F= 3.756 which was significant at p< .01 level. This indicated that the participants' critical thinking knowledge significantly differed across different age groups.

The participants also differed in the mean score of critical thinking knowledge on the basis of qualification, where F= 2.779 and p < .05. So, it could be said that participants having different qualifications varied in their knowledge about critical thinking.

Teachers also showed significant differences in their knowledge about critical thinking on the basis of their job status (F= 3.895, p< .01). However, no significant differences were found on the basis of teaching experience (F= .995, p = .410) and designation (F= .945, p = .438).

So, overall, the demographic characteristics that contributed to better knowledge are age, qualification, and status of job. These findings are not surprising, as the development of critical thinking increases with age and experience (Serulnikov, 2000). Further, regular faculty members are quite familiar with critical thinking concepts compared to the vising faculty. The visiting faculty here in Pakistan has comparatively fewer opportunities to be exposed to teaching and learning situations as compared to regular faculty. This might be the possible reason for a visible difference in the critical thinking knowledge of regular and visiting faculty members.

Further, Post-Hoc test was applied to examine the mean difference among the groups.

Variables	Group 1	Group 2	Mean difference	*P*
Age	50-59	Under 25	3.022	.039
	60+	Under 25	6.800	.031
Qualification	Ph.D.	M.A.	2.714	.049
Status of job	Permanent	Visiting	3.081	.001

Table 5: Post Hoc test for Mean Difference among the Groups (demographic variables)

Table 5 shows that teachers aged between 50-59 years, scored higher than teachers aged below 25 years. Similarly, teachers above 60 years had higher knowledge of critical thinking than the age group below 25. Further, it was found that teachers' qualification was also a significant predictor of critical thinking; teachers having PhD degrees had higher critical thinking knowledge than teachers having only a master's degree. Moreover, it was found that teachers having permanent job status had better critical thinking knowledge than visiting teachers.

Discussion and Recommendations

The study explored teacher educators' knowledge of critical thinking at teacher training institutions in the most populated and developed province, Punjab. It is found that 22% of teacher educators have high critical thinking knowledge, and the rest of the 78% have moderate or low knowledge about critical thinking. This shows that despite introducing new teacher education programs that focus on critical thinking, teachers' knowledge of critical thinking has not developed substantially. Therefore, teacher educators are not well capable of teaching critical thinking skills to prospective teachers because they lack in this area. Other studies done in the past years have similar findings regarding the critical thinking skills of teacher educators or school teachers. Khan (2017) reported high implementation gaps between the National Education Policy 2009 and its implementation in teacher education programs, particularly about critical thinking. They further stated that both teacher educators and prospective teachers lack critical thinking skills in teacher education programs.

Saeed, et al., (2012) investigated teachers' ability to use questioning skills to develop critical thinking among nursing students. They observed 92 university teachers' classrooms and assessed the quality of questions asked by teachers to develop critical thinking skills during teaching their critical thinking skills and found that almost 70% of questions asked to the students have their place in lower-level learning of Bloom's taxonomy and almost 6% were ambiguous questions which shows teachers' incapability to teach critical thinking. Moreover, teachers were not providing enough "thinking time" to students to respond to their questions, which is an important element in facilitating the critical thinking process. Din (2020) evaluated university students' critical thinking ability as reflected in their critical reading skills in the same province as the present study and found that although students have positive attitudes towards critical thinking, their critical thinking ability and its reflection in their critical reading skills were low.

Cassum, et al., (2015) explored teachers' perceptions about critical thinking from multiple disciplines (education, nursing, and medicine) in another province of Pakistan. The authors interviewed teacher educators to measure their perceptions of critical thinking and found that teachers in higher education need to practice their perceptions of critical thinking in the

classroom environment. Hence, teachers in higher education in multiple disciplines including teacher education deficits in critical thinking development practices in classrooms.

To improve teachers' critical thinking skills, it is important to identify the factors that act as a barrier to learning critical thinking skills among teachers. A few past studies have investigated the factors that hamper or support critical thinking in a classroom environment. Cassum, et al., (2015) measured the factors that support critical thinking teaching in multiple disciplines including teacher education, and found that teachers' expertise, learning environment, school ethos, nature of students, and school resources as significant contributors to critical thinking teaching.

The present study has found that gender did not turn out to influence critical thinking, the reason might be that teachers from both genders receive similar training. Qualification has turned out to be a significant factor showing that teachers with higher qualifications have better critical thinking skills than less qualified teachers. This might be because higher qualification means more opportunities for learning experiences which could improve their critical thinking. Teaching experience did not improve teachers' critical thinking, which might not have been anticipated, however, we argue that teaching experience can only be beneficial if teachers practice critical thinking in a classroom environment and teaching experience cannot be beneficial if teachers do not practice critical thinking teaching in the classroom.

From the above discussion, it can be concluded that presently, teacher education in Pakistan is incapable of instilling critical thinking among prospective teachers. As the data of the present study were collected from all teacher training institutes of the province of Punjab, the findings of the present study can be applied to the whole province. This shortcoming in teacher educators' knowledge would act as a chain of deprivation. Because teacher educators with low critical thinking could not develop critical thinking in their students (prospective teachers) and eventually when those prospective teachers would teach at school, their students would also not be able to develop critical thinking among school students. Barak and Shakman (2008) argued that teachers' insufficient knowledge of critical thinking is a leading factor in affecting the quality of teaching. In such circumstances, a developing country like Pakistan cannot reach the goal of good quality teaching which they have aimed for in SDGs, VISION 2025, Agenda 2030, and also in Single National Curriculum.

Khan (2017) pointed out the gaps between policy and implementation as a barrier to practicing critical thinking teaching in the classroom. Although, Education Policy 2009 stated instilling critical thinking as one of its goals and USAID has revised the teacher education curriculum, unfortunately, it has not been successful in inscribing critical thinking development in teacher education. Suhail (2021) stated that teacher education should be refurbished in Pakistan to develop critical thinking among teachers and students, and for this purpose, they recommended policymakers collaborate with the International Baccalaureate to introduce the practices of international teachers in Pakistan.

Teacher educators themselves do not have the experience of teaching the curriculum that prospective teachers will be teaching at schools (Khan, 2017). This shows that prospective teachers might gain pedagogical knowledge from teacher education programs, however, they lack content knowledge and pedagogical content knowledge, particularly about critical thinking. To tackle this challenge, countries, like Germany, train prospective teachers in the curriculum they will teach at schools. The authors suggest inculcating this practice in the teacher education system in Pakistan to improve its effectiveness and make it more relevant for prospective teachers. Because textbooks in Pakistan state objectives about Bloom's taxonomy, however, no

clear guidance is given to teachers on how these goals (particularly of higher order skills like critical thinking) will be achieved. Therefore, projects like 'teacher education projects' should train teacher educators in teaching critical thinking in relation to textbooks and then teacher educators will teach these skills to prospective teachers.

Note

This work has been taken from the Ph.D. thesis of the first author available at http://prr.hec.gov.pk/jspui/handle/123456789/17042

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