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## Meta-analysis of Studies on Pre-service Teachers' Critical Thinking Skills in Nigeria Public Universities

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### Abstract

This meta-analysis aimed to examine the studies on pre-service teachers of critical thinking skills. We conducted a meta-analysis to synthesize the extant literature on critical thinking and pre-service teachers. The method used in the study was based on the search of relevant literature through an online database such as IEEE Explore, ProQuest, ScienceDirect, and ResearchGate. The keywords in the search for the relevant literature include critical thinking skills in teacher education and pre-service teachers' critical thinking skills. After systematically searching the relevant literature through electronic databases using various search terms, we screened studies and reviewed them for inclusion. From 22 studies (27 samples, N= 3726), we found that critical thinking was moderately related to pre-service teachers' success, especially with the intervention's studies on critical thinking. The relationship between pre-service teachers' achievement and levels of critical thinking skills was found to be significant. However, pre-service teachers' stories of critical thinking skills tests have been trending in teacher education worldwide. Still, most of the studies on pre-service teachers' critical thinking were conducted in Turkey. The questionnaire used to measure pre-service teachers' necessary thinking skills was found to be California Critical Thinking Disposition Inventory by Facione. Implications for this study include the importance of teaching critical thinking skills in a teacher education program and the inclusion of components of critical thinking in the curriculum across the board.

**Keywords:** Critical Thinking Skills, Teacher Education, Pre-Service Teachers, Meta-Analysis

## Introduction

In recent decades, critical thinking has been bestowed with priority in institutions of learning throughout the world (Benjamin et al., 2013). It has now become that the concept of critical thinking has been incorporated into the curriculum of interdisciplinary study that attracts relevance from a global perspective. Developing and transferring this skill is regarded as one of the reasons for attaining educational goals. Critical thinking constitutes both skill and disposition, applying, analyzing, synthesizing, and evaluating information, and it includes the stage of cognitive development (Fonash, 2015; Peter, 2012). Over the decade, critical thinking has become part of university curricula (Facione et al., 2001).

The call for incorporating critical thinking into the school curriculum was inspired by the 1983 report by the American National Commission on Excellence in Education, "A nation at risk" (p. 11). The report found that 17 years old do not possess the required skills: intellectual and higher-order thinking (Willingham, 2007). As a result, a program was designed to teach students the art of critical thinking. This has made critical thinking famous worldwide, where practitioners and educators adopted the teaching of the concept throughout the world. Conversely, in Nigeria, despite decades of the call for the inclusion of critical thinking in the school curriculum, there is still a lack of these skills among pre-service teachers (Aboluwodi, 2016). Several studies have called for the implementation of this skill into the teacher education program so that teacher trainees may compete with their counterparts around the world (Abuhassna & Yahaya, 2018; Abuhassna et al., 2020b, Abuhassna et al., 2020a, Abuhassna & Awae, 2021; Abuhassna et al., 2022a, Abuhassna et al., 2022b; Aboluwodi, 2016; Foluso, 2014).

There is a shift from content-specific knowledge to the teaching and learning of critical thinking worldwide (Benjamin et al., 2013). Due to the importance attached to the teaching and learning of critical thinking, advanced countries have made it compulsory for all prospective students who are graduating from secondary to tertiary education to have critical thinking skills (Hodgen, 2010). In Germany, for instance, "A" level curricula are designed to accommodate transferable skills like critical thinking skills and creativity (McAleese et al., 2014). One of the objectives of "A" level guidance for teaching and learning by Germany, French, and Spain stipulates that teacher must ensure that they teach critical thinking skills to their students. It is also asserted that they should develop learners' critical thinking skills (OFQUAL, 2016). In Canada, the education system was designed to cover aspects of critical thinking, which is considered one of the basics for enrolling in undergraduate studies. Both local and international students undergo critical thinking tests (O'Sullivan & Guo, 2011). Contemporary, some universities have used neuroimaging and physiological tools to study the education process and the student responses to the educational process (Alsharif et al., 2021b, 2021e, 2021g, 2022, 2022).

Moreover, entry requirements to universities in the United Kingdom have recently been reviewed to incorporate critical thinking abilities for students seeking admission into the university (Farragher, 2015). Also, in New Zealand, for a student to proceed to the next level of education, they should have critical thinking ability (Farragher, 2015). There are concerns about the requirement of critical thinking ability for international students studying in the western world. Specifically, international Asian students lack critical thinking skills, which has raised much concern among Asian students seeking to learn in European countries, especially in the United Kingdom (Lun, 2010; Lin, 2014).

Furthermore, countries in Asia have also attached a great deal of importance to incorporating critical thinking into their curriculum at all levels of education. Mainly, Malaysia

has witnessed massive transformational changes, especially in the area of teaching students to become critical thinkers; this has been integrated into their school curriculum (Othman & Mohamad, 2014) at all levels of education (Zabidi & Rahman, 2012). It has been observed that every course in Malaysia, ranging from lower to higher levels of education, has included critical thinking (Zabidi & Rahman, 2012). This originated from the global realm of education in which teaching critical thinking is included in teaching and learning. For example, these skills were set in the school curriculums and extra-curricular activities.

It has been mentioned that critical thinking skills are essential elements of education. However, there is not enough empirical evidence to help educators and faculty members to decide how to enhance critical thinking among pre-service teachers (Marin & Halpern, 2011). Pre-service teachers need to equip themselves with critical thinking for the future of human capital development (Rodzalan & Saat, 2015). This is because, to secure graduates with the required basic skills, it is necessary to equip our teacher training curriculum with elements of critical thinking (Rodzalan & Saat, 2015). Critical thinking is needed by pre-service teachers for the development of the highest level of cognitive knowledge (Iglesias & Meesangnil, 2011; McBride et al., 2002).

The teaching and learning of critical thinking to pre-service teachers helps them select and use relevant information carefully and generate and evaluate that information. They also seek an effective and efficient means of achieving their instructional goals, and subsequently, they will become problem solvers and decision-makers on the faith of their students (Lin, 2014). Pre-service teachers in Nigeria also require these skills because it is assumed that a lack of critical thinking skills in pre-service teachers may result in an adverse effect that may linger for generations, which may negatively affect all sectors.

## Methods

An extensive literature search revealed thirty-eight (38) studies on pre-service teachers' critical thinking skills. Relevant studies on pre-service teachers' critical thinking were located by examining available literature published between 2014 through Feb 2018. The rationale for choosing this range of studies is to explore current happenings in the teacher education domain concerning critical thinking. The following online database and data sources were visited and obtained relevant studies directly related to the recent research: online research database, ProQuest, Science Direct, Research Gate, Wiley Online Library, Taylor and Francis, and IEEE Explore. The technique employed in the search for the studies was based on two search terms: critical thinking skills of pre-service teachers and critical thinking in the teacher education program. Secondly, the present study restricted its search to reputable journals and research-wise search engines like Google Scholar based on the sub-dimensions earlier stated. The retrieved articles were obtained through a digital solution based on pre-service teachers' critical thinking studies. The first result of the search has yielded relevant studies that include concept papers, library research, research papers, government reports, and conferences.

Thus, the search found a total of thirty-eight (38) papers in which, despite the relevance of the article to the present study, the nature of the study notes that much relevant to the study because they were government reports and conference papers; this has forced the researcher to drop sixteen (16) studies, only twenty-two (23) studies were found to be most relevant for this study. To achieve the objective of the meta-analysis, the researcher decides to analyze the articles based on methods, sample, instrument, statistics used, dimension, and location. The choice of those mentioned above was to help identify the

existing gap that needed to be filled by this study. For example, the present study sought to investigate the level of critical thinking skills among pre-service teachers. As envisaged in the problem statement, there is a lack of critical thinking among pre-service teachers in this part of the world. The researchers want to investigate studies on the critical thinking skills of pre-service teachers.

### **Findings**

According to the meta-analysis, studies on pre-service teacher critical thinking for a five-year range to examine how the concept of critical thinking is trending in teacher education programs across the world. The study found 22 studies, out of which 14 were conducted in Turkey (14 out of 22), while the rest are spread out in other countries worldwide. The majority of the study in Turkey employed the California Critical Thinking Disposition Inventory by Facione. Additionally, the methodology used in the majority of the studies was a cross-sectional survey and experimental design (Akinoglu & Karsantik, 2016; Bakir, 2015; Coskun & Altinkurt, 2016; Demirhan & Koklukaya, 2014; Gashan, 2015; Sada et al., 2016; Sendag et al., 2015; Yorganci, 2016; Arsal, 2015; Temel, 2014) except for one conducted by Demiral (2018), which used a mixed-method designed that comprised of descriptive survey and interview of participants. Demiral's study seems like the present study, though they differ in approach, pedagogy, and methodology used in the quantitative aspect covered by the present study. Furthermore, Demiral suggested that the development of pedagogical content and a learning environment enhance pre-service teachers' critical thinking since their study only examined the levels of critical thinking among learners.

Therefore, the findings of the studies show that research on pre-service teachers' critical thinking skills is trending, and based on location and method, there is a lack of studies that correlate with the present study. Hence, the need to conduct this study is justified, especially considering the poor background of critical thinking and the need presented by the infrastructural deficit, inadequate teaching staff, continuous application of conventional teaching approaches, and the overpopulated classroom that operated education system in Nigeria. The researcher deems it is necessary to utilize the opportunity presented by modern technology in which technology is quickly and strategically employed to foster pre-service teachers' critical thinking skills.

Table 1

Meta-Analysis of Pre-service Teachers Critical Thinking Skills.

S/No./Author year	Research Design	Sample	Questionnaire	Statistics	Research Participants	Location
Coskun (2016)	Survey	570	Florida Critical Thinking Disposition Scale and University Value Scale	Descriptive statistics, ANOVA, t-test, and Multivariate regression analysis	Pre-service teachers	Turkey
Akgun (2016)	Descriptive survey	346	CCTDI	ANOVA and t-test	Pre-service teachers	Turkey
Kincal et al (2016)	One-shot case study pre-experimental design	38 convenient sampling	structured interview	Content analysis	Arabic pre-service teachers	Turkey
McElroy (2017)	Qualitative case study	3	Semi-structured interview	Data analysis through inductively and deductively. Transcription	Pre-service teacher in online learning	Canada
Kalelioglu (2014)	Qualitative and Quantitative Experimental design and	24	CCTDI And Content analysis of critical thinking in online discussion	ANOVA and Content analysis in Online discussion	Pre-service teacher	Turkey
Yorganci (2016)	Survey	202	CCTDI	Descriptive statistics, independent sample t-test, and ANOVA	Preservice teachers	Turkey
Maltepe (2016)	Descriptive survey	215	CCTDI	Descriptive statistics,	Pre-service teachers	Turkey

				t-test, and ANOVA		
Aytunga (2016)	Descriptive survey	347	CTDS by Sosu, 2013	Spearman's correlation analysis and regression analysis	Pre-service teachers	Turkey
Kloppers & Grosser (2014)	Mixed method Quantitative Descriptive survey and Qualitative interactive phenomenological study	29 pre-service teachers Purposive	Self-developed questionnaire and structured interview	Frequencies and deductive and inductive content analysis	Mathematic Pre-service teachers	South Africa
Boonphadung & Unnanantn (2015)	Quasi-experimental design	55 purposely selected	Lesson plan, learning activities on Miller's Model and critical thinking assessment criteria, and Miller's Model-based learning activities.	Mean, Standard deviation, and t-test	Pre-service teachers	Thailand
Clark & Paulsen (2016)	Mixed method Quantitative through a qualitative study	21	The Florida Taxonomy of Cognitive Behavior with Bloom's six taxonomy as teaching objectives	Descriptive statistics and Observation	Pre-service teachers in Agriculture education	USA
Bakir (2015)	Quantitative survey	1106	CCTDI	Descriptive Statistics/ ANOVA	Pre-service teachers	Turkey

Gashan (2015)	Quantitative survey	29	A critical thinking questionnaire was adopted from Elder et al. (2007) and Al-degether (2009).	Descriptive statistics of mean and SD	Pre-service teachers	Saudia Arabia
Orhan (2016)	Quantitative Survey	134	Self-developed questionnaire	Percentage and Frequency	Pre-service Teachers	Turkey
Temel (2014)	Experimental design Pretest-posttest control groups.t	49	CCTDI and problem-solving inventory by Heppner and Petersen (1982)	T-test, ANOVA	Pre-service Teachers	Turkey
Arsal (2015)	Experimental design Control and Experimental groups.	70	CCTDI	ANCOVA	Pre-service teachers	Turkey
Sada et al (2016)	Library base research	Library base research	Library base research	Library base research	TVET college student	Nigeria
Kingsley et al 2015	Library base research	Library base research	Library base research	Library base research	Pre-service teacher	Nigeria
Philip & Lawrence, (2014)	Library base research	Library base research	Library base research	Library base research	Primary and secondary school student	Nigeria
Demiral (2018)	Sequential explanatory,	200	WGCTA	Descriptive and Interview	Pre-service teachers	Turkey
Geçit & Akarsu (2017)	Survey	246	CCTDI	Survey	Pre-service teachers	Turkey



Tican (2017)	Experimental	42	CCTS	Experimental	Pre-service teachers	Turkey
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### Discussions

Based on the findings in Table 1, the five years range meta-analysis on several research techniques was reported. For example, cross-sectional survey research (Coskun & Altinkurt, 2016; Akgun & Duruk, 2016; Yorganci 2016 Maltepe, 2016; Aytunga 2016; Bakir 2015; & Geçit & Akarsu, 2017), structured interview (McElroy, 2017), experimental studies (Temel, 2014; Arsal, 2015; Boonphadung & Unnanantn, 2015; Clark & Paulsen, 2016; Tican 2017), mixed-method research (Kincal et al., 2016; Kalelioglu & Gulbahar, 2014; Kloppers & Grosser, 2014; Demiral, 2018), and concept papers (Kingsley et al., 2015; Sada et al., 2016; Philip & Lawrence, 2014). These studies were conducted in different countries through different approaches and used different questionnaires. The extracted studies from the cross-sectional survey quantitative research design have been majorly conducted in Turkey, whereby only one of the nine (9) studies was from Saudi Arabia. Also, the questionnaire used in those studies is predominantly California Critical Thinking Disposition Inventory (CCTDI), while the remaining two are self-developed questionnaires. These were employed to determine pre-service teachers' critical thinking skills in various degrees. Similarly, the only qualitative research conducted to determine pre-service teachers' critical thinking was also from Turkey.

Furthermore, three of the five studies on mixed-method research design were also conducted in Turkey, and two were conducted in the United States of America and Turkey, respectively. These studies used various degrees of mixed-method design that emphasized the exact proportions of quantitative and qualitative methods. In contrast, only one recent study has used a sequential explanatory mixed-method design with a test instrument similar to the one used in this study. The instrument used in these studies were California Critical Thinking Disposition Inventory (CCTDI) by Kalelioglu & Gulbahar (2014), the Self-developed Questionnaire and interview by Kloppers & Grosser (2014), Watson Glaser Critical Thinking Appraisal by Demiral (2018), and Florida Critical Thinking Assessment and Bloom's Taxonomy by Clark & Paulsen, (2016). It is worthy to note that out of twenty studies from the meta-analysis for pre-service teachers' critical thinking, only three were conducted in Nigeria. These three studies are all conceptual papers that try to provide evidence that minimal consideration was given to the teacher's education in Nigeria. The emphasis was placed on the low level of critical thinking among pre-service teachers in Nigeria. Therefore, there is a need to complement the researcher's effort of conceptualizing the idea of enhancing the critical thinking of pre-service teachers in the area of teaching and learning in Nigeria's education system.

Based on the above analysis, it has been established that research in promoting pre-service teachers' critical thinking around the globe is currently trending in terms of location and approaches employed by the recent studies from the meta-analysis. Based on the evidence gathered from existing empirical studies, most of the research studies in Nigeria are library-based research, which may only explore the meaning. Still, they could not provide proper solutions through practical routines. Another factor that may lead to a lack of empirical data in studies conducted on critical thinking is the cost implication of existing questionnaires for measuring critical thinking.

Hence, to fill the existing gap in the present study, the meta-analysis findings have supported the earlier claim made by the researcher on the need for conducting this study. The results reveal a lack in applying mixed-method research rooted in sequential explanation guided by the quasi-experimental research as the basis for the survey and structured interview to explain the phenomenon to enhance pre-service teacher critical thinking. Moreover, there is a lack of empirical studies covering both quantitative and qualitative in Nigeria, especially in North-Eastern Nigeria. Thus, this study sought to address the lack of critical thinking by applying the station rotation model in a blended social, collaborative learning environment to enhance pre-service teachers' necessary thinking skills in a Nigerian University.

### Conclusion

This study provided a snapshot of studies on critical thinking in teacher education programs worldwide. It also demonstrates the importance of teaching critical thinking to pre-service teachers in Nigerian public universities. The meta-analysis findings indicate that the concept of necessary thinking skills in a teacher education program is trending now. Therefore, there is a need to review the existing curriculum for a teacher education program to include critical thinking skills to help achieve the national policy on education objectives. Based on the results, there is a lack of studies on critical thinking in Nigeria's teacher education program.

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