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The Role of Critical Thinking in Mediating the Association between Instructional Practices and Academic Achievement

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KEY WORDS

Instructional Practices, Academic Achievement, Critical Thinking Skills, Critical Thinking Dispositions

ABSTRACT

Critical thinking is recognized as a blend of basic life skills and dispositions which are closely related to other academic and professional attributes like collaboration, metacognition, motivation, creativity, and academic achievement. Previous research revealed that particular instructional practices have been more effective in development of critical thinking skills among students. A survey of 173 undergraduate university students was conducted to find out the relationships between interactive instructional practices employed by teachers to promote critical thinking among students and improve their academic achievement. This study also explored mediation effect of critical thinking skills and critical thinking dispositions in the relationship between instructional practices of university faculty and academic achievement of higher education students. Results showed a positive and significant correlation among the study variables. Findings also discovered that critical thinking skills were partially mediating the relationship between interactive instructional practice and academic achievement while mediating effect of critical thinking dispositions was found non-significant.

1. Introduction

It is now an agreed upon stance of educators that critical thinking is one of the most important ingredient of personal success as well as national development (Paul, 2004). Critical thinking has been recognized as prerequisite for tertiary education, citizenship, and the workplace productivity (Trilling & Fadel, 2009). Critical thinking generally refers to cautious

examination of available information in drawing inferences and making fair judgments about our beliefs and actions (Renaud & Murray, 2008).

The critical thinking movement has its historical origin in the dialogues of Socrates. Socratic questioning involves asking a series of probing questions and pursuing evidence to examine the assumptions taken for granted under the pressure of authorities and established social norms. Socrates encouraged the use of reason and justification to examine the truth and validity of propositions, presuppositions, theories and their implications. Socrates' method of asking reflective and systematic questions established standards for a valid and well-reasoned thought that have a profound effect on the work of the almost all the successor philosophers (Paul et al., 1997).

All the philosophers from ancient Greeks to modern era have focused on people's doing in their best capacity, specifying the qualities and characteristics of an ideal person (Sternberg, 1986; Thayer-Bacon, 2000). The writings of these philosophers provided the basis for intellectual approach of 'good thinking', which focuses on the talents and attributes of an ideal thinker rather than the actions or skills required to make choices in the real-life situations (Thayer-Bacon, 2000). In philosophical tradition, critical thinking represents intellectual attributes that are required for adequate and accurate application of formal logic (Sternberg, 1986; Bailin, 2002).

Cognitive psychologists on the other hand, have been interested in exploring the way people think, and describing how their thinking develops over time (Sternberg, 1986). Theatrical contributions of Piaget, Bruner, Vygotsky, Sternberg etc. have been exemplary in providing valuable insights about the nature of intellectual potentials. They defined critical thinking as cognitive information processing skills and procedures of an individual through which s/he make sense of the external world (Lewis & Smith, 1993). Thinking as a cognitive procedure is not observable; however, cognitive procedures and strategies can be studied indirectly when a person execute them in actual problem solving situations (Willingham, 2007). Through critical thinking an individual identifies a problem and logically processes the existing and/or new information to infer about the plausible solutions of the problem (Nickerson, 1985).

In educational perspective, higher-order thinking is a broader term that contains the specific ideas of critical thinking and creative thinking along with problem solving (Lewis & Smith, 1993). In this view, it is the ability to think rationally and reflectively about a problem to understand the logical links between the ideas for making a judgement within a given framework (Paul & Elder, 2008). Educationists have defined critical thinking as higher-order thinking skills which are important for learning, problem solving and decision making (Kennedy et al., 1991).

Critical thinking movement got its highest momentum in the beginning of twentieth-century when theorists like John Dewey, Jean Piaget, Donald Schön, Edward Glaser, and Lev Vygotsky significantly contributed to

the development of theory and practice in the field of critical thinking in education, especially by Dewey. He proposed student-centered progressive approach towards education which emphasized the development of reflective thinking among students as core objective of education. He advocated the education that is a reflection of genuine experience of life. According to Dewey an individual learns to solve the problems of the life through a reflective process of reconstruction and reorganization of experience that enhances the capacity to deal with the subsequent experiences (Kennedy et al., 1991).

Critical thinking has been found significantly correlated with other educational outcomes like academic engagement, academic motivation, metacognition, creative thinking and academic success (Daud & Husin, 2004). Educationists have focused on reforms that require educational institutions to foster critical thinking among students by adopting critical thinking based pedagogy. Consequently, the researchers have explored the effectiveness of different interactive instructional practices that promote critical thinking among students and enhance the generic competence of the students to ensure their academic, personal, and professional success. Assessment practices mostly reinforce lower-order thinking skills of recall and recognition of information. The major challenge of critical thinking movement in education is to shift the paradigm of teacher-centered to student-centered instruction (Daud & Husin, 2004).

There are certain instructional practices which have been found more effective to enhance the critical thinking level of the students. According to Smith (1977) instructors should model and highlight critical thinking skills in academic interactions by using ideas of the students to engage them in discussions and by appraising different perspectives to improve the intellectual level of the students. In class room discussions when students analyze their own ideas and the ideas of the others, they learn to challenge the assumptions behind their arguments and develop their ideas by practicing critical thought.

Written assignments are the compulsory part of the course work at higher education. Writing assignments if designed cautiously require from students to analyze diverse perspectives on a topic or problem to find out the similarities and differences of different perspectives and to infer about the current situation of a problem. Written assignments offer the best opportunity for the students to practice critical thinking skills (Tsui, 2002).

Although recent research has revealed the effectiveness of specific instructional practices for enhancing the academic success of students, there is still a dearth of studies to explore the interplay of instructional practices, critical thinking, and academic achievement at higher education level. This study was intended to find out the relationship of critical thinking skills and dispositions, critical thinking centered instructional practices, and academic performance at university level students. This study also explored the

mediating effect of critical thinking dispositions and critical thinking skills in the relationship between instructional practices and academic achievement.

Objectives of the Study

1. To measure the relationship among critical thinking skills, dispositions and academic achievement of university students at undergraduate level.
2. To find out the mediation effect of critical thinking skills and dispositions on the relationship between instructional practices used by the faculty for developing critical thinking among students and their academic achievement.

Research Model

The following figure presents a simplified form of conceptual framework showing the nature of relationships studied in this study.

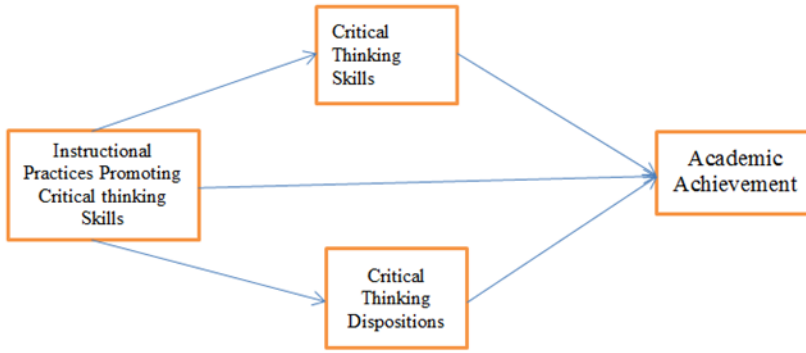

Figure 1: Conceptual framework of the study

The above figure shows that the main independent variables (predictors) of this study is instructional practices which university teachers follow in promoting critical thinking while students' academic achievement is the dependent variable (criterions). Furthermore, critical thinking skills and dispositions were also studied as the mediator variables.

Research Design

A survey-based descriptive and explanatory research design was used. The research methodology is purely quantitative involving the hypotheses testing of the theory.

Population

All the undergraduate students studying in University of Sargodha from sciences and social sciences faculties were the population.

Sampling Design

Stratified sampling technique has been used for this study the sample was selected in two steps. In the first step the university is divided into two strata of sciences and social sciences. In the second step, three academic departments as primary sampling units from each stratum were selected randomly. Then final year students of BS program (seventh or eighth semester-intact groups) were selected purposively from the selected academic departments. The target was to select a sample of 200 final year students of BS program (100 from sciences and 100 from social science).

Research Instruments

Instructional practices promoting critical thinking

A self-report scale was developed to find out students' ratings about representation of their teachers' instructional practices that particularly promote critical thinking among students. The researcher relied upon the extant literature for the development of this scale with 35 items rated on five-point Likert scale. The response pattern shows the frequency of use of each instructional practice in routine teaching from never to almost daily.

Critical Thinking Skills Test (CTST)

The researchers had developed CTST after reviewing the available literature. Theoretical construct of Watson-Glaser Critical Thinking Appraisal comprising five major areas of Critical Thinking Skills (recognition of assumptions, inference, deduction, evaluation of argument, interpretation) was adapted for developing a culturally fair CTST (Watson & Glaser, 1980). The researcher thoroughly studied the manual for Watson-Glaser Critical Thinking Appraisal and compared its basic constructs with other published measures of critical thinking to develop CTST that is adaptable for Pakistani undergraduate level students of sciences and social sciences disciplines. The CTST is a 43-item multiple-choice format measure.

Critical Thinking Disposition Assessment (EMI)

EMI adapted for this study was developed by Irani et al. (2007) was. This scale had three sub-scales (i. e. engagement, cognitive maturity, and innovativeness) and comprised of 26 five-point Likert type items.

Pilot Study of the Instruments

The questionnaire was pilot testing and validated with the data of 30 students (15 from sciences and 15 from social science). The purpose of the pilot testing was to identify and rectify any difficulty or mistake in the language or legibility, or format of the questionnaires.

Data collection

Out of 200 distributed questionnaires, 173 were received back with a response rate of 86.5%, and were used for data analysis. The researcher used SPSS version 22.0 to analyze the data.

Results

Relationship among Instructional Practice, Critical Thinking Skills, Critical Dispositions and Academic Achievements

Table 1
Pearson Correlation Coefficient among Variables of Study (n = 173)

	Instructional Practice	CT Skills	Critical Dispositions
Critical Thinking Skills	.178*	---	
Critical Dispositions	.240**	.245**	---
Academic Achievements	.352**	.389**	.245**

* 0.05 level (2-tailed), ** 0.01 level (2-tailed)

Table 1 shows weak positive but significant correlation between instructional practice and critical thinking skills ($r = .178$, $p < .05$), instructional practice and critical dispositions ($r = .240$, $p < .001$), instructional practice and academic achievements ($r = .352$, $p < .001$). It further revealed that critical thinking skills showed positive correlation with critical dispositions ($r = .245$, $p < .001$), and academic achievements ($r = .384$, $p < .001$). The results also revealed critical dispositions showed positive correlation with academic achievements ($r = .245$, $p < .001$).

Mediation of Critical Thinking Skills and Critical Dispositions in the relationship between Instructional Practice and Academic Achievements

The mediation of critical thinking skills and critical dispositions in the relationship between instructional practice and academic achievements were analyzed with the PROCESS macro Version 3 (Hayes, 2017) in SPSS.

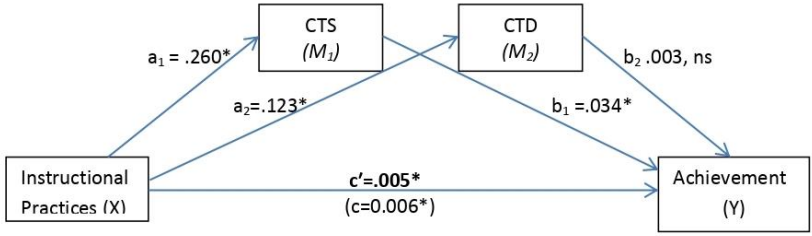

Figure 2: Direct and Indirect Paths of the variables.

Table 4
Mediation of Critical Thinking in the association between Instructional Practice and Academic Achievements

Paths	Effect	95%CI (LL, UL)	SE	t	P	R^2
Direct Effects (c′)						
IPs → Ach	.005	(.002, .006)	.001	3.91	.000	.124
IPs → CTS	.260	(.004, .0478)	.011	2.36	.019	.032
IPs → CTD	.123	(.0478, .198)	.038	3.23	.002	.058
CTS → Ach	.034	(.019, .048)	.007	4.69	.000	.151
CTD → Ach	.003	(-.001, .007)	.002	1.50	.147	.060
Indirect Effects						
IPs → CTS → Ach	.056	(.027. .006)	.027		Sig.	
IPs → CTD → Ach	.025	(-.007, .064)	.018		ns	
Total Effects (c)						
IPs → Ach + IPs→ CTD → Ach+ IPs → CTS→ Ach	.006	(.003, .008)	.001	4.92	.000	.244

CTS = Critical Thinking skills; CTD = Critical Dispositions; Ach = Academic Achievements; IPs = Instructional practices

Table 4 shows the results for H_2 which stated that there is statistically significant mediation effect of critical thinking skills and critical dispositions in the relationship between instructional practice and academic achievements. In this model instructional practices accounted for 12.4% of the variance in achievement (R^2=0.124). Results indicated that instructional practice was a significant predictor of academic achievements β= .005, 95% CI = (.0021, .0064), p = .000. The bootstrapped standardized indirect effect of

instructional practice on academic achievements through critical thinking skills (β = .056, 95% CI = (.027, .006) was significant, because the bootstrap CI was above zero while controlling for critical thinking skills. It explained that due to indirect effect (mediation) of critical thinking skills when instructional practice goes up by 1 standard deviation, academic achievements goes up by .06 standard deviations. Overall significant results of direct effect (β = .005, p < .001) and indirect effect (β = .056 p < .001) indicated partial mediation of critical thinking skills in the relationship between instructional practice and academic achievements at p < .05. The table also revealed insignificant indirect effect of instructional practice on academic achievements through critical dispositions (β = .025, 95% CI = (-.0072, .0638) because the bootstrap CI was not different than zero while controlling for critical thinking dispositions. The total amount of variance accounted for by the overall model was 24.4%, which included instructional practices and two proposed mediators (R^2=0.244). The total effect of instructional practices through direct and indirect paths was significant (c=0.006, CI =.0033- .0077, t=4.92, P<0.001).

Discussion and Implications

The results revealed that there were significantly and positive relationships among interactive instructional practices, critical thinking dispositions and skills, and academic achievement of university students at undergraduate level. These results coincide with some other studies conducted on the same topic. Some studies revolved around the interaction of critical thinking skills and critical thinking dispositions (Colucciello, 1997; Rimiene, 2002; Ricketts, & Rudd, 2005; Ghazivakili et al., 2014); or study the relationship of academic achievement with critical thinking dispositions (Kalelioglu & Gülbahar, 2014; Ashoori, 2014; Tafazzoli et al., 2015); and critical thinking skills(Gómez, 2010; Taghva et al., 2014; Fong et al., 2017; Fuad, et al., 2017; Abbasi, & Izadpanah, 2018). Other studies have particularly explored the effect of multiple interactive instructional activities on academic achievement and critical thinking (Browne & Freeman, 2000; Miller, 2003; Snyder & Snyder, 2008; Yang, & Chung, 2009; Richardson, & Ice, 2010; Marin, & Halpern, 2011; Pekdoğan, & Korkmaz, 2016; Zhao et al., 2016).

All these studies have provided empirical evidence that acquired level of critical thinking of students and interactive instructional practices promoting critical thinking positively influence the academic achievement. However, studies exploring the mediating role of the acquired level of critical thinking of the students in the teaching learning context are rare. This study verified that if the acquired level of critical thinking skills of students is high they will get more benefit from interactive and thinking based instructional practices of the teachers and their academic achievement will be higher than those with lower level of acquired critical thinking skills.

Conclusion

The results lead us towards the conclusion that critical thinking centered instructional practices had a significant positive relationship with students' academic achievement their critical thinking dispositions and skills. It was also concluded that critical thinking skills were partially mediating the association between instructional practices and academic achievement of students, but this was not the case for mediation of critical thinking dispositions.

The importance of critical thinking as an educational outcome has been highlighted by recent researches (Forst, 1997; Williams & Cole, 2018). Results and conclusion of this study, like many other studies, urge faculty members, curriculum planners and administrators to integrate and focus on critical thinking based instructional techniques and practices in curriculum development and curriculum implementation.

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