



## Higher Education in Different Disciplines and its Impacts on Critical Thinking Skills

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**Abstract-** Developing critical thinking (CT) has been widely seen as a fundamental and essential skill to meet 21<sup>st</sup> century educational goals. The changing conditions of the world do not permit to provide students with specific success formulas. Thus, it is necessary to instill into students the ability to think with open minds, to approach to their life challenges and joys by introducing CT skills in higher education. In this era of science and technology, the amount of information is massive. Students need guidance to analyze the information and effectively apply these CT skills to academic studies. For this research study 732 students from different disciplines wereselected in the sample. The researcher's self-developed CT skills test was used to assess the level of CT skills. Students of different disciplines were compared on CT skills toanalyze the arguments, make assumptions, deduct conclusions, draw inferences and interpret information. The research will have implications for thepolicy makers, educators and curriculum developers to incorporate CT skills in higher education in Pakistan.

**Keywords:** Higher Education, Multi-discipline, Critical thinking Skills

### I. INTRODUCTION

Critical thinking (CT), (self-regularity judgment involving critique) has been widely seen as fundamental and essential skill to meet 21<sup>st</sup> century educational goals. CT has been recognized as an ability to test the assumptions, question to examine, reason, interpret and reflect for making informed decisions (Ennis, 1962; Halpern, 2014; Paul & Elder, 2013).The changing conditions of the world do not permit to provide students with specific success formulas. Thus, it is necessary to instill into students the ability to think with open minds, approach to their life's challenges and joys by introducing CT skills in education. In this era of science and technology, the amount of information is massive. Students need guidance to analyze the information and apply CT skills effectively to academic studies. Halpern (2007) states that world is getting more complex and technical day by day and living in a democratic society, students are required to think critically in order to make decisions about personal and social life. It is due to this fact that countries all over the world are focusing to introduce better educational system that can enable the students to address both social and economic expectations of the world (OECD, 2014). Individuals of any society should have responsive thinking skills to deal with the rapid changes in the world. Rote learning and memorization are no longer suitable for those who are striving for CT new and meaningful knowledge (Marin & Halpern, 2011). In the field of education, CT skills have been part of much scholarly work, frameworks, and reforms (Ennis, 1962; Scriven, & Paul 1996; Halpern, 2013). The concept of CT skills has been addressed by many others who work on dispositional and characteristics (Ennis 1998; Facione, 2000; Salvin, et al., 2005; Cottrell, 2017; Paul & Elder, 2019).

Developing the CT skills of students is an important aspect of education, which is often ignored because schools have to follow prescribed curriculum and syllabi (Coil et al, 2010). Critical thinking elicits creativity, solving problem and decision-making (Pithers&Soden, 2000). Supporters of CT take it as a core element of education and believe that CT must be part of educational(Dewey, 1933).In educational settings, teachers are considered change agents, holding CT skills to guide the students to become better critical thinkers(Halpern, 2014). Inclusion of CT skills in education and teaching strategies for developing these skills are considered

important (Lipman, 1987; Ennis 1998; Facione, 2000; Halpern, 2013). The history of academic learning given importance to CT skills in scholarly work, provided students with the opportunities to ask questions, and discuss situations with each other (Edler & Paul, 2010).

Some researchers and educators that develop CT skills can be developed by focusing on developing individual skills (Crenshaw, Hale, & Harper, 2011). Dewey (1933) defined about thinking as review of beliefs, ideas and reasoning. CT is different in its focus, activities and goals from thinking. Byer (1987) has stated CT dispositions as criteria, argument, and reasoning qualities of critical thinkers. He believes that a critical thinker must have open mindedness, respect for clarity, evidence and precision in looking at different aspects and have ability to change positions on the basis of reasons. Though, most teachers consider developing CT as a primary objective of their instruction but they do not realize that students must pass through few levels of development in CT. Six stages of critical thinker proposed by researchers include unreflective thinkers, challenged thinkers, beginning thinkers, practicing thinkers, advanced thinkers and masters' thinkers.

The unreflective thinkers are those who do not reflect on their thinking and it has effects on their life decisions based on misconceptions and prejudiced opinions. Unreflective thinkers lack basic skills and ignore the standards like logic, accuracy and precision. The challenged thinkers are the persons who have awareness and importance of thinking. They understand that higher order thinking requires reflection and acknowledge their flaws in thinking but unable to identify all the flaws while beginning thinkers know their limited capacity to address the problems by placing more value on reason. The practicing thinkers not only practice better thinking but also appreciate their own deficiencies. While they might be able to recognize their thinking weaknesses and strengths but they still do not have an organized way of gaining insights. The advanced thinkers are the one who analyze their thinking with reasons and insights. Masters thinkers have supreme level of thinking, who aim at improving their thought process through skills and experiences. This level of thinking requires practical knowledge and insights to re-examine their assumptions for logic, reason and argumentations.

There has been much debate whether one approach to teaching CT skills is greater than another. The two approaches, general approach and specific approach, are considerable for effective teaching of CT skills. The general approach is a fixed skill that can be cultivated independently in a subject of study or any domain and can be transferred to other domains. The interchangeable CT instructions are explicit in general approach whereas the domain-specific approach to instruction in CT is based on the subject being taught. Ennis (1989) has suggested a model pointing to four approaches of teaching CT which include general, infusion, immersion based and mixed approach. This research study will be a contribution to higher education in different disciplines in terms of its suggestions about the choice of an effective approach to CT skills.

### **Research Objectives**

The objectives of the study were to

- a. Find the difference in multi-disciplines on various components of CT skills.
- a. Find the difference in CT skills and its components with respect to various semesters

### **Research Questions**

The study addressed the following research questions:

- b. What is the difference in multi-disciplines with reference to CT skills and their components?
- c. What is the difference in CT skills and their components with respect to various semesters?

## **II. METHODOLOGY**

The following methodology was followed to conduct this study.

### **Design**

The study was conducted to find out differences in multiple disciplines of higher education regarding CT skills. To achieve the objectives of the study, quantitative approach with cross-sectional survey design was used.

### **Population**

Higher education is focused in universities, in Pakistan and there are 163 universities, 69 private and 94 in public sector providing education in multiple disciplines. 30 students enrolled in 13 disciplines in University of the Punjab, Pakistan were the target population for this study.

### **Sampling and Sample size**

Multistage sampling technique was used for selecting sample for this study. At the first stage, four disciplines or faculties were selected randomly from 13 faculties. At the second-stage, four departments were selected

from the 30 departments of the four selected disciplines.

**Table 1**  
**Sample of the Study**

Faculties/Disciplines	N (%)
Faculty of Education	320(43.7%)
faculty of sciences	254(34.7%)
Faculty of Commerce	90(12.3%)
Faculty of Life Sciences	68(9.3%)

Seven hundred thirty two participants were selected to assess the CT Skills from four faculties of the University of the Punjab, Lahore Pakistan. Faculty of education is largest in size and number of programs as compare to other faculties.

#### Measures and Data collection

To access the CT skills in different disciplines, the researcher developed test under guidelines of Watson-Glaser Thinking Appraisal were used. This test consisted of five skills i.e. analyzing arguments, assumptions, deduction, inferences and interpreting information. Each skill consisted of 8 items and total number of items in test was 40. Reliability coefficient estimated by Cronbach' alpha was 0.686. Data was collected online using Google forms. The test items were bilingual. The average time to solve this test was 40 minutes.

#### Data analysis

The raw data was entered into Microsoft Excel spreadsheet, coded and transferred to SPSS (version 25) for analysis. The data was analyzed through descriptive and inferential statistics. To ascertain the level of critical thinking skills, mean and SD were calculated. One-way ANOVA was used to ascertain the difference on CT skills in terms of disciplines and semesters.

#### Ethical Considerations

Ethical clearance to conduct the study was obtained from heads of the relevant departments of University of the Punjab, Lahore, Pakistan. Informed consent of the participants was obtained and commitment to confidentiality was ensured.

### III. RESULTS

Data of 732 participants were analyzed using SPSS ver. 25, results are shown in the tabular and graphical forms.

**Table 2**  
**Means and SDs of CT Skills and its Components of Students Studying in Different Faculties**

Critical Thinking Skills	Faculty of Education	Faculty of Sciences	Faculty of Commerce	Faculty Life Sciences	Total Scores	One-way ANOVA	
	<i>M(SD)</i>	<i>M(SD)</i>	<i>M(SD)</i>	<i>M(SD)</i>	<i>M(SD)</i>	<i>F</i>	<i>p</i>
Analyzing Arguments	4.05(1.53)	4.21(1.56)	4.11(1.45)	3.85(1.37)	4.09(1.52)	1.20	.310
Assumptions	4.19(2.01)	4.34(2.12)	4.00(1.87)	4.46(1.85)	4.24(2.02)	0.97	.405
Deduction	4.26(1.89)	4.54(2.00)	4.24(1.99)	4.46(1.75)	4.37(1.93)	1.23	.299
Inferences	1.93(1.45)	1.94(1.69)	1.82(1.43)	1.97(1.53)	1.92(1.54)	0.17	.918
Interpreting Information	4.05(2.0)	4.40(2.01)	4.19(1.85)	4.07(1.71)	4.19(1.97)	1.59	.190
Total	18.81(7.60)	19.82(8.21)	18.66(7.33)	19.07(6.5)	19.17(7.69)	0.98	.402

Table 2 shows that the CT skills of the graduate students are not statistically significant ( $p > .05$ ). The mean score on CT skills (deduction) of students studying in Faculty of Education ( $M=4.26$ ,  $SD=1.89$ ) is the highest as compared to other CT skills. The mean score on CT skills (Analyzing Arguments and Interpreting Information) of students studying in Faculty of Education ( $M=4.05$ ) is the lowest as compared to other CT skills. The mean score on CT skills (deduction) of students studying in Faculty of Sciences ( $M=4.54$ ,  $SD=2.0$ ) is the highest as compared to other CT skills. The mean score on CT skills (Inferences) of students studying in Faculty of Sciences ( $M=1.94$ ,  $SD=1.69$ ) is the lowest as compared to other CT skills. The mean score on CT

skills (deduction) of students studying in Faculty of Commerce (M=4.24, SD=1.99) is the highest as compare to other CT skills. The mean score on CT skills (Inferences) of students studying in Faculty of Commerce (M=1.82, SD=1.43) is the lowest as compared to other CT skills. The mean score on the CT skills (Assumption, deduction) of students studying in Faculty of Life Sciences (M=4.46) is highest as compare to other CT skills. The mean score on CT skills (Inferences) of students studying in Faculty of Life Sciences (M=1.97, SD=1.53) is the lowest as compared to other CT skills. The overall mean score on assumptions skill (M=4.24) is the highest as compared to other CT skills. The overall mean score on inferences skill (M=1.92) is the lowest as compared to other CT skills.

**Table 3**  
*Means and SDs of CT Skills and its Components of Students Studying in Different Semester*

Critical Thinking Skills	2 <sup>nd</sup>	4 <sup>th</sup>	6 <sup>th</sup>	8 <sup>th</sup>	One-way ANOVA	
	<i>M(SD)</i>	<i>M(SD)</i>	<i>M(SD)</i>	<i>M(SD)</i>	<i>F</i>	<i>p</i>
Analyzing Arguments	4.34(1.49)	4.28(1.59)	4.09(1.61)	3.66(1.26)	7.67	<.001
Assumptions	4.46(2.07)	4.29(2.18)	4.37(2.10)	3.87(1.63)	2.97	.031
Deduction	4.59(1.95)	4.46(2.10)	4.54(1.96)	3.92(1.59)	4.61	.003
Inferences	1.92(1.68)	1.94(1.56)	2.08(1.63)	1.77(1.26)	1.18	.317
Interpreting Information	4.41(2.09)	4.31(2.05)	4.31(1.92)	3.72(1.72)	4.76	.003
Total	20.08(8.09)	19.66(8.37)	19.74(8.16)	17.22(5.43)	5.37	.001

Table 3 shows that mean score of second semester students on analyzing arguments is the highest (M=4.34, SD=1.49) as compared to students of other semesters. The mean score of 8<sup>th</sup> semester students is the lowest (M=3.66, SD=1.26) as compared to students of other semesters. Among students in different semesters on assumptions, the mean score of 2<sup>nd</sup> semester students is the highest (M=4.60, SD=2.07) as compared to students of other semesters. The mean score of 8<sup>th</sup> semester students is the lowest (M=3.87, SD=1.63) as compared to students of other semesters. Among students in different semesters on deduction, the mean score of 2<sup>nd</sup> semester students is the highest (M=4.59, SD=1.95) as compared to students of other semesters. The mean score of 8<sup>th</sup> semester students is lowest (M=3.92, SD=1.59) as compare to students of other semesters. Among students in different semesters on inferences, the mean score of 4<sup>th</sup> semester students is the highest (M=1.94, SD=1.56) as compared to students of other semesters. The mean score of 8<sup>th</sup> semester students is lowest (M=1.77, SD=1.26) as compare to students of other semesters. Among students in different semesters on interpreting, the mean score of 2<sup>nd</sup> semester students is highest (M=4.41, SD=2.09) as compared to students of other semesters. The mean score of 8<sup>th</sup> semester students is lowest (M=3.72, SD=1.72) as compared to students of other semesters. The overall mean score of 2<sup>nd</sup> semester students is the highest (M=20.08, SD=8.09) as compared to students of other semesters. The mean score of 8<sup>th</sup> semester students is the lowest (M=17.22, SD=5.43) as compared to students of other semesters.

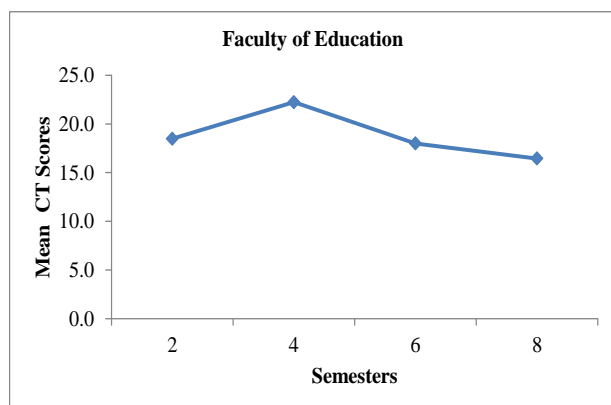


Figure 1. Semester wise CT Skills of Faculty of Education

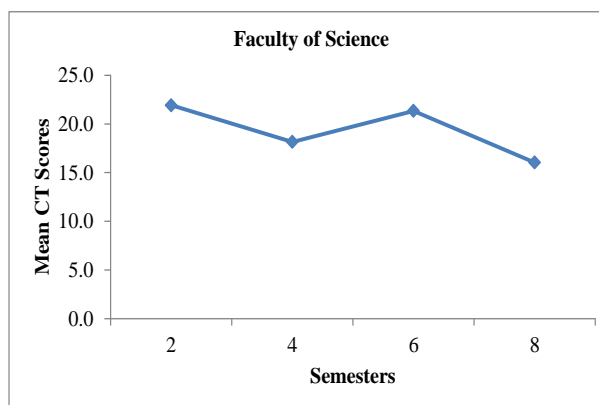


Figure 2. Semester wise CT Skills of Faculty of Science

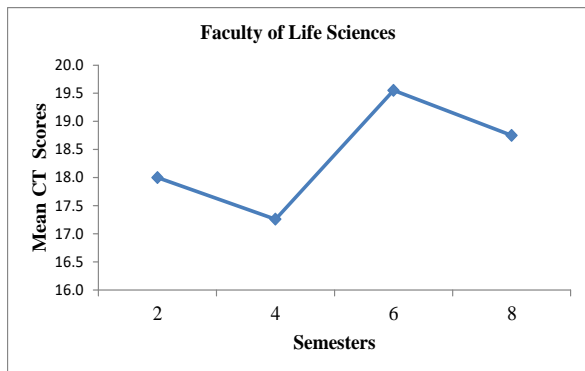


Figure 3. Semester wise CT Skills of Faculty of Life Science

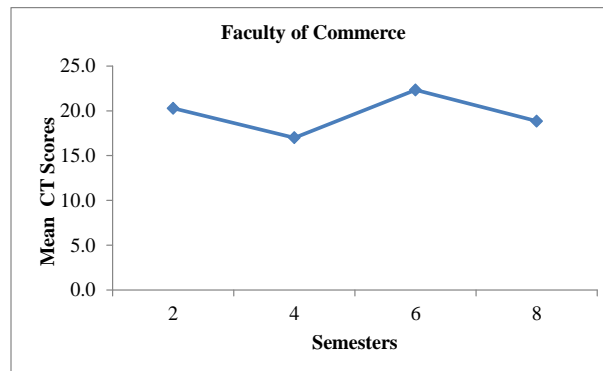


Figure 4. Semester wise CT Skills of Faculty of Commerce

Data was further analyzed to see difference in CT skills among students of different semesters in each faculty. Figure 1 shows that there was low variation in CT skills among students of different semesters in Faculty of Education but decreasing trend has been noted in senior semesters. Figure 2 shows that there was low variation in CT skills among students of different semesters in Faculty of Science but decreasing trend has been seen in senior semesters. Figure 3 shows that there was high variation in CT skills among students of different semesters in Faculty of Life Science but increasing trend has been seen in senior semesters. Figure 4 shows that there was low variation in CT skills among students of different semesters in Faculty of Commerce but increasing trend has been seen in senior semesters.

#### IV. DISCUSSION

The focus of the study was to know whether there is difference in CT Skills regarding different disciplines and semesters. The results of the study indicated that there was no significant difference among students studying in different disciplines of higher education. There is lack of consensus among researchers that there is variation in CT skills across disciplines (Thonney, & Montgomery, 2019). In Pakistani context, multi-disciplines in higher education can foster measureable CT skills if the students are provided with conditions and challenges for developing higher order thinking skills to think critically using capacity for rational thoughts. Educators can play important role to foster CT skills as Gardener (2008) stated that educators should function as models of the integrative thinking to help students develop the in themselves. The results of the study indicated that there was significant difference in CT skills on the basis of different semesters. The study conducted by Tumkaya, et al. (2009) reported that mean score of junior students on CT are greater than mean score of senior students. Findings of the study reflect that there is variation in different disciplines and academic levels. All disciplines cannot be taught with the same instructional approaches to develop CT skills, it requires different contents, courses and instructional approaches. Tsui (2001) stated that "courses and programs designed to foster critical thinking might differ widely in content as well as delivery" (p. 186).

#### V. CONCLUSION

In the light of the above discussion, it is concluded that level of CT skills among university students are not appreciable because even at university level students not provide with inquiry based situation which may stimulates deep introspection. CT skills have been seen less variant in different disciplines along different semesters.

#### VI. RECOMMENDATIONS

CT is a complex construct including vast range of attitudes and skills, so it is recommended that teaching and learning situations should be provided with inquiry based opportunities. Higher educational institutions should allow their faculty members to promote CT skills to improve their students 'higher order thinking skills.

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