

A Survey on the Relationship between Critical Thinking and Self-Efficacy Case Study: Mathematic Students of Payam e Noor University in Maragheh

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Abstract: Critical Thinking is closely related to notions of "personal skills", "life fitness", "practical intelligence and "personal competence". By developing Critical Thinking and studying its effects on General Self-Efficacy we can have students more compatible in every sophisticated and complicated era in both learning and their life. By using the practical guides in this paper professors and university instructors can develop students' critical thinking and general Self Efficacy. This paper will review more the critical thinking literature because of its importance.

Key words: Critical Thinking; General Self-Efficacy; Mathematic Students; Higher Education

1. CRITICAL THINKING

Critical thinking theoreticians agree that the intellectual roots for critical thinking primarily began with Socrates' form of questioning [1, 2]. As Ref. [3] argues that there is a problem with the entire notion of attempting to produce one-line definitions of complex concepts such as critical thinking. Such "definitions" are, for Paul, inevitably incomplete and limiting.

1.1 Some Critical Thinking Definitions

There are varieties of definitions regarding critical thinking among researchers and public but following are some according to Ref. [4]:

- (1) An attitude of being disposed to consider in a thoughtful way the problems and subjects that come within the range of one's experiences.
- (2) "Knowledge of the methods of logical inquiry and reasoning, and some skill in applying those methods" [5].

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(3) “Reasonable and reflective thinking about what to believe or do”.

(4) “The ability to participate in critical and open evaluation of rules and principles in any area of life” [6].

(5) Dr. Elder said, Critical thinking involves the ability to:

- Raise vital questions and problems;
- Gather and assess relevant information;
- Use abstract ideas to interpret information effectively;
- Come to well-reasoned conclusions and solutions, testing them against relevant criteria or standards;
- Think open-mindedly within alternative systems of thought, recognizing and assessing their assumptions, implications, and practical consequences [7, 8].

(6) “Thinking that devotes itself to the improvement of thinking” [9]

(7) “Skillful, responsible thinking that is conducive to good judgment because it is sensitive to context, relies on criteria, and is self-correcting” [1].

All definitions are true and the appropriate one is the one which is most compatible with reader and researchers' goal so it can be selected the one which is more compatible with our research question.

1.2 Some Characteristics of Critical Thinkers

According to [10] the critical thinker will routinely ask the following questions:

- What is the purpose of my thinking (goal/objective)?
- What precise question (problem) am I trying to answer?
- Within what point of view (perspective) am I thinking?
- What concepts or ideas are central to my thinking?
- What am I taking for granted, what assumptions am I making?
- What information am I using (data, facts, observation)?
- How am I interpreting that information?
- What conclusions am I coming to?
- If I accept the conclusions, what are the implications? What would the consequence be if I put my thoughts into action?

For each element, the thinker must consider standards that shed light on the effectiveness of his/her thinking [8, 10, 11].

1.3 Self-efficacy

Self-efficacy was defined by Albert Bandura as a person's belief in their capability to successfully perform a particular task. Together with the goals that people set, self-efficacy is one of the most powerful motivational predictors of how well a person will perform at almost any endeavour. A person's self-efficacy is a strong determinant of their effort, persistence, strategizing, as well as their subsequent training and job performance. Besides being highly predictive, much is also known about how self-efficacy can be developed in order to harness its performance enhancing benefits.

2. METHODOLOGY AND INSTRUMENTS

This project has been done by two questionnaires with high reliability and validity among 252 (102 Male and 150 Female) mathematic higher education student in Payam e Noor University of Maragheh in four levels (freshman, sophomore, junior, and uppers). And studied the Critical Thinking and General Self-Efficacy between basic and humanity science students and other hypothesis will be discussed as well.

General Self-Efficacy, The General Self-Efficacy Scale is a 10-item psychometric scale that is designed to assess optimistic self-beliefs to cope with a variety of difficult demands in life. The scale has been originally developed in German by *Matthias Jerusalem* and *Ralf Schwarzer* in 1981 and has been used in many studies with hundred thousands of participants. In contrast to other scales that were designed to assess optimism, this one explicitly refers to personal agency, i.e., the belief that one's actions are responsible for successful [12].

Critical thinking, we used from a questionnaire of Foundation for Critical Thinking Press, 2007 contains of 20 questions and with permission of the developer [13]

2.1 Research Questions:

- (1) Is there significant relation between Critical Thinking and Self efficacy among mathematic students of Payam e Noor university of Maragheh?
- (2) Is there significant relation between Critical Thinking and Self efficacy among girls and boys of mathematic students of Payam e Noor university of Maragheh?
- (3) Is there significant relation between Critical Thinking and Self efficacy among Basic science and Humanity science of mathematic students of Payam e Noor university of Maragheh?

2.2 Data Analysis

To assess normal distribution, Descriptive statistics was applied. To determine the relationship between students' Self-efficacy and Critical Thinking, Pearson correlation test was used. Gender roles and the tendency to check the Critical Thinking and student Self-efficacy, independent t test were used.

2.3 Results

Table 3 shows the results of descriptive statistics for the two instruments – Critical Thinking and Self-efficacy questionnaires - used in the study.

Table 1: Descriptive statistics for self-efficacy and critical thinking

	N	Minimum	Maximum	Mean	Std. Deviation
Critical Thinking	213	7	98	57.11	1.597
Self Efficacy	213	17	40	28.80	.471
Valid N (listwise)	213				

In order to evaluate the correlation between Self-efficacy and Critical Thinking of student, Pearson correlation test was used. The results showed that there is significant relationship between Self-efficacy and Critical Thinking of student ($p < 0.025$ $r = .153$) (see Table 2).

To evaluate the effectiveness of gender roles in student Critical Thinking and Self-efficacy, independent t test was applied. Results showed there are no significant difference between male and female students regarding the Critical Thinking ($p < 0.05$, $t = 2.839$) and Self-efficacy ($p < 0.05$, $t = -4.113$). As Table 3 shows the mean scores of female students in the life of effectiveness variable scores by students is more than male, but Self-efficacy scores in male students in grades got by female students in this variable are more.

Table 2: Person correlation between self-efficacy and critical thinking of student

		Self-efficacy	Critical Thinking
Critical Thinking	Pearson Correlation	1	.153*
	Sig. (2-tailed)		.025
	N	216	216
Self-efficacy	Pearson Correlation	.153*	1
	Sig. (2-tailed)	.025	
	N	216	216

Table 3: Independent t test for the role of gender in critical thinking and self-efficacy

	T	DF	Female Means	Male Means	P
Critical Thinking	2.839	211	57.11	64.05	.005
Self-Efficacy	4.113	211	28.80	31.44	0.000

Table 4: Independent t test for the role of tendency in critical thinking and self-efficacy

	T	DF	Basic Science Means	Humanity Science Means	P
Critical Thinking	2.107	204	55.39	61.68	.036
Self-Efficacy	0.187	204	29.76	29.91	.852

For investigating the roles of educational tendency of students' Critical Thinking and Self-efficacy, independent t test was applied. The results showed that the difference between students of Basic Sciences and Humanities trends are not significant regarding the Critical Thinking ($p < 0.05$, $t = 2.107$) and Self-efficacy ($p \geq 0.05$, $t = 0.187$)

3. DISCUSSION AND IMPLICATIONS

“A critical thinker is...one who is *appropriately moved by reasons*...critical thinking is impartial, consistent, and non-arbitrary, and the critical thinker both acts and thinks in accordance with, and values, consistency, fairness, and impartiality of judgment and action” (Emphasis in original; Ref. [14]). Some characteristics of critical thinking are:

1. It is purposeful.
2. It is responsive to and guided by intellectual standards (relevance, accuracy, precision, clarity, depth, and breadth).
3. It supports the development of intellectual traits in the thinker of humility, integrity, perseverance, empathy, and self-discipline.
4. The thinker can identify the elements of thought present in thinking about any problem, such that the thinker makes the logical connection between the elements and the problem at hand.
5. It is self-assessing and self-improving. The thinker takes steps to assess his/ her thinking, using appropriate intellectual standards. If you are not assessing your thinking, you are not thinking critically.
6. There is integrity to the whole system. The thinker is able to critically examine his/her thought as a whole and to take it apart (consider its parts as well). The thinker is committed to be intellectually humble, persevering, courageous, fair, and just. The critical thinker is aware of the variety of ways in which thinking can become distorted, misleading, prejudiced, superficial, unfair, or otherwise defective.
7. It yields a well-reasoned answer. If we know how to check our thinking and are committed to doing so, and we get extensive practice, then we can depend on the results of our thinking being productive [8].

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