



The Mediating Role of Critical Thinking in Relation to Higher Education Students' Meta-Cognition and Self-efficacy

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Abstract

This study aimed at scrutinizing the mediating role of critical thinking in relation to higher education students' metacognition and self-efficacy in Islamic Azad University, Nourabad Mamasani. Samples were collected through random sampling method and it was equal to 248. Instruments used in this study were three standard questionnaires including critical thinking, metacognition and self-efficacy. Cronbach's alpha was employed to estimate the instruments' reliability, based on which critical thinking was found to be 0.88, metacognition 0.89 and self-efficacy 0.87. Findings revealed that meta-cognition could significantly predict students' self-efficacy and critical thinking. Also, it was found that meta-cognition and critical thinking could significantly predict students' self-efficacy. This study also showed that critical thinking had a mediating role in relation to students' meta-cognition and self-efficacy. The dimensions of meta-cognition and critical thinking could significantly predict students' self-efficacy.

Keywords: Critical thinking, higher education students, meta-cognition, self-efficacy

Introduction

Thinking is regarded as the most complicated form of human behavior and the highest form of rational and mental activities. In other words, thinking is a cognitive process characterized by passwords or signs which represents objects and events (Barzilai & Zohar, 2016). Philosophically, thinking is one of human inevitable activities appearing in two forms, we might think in a particular area in order to acquire knowledge, or with a certain view, in order to adjust the structure of our minds in accordance with what we want to do (Sfard, 2008).

Thinking helps human being continue to survive in adapting to the environment and its issues in comparison with other creatures and it has also contributed to the rise of great civilizations and cultures. Moreover, thinking has gained a very special place in the realm of education process as coaches and great masters, whether in the past or present, have recognized thinking as the basis of education. No

doubt, teaching and learning can enable a person to have a clear, logical, and productive thinking (Maktabifar, 2009). On the other hand, thinking and its development can result in producing scientific knowledge, highlighting its profound importance in high-level educational institutions as universities.

One of the important features that affects the academic performance and progress and can make noteworthy changes in the process of life is cognition and metacognition issue. Metacognition means thinking about one's own thoughts. Thinking can be about what one already knows (Saif, 2015). Cognition includes activities that aim to regulate and control learning and thinking. Cognitive regulation includes five processes: Planning, information management strategies, comprehension monitoring, debugging strategies, and evaluation of the learning process (Soto et al., 2019). Planning involves choosing the appropriate strategies and allocation of resources that affect performance, such as prediction before reading and observing the hierarchy of using strategies. Planning may include the following decisions: How much time is needed to perform a task or achieve a goal? What strategies should be used and how should

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we get started and what material should be collected? What kind of material needs cursory or careful look? (Woolfolk, 2004)

Metacognition refers to our knowledge about our cognitive processes and the efficient use of them to achieve the desired objectives. Another definition of metacognition is knowledge and awareness of a person's own cognitive system, or knowing about knowledge. Metacognitive knowledge helps us to monitor our own progress while acquiring knowledge of different tasks and assignments. This knowledge helps us to assess the results of our own efforts and measure our mastery (Seif, 2015). In this regard, Burke (2000) said that in order for information processing systems to operate with full effectiveness, it should be aware of itself. This system must reach the understanding that I had better write the phone number or I will forget it or that this is a complicated paragraph and I should read it again to understand what the author means. Metacognition is considered as knowing knowledge. Therefore, if we define cognition as knowing and learning, we can define metacognition as knowing about the way we learn and think. In this study, metacognition includes five aspects which are as the following: cognitive conflict, positive beliefs, cognitive self-awareness, uncontrollability and danger of and the need to control thoughts, that each of these aspects can separately influence diverse aspects of human life.

Conceptual basis of cognitive learning environment is based on the theory of social constructivism of learning and teaching. According to this view, discussion, language and social interaction are of special importance in developing, enhancing and improving learners' metacognitive skills (Thomas, 2004). The nature or structure of cognitive learning environments is often recognized by the discussions that take place in these settings and emerges as a key factor in the development of students' metacognition. Discussions in class should be based on an actively open exchange of ideas and thoughts about learning between teacher and students and among students with each other. Hence, this exchange of thoughts can improve and develop students' metacognitive skills (Thomas & Kin Mee, 2005). Thomas (2004) suggested several characteristics to explain the cognitive learning environment; these features include cognitive demands, discussions among students, student-teacher discussions, distributed control, students' comments, teacher's provision and emotional support. Metacognition is a multifaceted concept that encompasses knowledge (beliefs), processes and strategies that assesses, monitors and controls cognition. It consists of two broad categories of mental

activities namely metacognitive knowledge and metacognitive monitoring. Metacognitive knowledge is the person's explicit knowledge about metacognitive strengths and weaknesses, while metacognitive monitoring refers to a range of executive functions, such as devoting attention, controlling, checking, planning, and recognizing errors in performance (Wells, 2009). It is believed that metacognitive skills play an important role in a variety of cognitive activities, such as exchanging information verbally, verbal persuasion, comprehending readings, writing, learning, perception, attention, memory, problem solving, social cognition, various forms of self-education and self-control.

Metacognition and its related concepts have been applied in the fields of cognitive psychology, personality psychology, gerontology, educational psychology, and clinical psychology, as well as child's cognitive development. The concept of metacognition and its affiliates are also proposed in psychology and education (Maras, Gamble & Brosnan, 2019). Moreover, metacognition can lead to a better understanding of one's self; it will enhance critical thinking and self-efficacy in humans. On the other hand, since critical thinking is influenced by metacognition; therefore, it can promote self-efficacy by influencing critical thinking. In addition, traditional and commonly used methods of education at universities equip students with a lot of theoretical knowledge and information, sending them to the society but without capability of solving the simplest problems of the future challenges. The task of education centers is to develop students' critical thinking skills in such a way that it leads them to enhancing their scientific knowledge and acquiring wisdom (Kim, 2016).

Moreover, critical thinking is considered as higher order thinking. It would be the fusion between critical thinking and creative thinking, it is characterized by being ingenious and flexible and because it looks for the resources it needs and is able to deploy them freely to maximize its effectiveness (Cornejo et al., 2019). Critical thinking is a rational and logical thinking that focuses on our decisions about what we want to do or believe (Ennis, 1987). Moreover, it is a skillful and responsible thinking that facilitates good judgment, because it is based on standards, self-improving, and sensitive to context (Lipman, 2003). Critical thinking features include interpretation, analysis, evaluation, inference, and explanation. Each of these components can, individually or together, lead to an increase in critical thinking of people. In fact, the sum of these components gives rise to critical thinking. Subsequently, critical thinking and its related

components can be effective on many human psychological aspects

One of the most important variables that can be influenced by critical thinking is the one which will ultimately lead to changes in human behavior. One of the most widely used theories in behavioral change is self-efficacy in personality structure which lies at the center of Bandura's social cognitive theory. In this theory, the role of confidence in accomplishing the desired behavior is emphasized and it regards self-efficacy as a prerequisite for a change in the behavior . People with low self-efficacy are less likely to try to change the behavior to which they are accustomed (Bandura, 2006; Queenie, Janita & Eleanor, 2010).

Self-efficacy refers to each person's belief about his ability to produce the desired results while performing certain activities and pursuing goals (Miller, 2009). In addition, in some studies, the role of perceived self-efficacy has been emphasized in different ways of coping with stressful situations (Benyon, Hill, Zadurian & Mallen, 2010). One of the fundamental aspects of self-efficacy is the belief that a person can influence the consequences of his life, especially when facing stressful factors by controlling them (Masoudnia, 2007). In this study, efficacy has two subscales, including general self-efficacy and specified self-efficacy. Feelings of low self-efficacy are identified by emotion-focused coping strategies, such as denial, avoidance, self-control, adapting, and re-evaluation (Benyon et al., 2010; Dwyer & Cummings, 2001). Self-efficacy is a model of cognitive processes for adjustment. With this explanation, people with high self-efficacy use activities of self-control in various fields which is considered an aspect of metacognitive knowledge (Rabbani & Joseph, 2012, Coutinho, 2008). The higher education learning environments, as well as the course of studies are highly important factors in students' educational performance and their future academic achievements. Considering the impact that critical thinking has on students' metacognition and self-efficacy, therefore, critical thinking, self-efficacy and metacognition may affect students' performance.

With regard to the subject mentioned above, the main research question raised in the present study is: whether critical thinking has an intermediary role in relation to students' metacognition and self-efficacy in Nourabad Islamic Azad University? Other research objectives include predicting students' self-efficacy from metacognition, predicting students' critical thinking from metacognition, and predicting students' self-efficacy from both metacognition and critical thinking in Nourabad Islamic Azad University.

People with self-efficacy have a suitable plan and strategy for thinking and contemplation, and when necessary, they use appropriate thinking for analyzing and solving issues. Because of the power of metacognition, i.e. knowledge about how to identify things, people have the necessary concentration and control over their cognition processes. In other words, metacognition refers to the information that a person has of his cognitive system (Maras, Gamble & Brosnan, 2019).

Bandura is among the neo-behaviorists who have accepted cognition and the effect of mental processes as the cause of behavior. In the process of metacognition, metacognition controllers adjust the person's condition with the condition of the new environment (Jacobse & Parise, 1987). These controllers are mechanisms that a person with self-efficacy uses for achieving their goals. So through this, self-efficacy is affected by metacognition, and in turn, metacognition increases self-efficacy. On the other hand, people with more self-efficacy have more metacognition power.

Metacognition is one of the most important skills that can be taught and learned. Moreover, many factors can affect self-efficacy. In the light of these, decision-making skills, constructive interaction with others, planning, deep-thinking, constructive judgment, respect to conflicts of interest, peaceful coexistence, self-control, and self-evaluation can be improved and thereby self-efficacy will also increase (Bandura, 1993; Coutinho, 2008).

People with high self-efficacy respond better in the face of challenges in comparison to people with low self-efficacy. Critical thinking is actually the skill of right-thinking which is one of the most important principles of teaching. Given that critical thinking increases the ability to achieve reasonable results based on observation of information, it also improves self-efficacy. This research merely studies students' self-efficacy and its relation to metacognition and critical thinking. That is, by using self-control activities which are among aspects of metacognitive knowledge, people with high self-efficacy can be more successful in various areas and in this way, self-efficacy is also influenced by metacognition. Critical thinking as a bias against a lot of things can also cause assessment and judgment about issues and it can influence people's self-efficacy (Bandura, 1993; Bandura, Barbaranelli, Caprara, & Pastorelli, 1996; Coutinho, 2008). On the other hand, if critical thinking is at a low level, it can contribute to biases in processing and interpreting information and appears in forms of negative thoughts in the unconscious level and affects self-efficacy. Therefore, by having a direct

impact on self-efficacy, metacognition can also influence self-efficacy through the intermediary role of critical thinking.

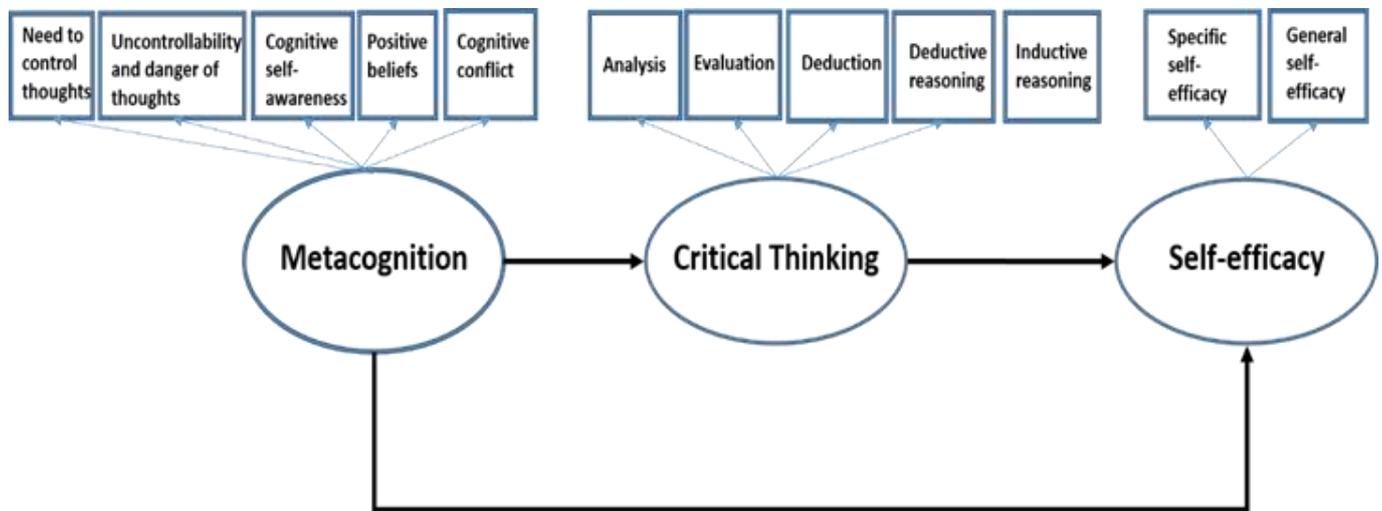


Figure 1.
Research Conceptual Mode

Method

Research design for the study was correlational-descriptive and in terms of using structural equation modeling it is causal-comparative.

Participants

Population of the study consisted of all the students of humanities in whose scores were above 677. Stratified random sampling method is used to determine sample size. Therefore, given that the initial volume is about 677 people, so the statistical sample size is 248 using Morgan table.

Instruments

In order to measure critical thinking, California questionnaire (Form B) developed by Giancarlo and Facione (2001) was used. This questionnaire contains 34 questions, including five aspects (analysis, evaluation, inference, deductive reasoning, inductive reasoning) respectively. Cronbach's alpha coefficient of this questionnaire and its components is reported in a range of 0.72 to 0.93 and its test-retest reliability coefficient is reported to be 0.73 (within a month). Critical Thinking Questionnaire is 0.88 and critical thinking components analysis is 0.79, assessment 0.81,

inference 0.68, deductive reasoning 0.89, and inductive reasoning 0.83.

In order to assess metacognition, the short form of the questionnaire taken from Wells & Cartwright-Hatton (2004) questionnaire (MCQ) was used. This questionnaire has 30 items on the basis five-point Likert type scales ranging from strongly disagree to strongly agree. Cronbach's alpha coefficient of this questionnaire was 0.83 and its components consisted of positive beliefs 0.84, uncontrollability 0.75, self-awareness 0.69, self-knowledge conflicts 0.76, and the need to control 0.86. To evaluate the validity of the questionnaires, expert consensus was used.

To measure self-efficacy Sherer et al. (1982) questionnaire was used. This scale has two subscales 'general self-efficacy' and 'specific self-efficacy'. Cronbach's alpha of this questionnaire was 0.89, and those of self-efficacy components for general, was 0.90 and 0.85 for specific.

Findings

In order to test the hypothesis "metacognition can significantly predict self-efficacy of students" Structural equation modeling was used, the results of which are presented in Figure 1.



Figure 2.
Prediction of Self-Efficacy based on Students' Metacognition

According to the calculations, metacognition beta value is 4.29 and statistic of 29.4 T value can significantly predict students' self-efficacy.

H1. Meta-cognition can significantly predict critical thinking of the students. To test this hypothesis Structural equation modeling was used, the results of which are presented in Figure 2.

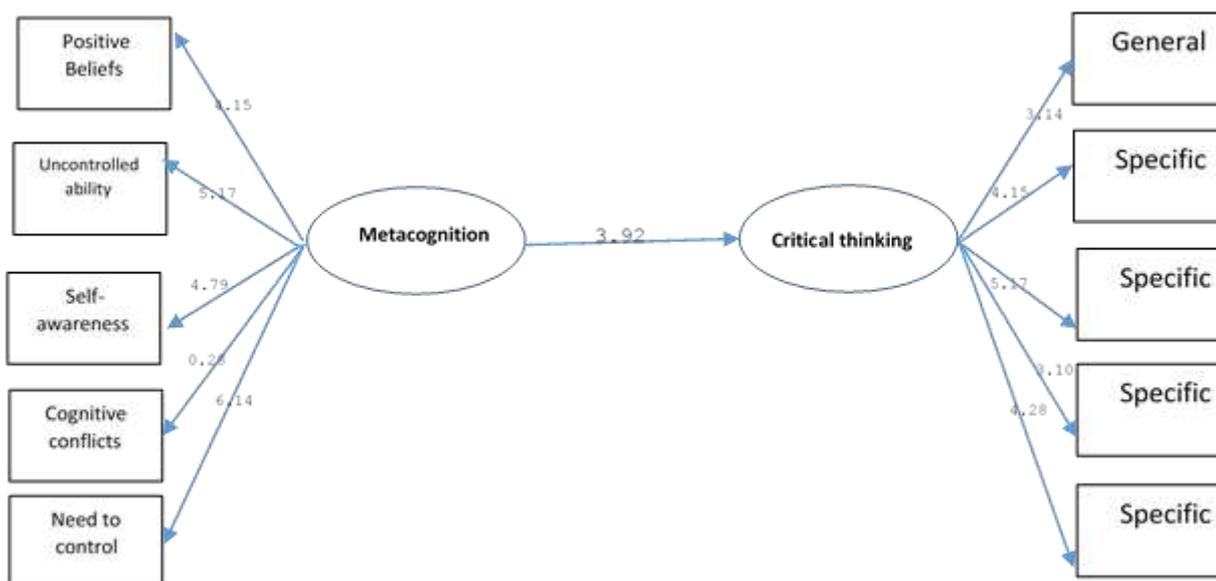


Figure 3.
Prediction of Critical Thinking Based on Students' Metacognition

According to figure 2, since t value equaled 3.92, it suggested that metacognition could significantly predict the student's critical thinking and therefore, the hypothesis was confirmed.

H2. Metacognition and critical thinking can significantly predict students' self-efficacy. To test this hypothesis, Structural Equation Modeling was employed. Results are shown in Figure 3.

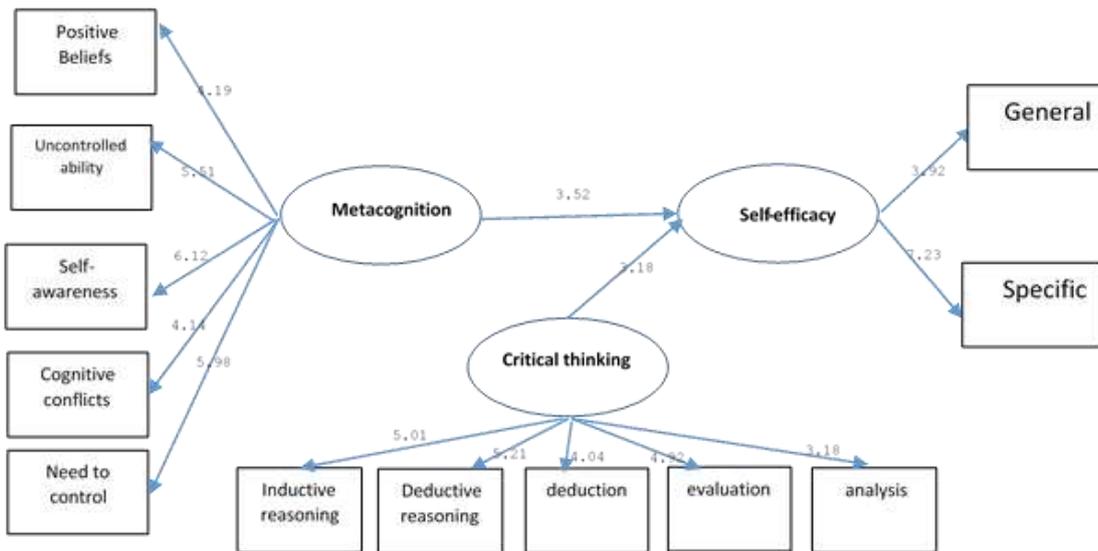


Figure 4. Prediction of Self-Efficacy Based on Students' Metacognition and Critical Thinking

Based on the path analysis, it can be said that metacognition by 3.52 t value and critical thinking by 3.18 t value have a significant effect on self-efficacy. Therefore, metacognition has a greater impact on predicting self-efficacy.

H3. Critical thinking has an intermediary role in relation to students' metacognition and self-efficacy. Baron and Kenny (1986) method was used to test the hypothesis. The result of general path analysis in the presence of mediation is shown in Figure 4.

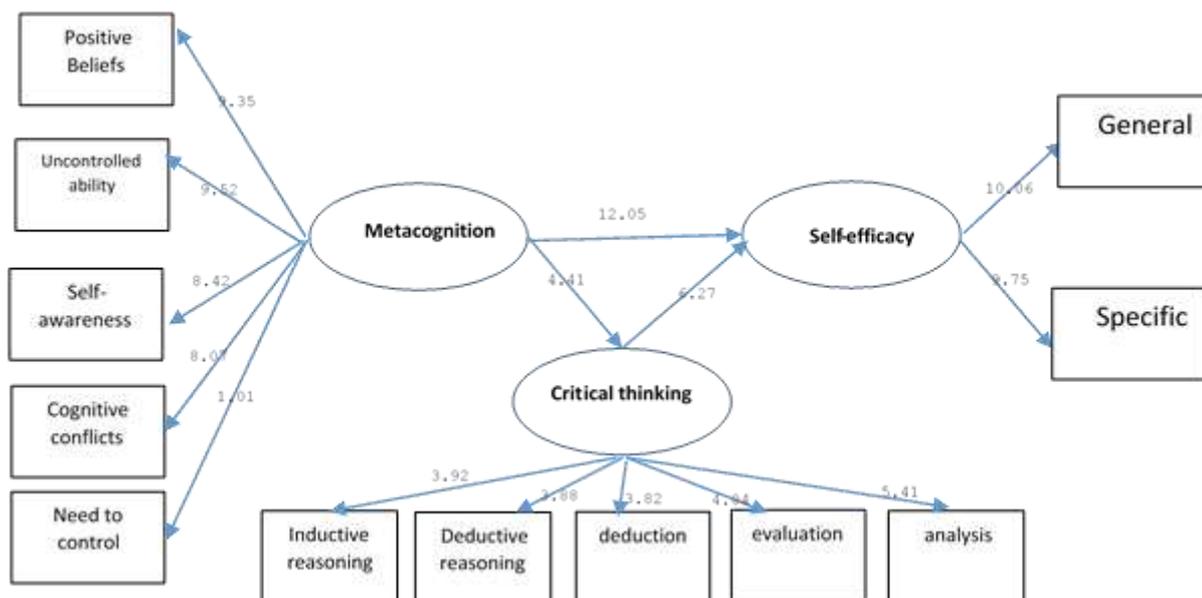


Figure 5. General Path Analysis

Considering the results obtained from the general model and according to the calculations, the standard factor loading of critical thinking with self-efficacy is 0.43 that shows there is a favorable and strong

relationship between these two variables. Load factor of t-statistics is 6.27 indicating that the observed correlation is significant. Also, the factor loading of metacognition structure with self-efficacy is 0.37 that

shows there is a favorable and strong relationship between these two variables. Load factor of t-statistic is 4.41 indicating that the observed correlation is significant. In order for structural model to fit the main research model, some goodness of fit indicators was used. One of the general indicators for considering free parameters in calculating the fitting index is normed chi-square index which is calculated by the

simple division of chi-square by the model's degree of freedom. If this value is from 1 to 5, it is favorable (Klein, 2010). To determine the fitness of the model, a number of goodness of fit indicators are used which are presented in Table (1). Since RMSEA index is obtained less than 0.1, the model has a good fit. The other goodness of fit indexes is also in the appropriate range.

Table 1.

Goodness of Fit Index of Structural Model

Fitting Index	NNFI	NFI	AGFI	GFI	RMSEA	SRMR	IFI
Accepted	>0.9	>0.9	>0.9	>0.9	<0.1	<0.1	0-1
Calculated	0.95	0.94	0.97	0.93	0.046	0.036	0.96

Discussion and Conclusion

In the first hypothesis, the researcher aimed to determine that metacognition can significantly predict students' self-efficacy. According to the findings of the structural equation modeling, the standard load factor of metacognition with self-efficacy shows that metacognition can predict students' self-efficacy. The results of this hypothesis are consistent with the studies of Rabbani and Joseph (2012) as well as Coutinho (2008). Examining the relationships among self-efficacy, metacognition and performance, Coutinho (2007) in his study found that metacognition was a predictor of self-efficacy, and that self-efficacy was a predictor of performance. The correlation between students' self-efficacy and metacognition suggested that these two variables were dependent on each other. In other words, students with high self-efficacy are likely to have high metacognitive awareness. Research findings suggest that individual differences exist in metacognition and people with poor metacognition are deemed "incompetent" as they perform inadequately relative to their peers (Kruger & Dunning, 1999).

Results of the study also indicated that the factors of metacognition were significantly related to the factors of critical thinking and could predict it. Results were consistent with the findings in the structural model where metacognition significantly increases the variability of critical thinking, too. The results of this hypothesis were aligned with the studies of Magno (2010) who found that critical thinking occurs when individuals use their cognitive skills or strategies that increase the probability. In confirmation of this hypothesis, Kugute (1996) found specific strategies that promoted critical thinking which were metacognitive in nature. In the same way, Choy and

Cheah (2009) showed a more apparent connection between metacognition and critical thinking. The specificity of metacognition, as in the case of the present study, means that individuals can identify and use multiple metacognitive skills when required to think critically.

In the third hypothesis, the researcher aimed to determine that metacognition and critical thinking can significantly predict students' self-efficacy. Considering the findings from path analysis, it can be stated that both of variables can predict students' self-efficacy. The results of the present study are in line with the study done by Uzuntiryaki-Kondakci and Capa-Aydin (2013).

In the fourth hypothesis, the researcher aimed to determine that critical thinking has an intermediary role in relation to students' metacognition and self-efficacy. Considering the findings from path analysis, it can be stated that critical thinking gives an intermediation to the impact of metacognition on self-efficacy. The results of the present study are consistent with the results of the studies by Maddux (2016); Zimmerman and Bandura (1994); Montagu (1992).

The ability to identify specific metacognitive skills that is predicted to work well is a key element to reach critical thinking. This suggests that when higher order thinking skills are required, the individual starts to identify multiple skills to reach the goal. Having identified several skills provides a way to reach higher order thinking because the individual uses several meta-level resources that serve as a bridge to reach critical thinking. This bridge is unclear when specific skills are not identified; that's why skillful individual who uses metacognition undergoes an initial identification process on what metacognition skills to use, how each specific metacognition will be used, and

test if these selected and used processes will work well.

Considering the importance of students' critical thinking, metacognition and self-efficacy, the purpose of the current study was to determine the mediating role of critical thinking in relation to higher education students' metacognition and self-efficacy. Therefore, the most important finding of this research shows students' critical thinking has a mediating role in relation to metacognition and self-efficacy. Given that every study has its limitations; this study was limited to the students of humanities in Nourabad Islamic Azad University as a case study. Thus other centers could also be investigated.

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