Prediction of Critical thinking based on Meta-Cognitive Beliefs and Teaching Quality

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ABSTRACT

Introduction: Scholars believe that critical thinking can be influenced by another variable called meta-cognition. In addition to meta-cognitive skills, critical thinking is influenced by other factors, one of which is educational environments and teaching styles. The present study was aimed to predict critical thinking based on meta-cognitive beliefs and teaching quality in human Science students of Shahid Rajayi University. Method: The present research was correlational. From the BA students of Shahid Rajayi University, 240 students (75 boys and 165 girls) were selected using a simple random sampling method; they participated in the research after they had completed the questionnaires of meta-cognitive beliefs, critical thinking, and teaching quality. Results: findings showed that there was a positive and significant relationship between the total score of meta-cognitive strategies and critical thinking (p<0.01, r = 0.439); and that there was a positive and significant relationship between the total score of teaching quality and critical thinking (p<0.05, r=0.16). The results obtained from concurrent regression showed that meta-cognitive strategies can predict critical thinking in a positive and significant way (p<0.001, β = 0.360). Additionally, teaching quality can predict critical thinking in a positive and significant way (p<0.001, β=0.296). Conclusion: Considering these findings, it can be said that with an increase in the score of meta-cognitive beliefs and an increase in teaching quality, the score of critical thinking increases.

Keywords: critical thinking, meta-cognitive beliefs, teaching quality

Introduction

One of the basic features of humans is self-awareness of behavior, and the ability to think. Critical thinking is one of the main dimensions of humans' existence, development of which leads to growth and perfection. Woolfolk (2001) refer to critical thinking as evaluation of decisions through logical and regular examination of problems, evidence, and solutions. Furthermore, Fasion (2007) refers to critical thinking as a process of self-adjustment and purposeful judgment, which helps to solve problems and make proper decisions. Critical thinking is a cognitive process of acquiring knowledge, which is usable for managerial, social, and other affairs (Gal et al, 2010). According to Dinuta (2015), critical thinking is a logical process of using, analyzing, and combining, conceptualizing and evaluating information collected through observation, experience, thinking, and reasoning, which are based upon sensible values such as transparency, accuracy, compatibility, and fairness. Scholars believe that critical thinking is a variable which can be influenced by another variable called meta-cognition, in such a way that one of the elements of critical thinking, related to thinking ability, is connected to another person's thinking, which is inherently a type of meta-cognition (Dinuta, 2015). Moreover, one of the features of critical thinking is analysis and evaluation, which is true for meta-cognition too. According to Ku and Hue (2010), meta-cognition strategies which are used in critical thinking include three components: planning, control, and evaluation. Meta-cognition is a multifaceted concept including processes which evaluate, monitor, and control one's cognition; it comprises two basic components: knowledge and meta-cognitive monitoring (Wells, 2000). Meta-cognition includes controlling and adjusting cognitive activities in order to attain cognitive goals. This process can be in the form of examination, planning, selection, and reasoning (Felavel, 1977). In addition, meta-cognition can be referred to as one's awareness of the process of thinking and the ability to control this process (Cakir Veglo, 2007; Disut and Ezsoy, 2009; Haker and Donloski, 2003). A study conducted by Joe and Gich (2009) shows that there is a positive and significant relationship between cognitive skills and critical thinking. This means that when a teacher provides students with meta-cognitive strategies in a classroom, critical thinking skills increase. A study done by Erin and Cali (2005) called "Effect of Learning Earth Science on Scientific Thinking Skills" showed that there is significant relationship between scientific thinking skills and meta-cognitive skills. The results

obtained from a study done by Magno (2010) called "Role of Meta-cognitive Skills in Developing Critical Thinking, Using a Structural Equations Model" showed that there is a significant relationship between the models of meta-cognitive skills and critical thinking. His study also showed that the ability to evaluate personal knowledge and thinking processes directly predict critical thinking. Brown (2004) believes that without meta-cognition, it is not possible to use critical thinking. Critical thinking is not only influenced by meta-cognitive skills, but it is also influenced by other factors, one of which is educational environments and teaching styles (Ozkan, 2010; Kasmari et al, 2010). Today, one of the most important methods of enhancing education quality is evaluation of teaching quality. Teaching quality is something which students and faculty members refer to as teaching efficiency, comprising general components of teaching and learning, which is more related to higher education conditions (Marsh et al, 2009; according to Pakmehr, Jafari Sani, Saeed Rezvani and Karshki, 2012). The results of the study done by Cartis et al (2008) show that there is a positive relationship between teaching quality and critical thinking skills. A study conducted by Pakmehr et al (2012) showed that there is a significant relationship between teaching quality and students' critical thinking skills. From the four components of teaching, lesson plan has the least relationship; and the component of inter-personal relationship has the most relationship with critical thinking. In addition, teaching quality is able to predict 30 percent of critical thinking. The results of a study conducted by Colic and McKachi (2004) called "Evaluation of Higher Education Teachers" shows that if students and teachers take time to discuss and exchange ideas within high-quality teaching, their capability of critical thinking will increase. Considering the fact that developing intellectual skills in students is a main objective in higher education, and considering the results of numerous studies, it is shown that the level of critical thinking in students is low; on the other hand, examination of theoretical concepts indicates the importance of teaching quality in improvement. In addition, considering the importance of teachers' behavioral and scientific position in the process of developing intellectual skills in students, the present study examined the prediction of critical thinking based on meta-cognitive beliefs and teaching quality. The hypotheses of the present study are:

1) There is a relationship between meta-cognitive beliefs and teaching quality with students' critical thinking.
2) It is possible to predict students' critical thinking based on meta-cognitive beliefs and teaching quality.

In order to respond to the above hypotheses, Pearson Correlation Coefficient, concurrent regression, and step-by-steep regression were used.

Method

The statistical population of this research consisted of all BA students of Shahid Rajayi University (from 2014 to 2017), from whom 240 individuals (75 boys and 165 girls) were selected using a simple random sampling method. They participated in this study by responding to meta-cognitive beliefs questionnaire, critical thinking questionnaire, and teaching quality questionnaire.

Data Collection Tools

Meta-cognitive beliefs questionnaire

Meta-cognitive beliefs questionnaire (Wells and Catrait Hatton, 2004) is a 30-item self-report scale which evaluates personal differences in terms of meta-cognitive beliefs, judgments, and monitoring orientations. This questionnaire consists of 5 subscales: 1) cognitive dissonance, 2) positive beliefs, 3) cognitive self-awareness, 4) uncontrollability and risk of thoughts (or negative beliefs about uncontrollability and risk of thoughts), 5) the need to control thoughts. Each item is scored based on a 4-point Likert scale. Shirinzadeh et al (2008) translated the questionnaire for Iran's population. Cronbach's alpha coefficient in the Iranian sample was reported to be 0.91; and for the subscales of uncontrollability, positive beliefs, cognitive self-awareness, cognitive certainty, and need for controlling negative thoughts, it was reported to be 0.87, 0.86, 0.81, 0.80, and 0.71, respectively. Using a Cronbach's alpha method, the reliability of this questionnaire was calculated to be 0.73.

Critical Thinking Skills Questionnaire

In this research, data collection tool was California's standardized test of critical thinking skills (form B). This test was devised in order to evaluate critical thinking skills in high school and higher level students (Fasion and Fasion, 1998). California's critical thinking test is available in two forms: A and B, which are structurally and statistically concurrent. In this research, form B was used. Critical thinking skills test included 34 items, which evaluate critical thinking skills. Form B was a critical thinking test, whose skills included: analysis, inference, evaluation, comparative reasoning, and inductive reasoning (Facon and Facon, 1998). The validity of the test was approved using a factor analysis method for the main components (Fasion and Fasion, 1998). Eslami (2003) reported the content validity of the

test to be favorable for the students of Tehran's teacher training centers. In addition, using a Kuder-Richardson method, the reliability of the test was calculated to be between 0.68 and 0.70 (Facon and Facon, 1992; 1988). Using a retest method, Eslami (2003) reported the reliability of California's critical thinking skills test to be 0.78 for Iran's student population. Using a Cronbach's alpha method in this research, the reliability of the critical thinking questionnaire was calculated to be 0.70.

Teaching Quality Questionnaire

This questionnaire was devised by Seraj (2002), consisting of 20 items, which were scored using a 5-point Likert scale (from "very little" to "very much"). The validity of the teaching quality questionnaire was approved by Shabani Varaki and Hossein Gholi Zadeh (2006), using factor analysis. Using a Cronbach's alpha method, the reliability of the scale was calculated to be 86.55. In the present study, the reliability of the questionnaire was

calculated to be 0.77, using a Cronbach's alpha method.

Conclusions

The present study was aimed to predict critical thinking based on meta-cognitive beliefs and teaching quality. First, using a Pearson Correlation method and a correlation matrix, the relationship between research variables was examined. As it can be seen from table 1, there is a positive and significant relationship between the total scores of met-cognitive strategies and critical thinking ($p<0.01$, $r=0.439$). There is a positive and significant relationship between the total scores of teaching quality and critical thinking ($p<0.05$, $r=0.16$). Other results presented in table 1. Generally, these results show that with an increase in the total score of meta-cognitive scores and teaching quality, the score of critical thinking increases.

Table 1: Correlation matrix for meta-cognitive beliefs and teaching quality with critical thinking

Variables	1	2	3	4	5	6	7	8
Critical thinking	1							
Needing to control thoughts	0.209 **	1						
Uncontrollability and risk of thoughts	0.128 *	0.281 **	1					
Positive beliefs	0.246 **	0.330 **	0.482 **	1				
Cognitive self-awareness	0.313 **	0.551 **	0.269 **	0.354 **	1			
Cognitive dissonance	0.215 **	0.378 **	0.376 **	0.380 **	0.209 **	1		
Total score of meta-cognitive strategies	0.439 **	0.630 **	0.568 **	0.618 **	0.604 **	0.626 **	1	
Teaching quality	0.393 **	0.193 **	0.068	0.103	0.282 **	0.151 *	0.267 **	1

*P<0.05   **p<0.01

In the next step, considering the main purpose of the research, in order to examine the prediction ability in meta-cognitive strategies and teaching quality for the prediction of the total score of critical thinking, a multifold concurrent regression was used. Data analysis results have been given in table 2. As shown in the table, meta-cognitive

strategies have been able to positively and significantly predict critical thinking ($p<0.001$, $\beta=0.360$). In addition, teaching quality has been able to positively and significantly predict critical thinking ($p <0.001$, $\beta=0.296$).

Table 2: Prediction of critical thinking based on teaching quality and meta-cognitive strategies

Predictor Variable	Regression coefficient (B)	"t" value	Standard coefficient (β)	R	R^2	Significance
Meta-cognitive strategies	0.684	6.26	0.360	0.524	0.274	0.001
Teaching quality	0.438	5.16	0.296			0.001

In order to examine the role of each meta-cognitive strategy in critical thinking, a step-by-step statistical regression method was used; the results are given in table 3.

Table 3: Step-by-step regression of meta-cognitive strategies in critical thinking

Predictor variables	F	Regression Coefficient (B)	Standard Coefficient (β)	t	R	R^2	Significance
Step 1: cognitive self-awareness	25.79	2.23	0.280	4.49	0.313	0.098	0.001
Step 2: Cognitive Dissonance	16.33	0.848	0.156	2.51	0.348	0.114	0.001

The step-by-step regression model in table 3 shows that from the dimensions of meta-cognitive strategies, dimensions such as cognitive self-awareness and cognitive dissonance could predict critical thinking; and in sum, these two dimensions were able to express about 11 percent of the variance of critical thinking. In the first step, cognitive self-awareness expressed 0.09 percent of the variance of critical thinking; and when cognitive dissonance was used, the amount of expression increased by 0.11 percent. Here, the component of anxiety expressed 3 percent of the variance of critical thinking. As it can be seen, all effects of expressing the desired variables on critical thinking in a 0.001 level are significant.

Discussion and Conclusion

The present study was aimed to predict critical thinking based on meta-cognitive beliefs and teaching quality in students. Obtained results showed that there was a positive and significant relationship between the total scores of meta-cognitive strategies and critical thinking. Additionally, meta-cognitive strategies could positively and significantly predict critical thinking. Teaching quality could also positively and significantly predict critical thinking. The results obtained from this research are in congruence with those obtained from studies conducted by Joe and Gich (2009), Erin and Cali (2005), Magno (2010), and Ku and Hue (2010), connected to the relationship between meta-cognition and critical thinking. In expressing this finding, it can be said that meta-cognition helps critical thinking skills, because meta-cognition, like critical thinking skills, requires high-level actions in the mind, (Magno, 2010). When learners learn to control their meta-cognition processes, they most probably have a critical look at realities. This feeling of control allows people to better judge the environment and the gathered information, resulting in the promotion of critical thinking. When students try to use meta-cognitive strategies, their critical thinking skills develop. In addition to the mentioned expressions, another expression of the relationship between meta-cognition and critical thinking is that these two constructs have common features. Both constructs are certain forms of thinking in a higher level; both are executive processes in a higher level, leading to maximum learning (Pantrich, 2002). The findings of this study, in connection with the prediction of critical thinking based on teaching quality, are consistent with the findings proposed by Kasmari et al, 2010; Cartis et al; McKachi, 2004; and Pakmehr et al, 2012. In expressing this finding, it can be said that professors' attention to the qualitative dimension of teaching, in line with the development of students' critical thinking, as an opportunity in higher education, not only enhances students' intellectual skills but it also provides an opportunity for higher-quality and deeper learning. Furthermore, inefficiency and lack of attention to the mechanisms of teaching quality, as a challenge, can lead to the ignorance of students' thinking

skills in high levels (Pakmehr et al, 2012). Critical thinking defines problem-solving for human sciences students, by evaluating concepts and identifying phenomena. This way, it enables them to search and discover problems in order to solve them. Here, the most important educational result, obtained from critical thinking, helps individuals to become more articulate and more critical, resulting in the ability to understand and stand opposing opinions and ideas. In order to teach these thinking styles, we must consider teachers' proficiency, teaching quality, and meta-cognitive skills; this requires the provision of an appropriate opportunity for students' active minds, who critically consider problems and upgrade their attitudes with the help of experienced teachers, leading to innovative ideas.

Reference

Cakiroglu, A. (2007). Ustbilis. Turkiye Sosyal Arastirmalar Dergisi, 11 (2), 21- 27.

Choy, S. C. & Cheah, P. K. (2009). Teacher perceptions of critical thinking among students and its influence on higher education. *International Journal of Teaching and Learning in Higher Education*, 20(2), 198–206.

Curtis, F., Rudd, T., Gallo, R., Eckhart, M., Ricketts, E. (2008). Overtly teaching critical thinking and inquiry-based learning: A comparison of two undergraduate biotechnology classes. *Journal of agricultural education* ,49 (1), 72-84.

design and delivery: A randomized controlled trial for educators. Procedia Soc Behav Sci. 2010, 2(2), 3219-25.

Desoete, A. & Ozsoy, G. (2009). Introduction: Metacognition, more than the lognes monster? *International Electronic Journal of Elementary Education*, 2(1), 1-6.

Dinuta, N. (2015). The use of critical thinking in teaching geometric concepts in primary school . Procedia - Social and Behavioral Sciences, 180 ,788 – 794

Facione .P. A. Facione, N. C. (1992). Test manual: The California Critical Thinking Disposition Inventory. California Academic Press, Millbrae, C. A.

Eslami, M (2003). Proposing a pattern for designing and implementing a critical reading program; and examination of its effect on critical thinking in students of Tehran's teacher training university. PhD thesis of educational planning, teacher training university.

Pakmehr, H, Jafari Sani, H; Saeedi Rezvani, M, and Karshki, H (2012). Role of teachers' teaching quality and its components in developing students' critical thinking; opportunities and challenges of educational plan in higher education. Education Psychology Studies: course 9, No 16; 17-38.

Shabani Varaki, B and Hossein Gholi Zadeh, R (2006). Examination of teaching quality in universities. Research and planning in higher education, course 12, No 1 (39); 1-22.

Shirinzadeh Dastgiri, S, Goudarzi, Rahimi, Ch and Naziri, Gh (2008). Examination of factor structure, validity, and reliability of meta-cognition questionnaire. Psychology magazine, course 12, No 4 (48): 455-461.