The relationship between epistemological beliefs and metacognitive thinking of gifted and non-gifted students

Wail Muil, Zaharah Hussin, Wan Hasmah Wan Mamat, Mohd Faisal Mohamed, Muhammad Azhar Zailani.

Faculty of Education, University of Malaya, 50603 Kuala Lumpur, Malaysia.
Wail77@yahoo.com

Abstract: The aim of this study is to investigate the correlation between epistemological beliefs and metacognitive thinking of gifted and non-gifted students. The research sample consists of two groups. The first group represents the gifted students, who were selected from the King Abdullah the Second Schools for Excellence in Irbid, Jordan; the other group represents non-gifted students selected from various ordinary schools in Irbid. The sample size of the first group was 166 students (91 students from level 10 and 75 students from level 11); the control group consisted of 110 students (54 students from level 10 and 56 students from level 11). In order to achieve the aim of this study, the researcher used the Schommer epistemological questionnaires adapted to the Jordanian environment as well as the Kawaldah Metacognitive Questionnaire scale (M.Q.S.) which was developed for the Jordanian environment. The researcher also used correlation coefficient and Z Fisheir test. The results of the study show that gifted and non-gifted students' responses on the epistemological beliefs scores and Metacognitive Questionnaire scale fall within the degree of frequency and there was a significant correlation in the two domains (omniscient authority and palpable serial) in favor of the non-gifted students.
[Wail Muil, Zaharah Hussin, Wan Hasmah Wan Mamat, Mohd Faisal Mohamed, Muhammad Azhar Zailani. **The relationship between epistemological beliefs and metacognitive thinking of gifted and non-gifted students.** *J Am Sci* 2013;9(10):313-319]. (ISSN: 1545-1003). http://www.jofamericanscience.org. 41

Keywords: epistemological beliefs, Metacognition, gifted and non-gifted.

1. Introduction

Epistemological beliefs comprise one of the main paths for understanding the structure of the process of metacognition, and many studies have been conducted to examine the relationship between epistemological beliefs and metacognitive strategy. These have found that students who differ in metacognitive ability are likely to differ in their epistemological beliefs (Ryan, 1984; Schommer, 1990). Hofer (2004) and Kitchener (1983) indicated that when individuals begin in building epistemological action on a particular topic, they can be inferred to be interested in a range of metacognitive operations. Thus, they tend to become aware of their understanding of new concepts; they question whether they have absorbed what they have read, and begin to organize a response. Therefore, another level of metacognition is achieved.

In the studies of Moos and Finley (2013); Tsai and Chuang (2005); Pieschl, Stahl, and Bromme (2006); and Ozgelen (2012), these relationships could improve educational activities. Other studies also confirmed that improving epistemological beliefs and increasing the level of metacognitive strategy application will contribute significantly to positive learning outcomes and academic achievement (Barnard, Lan, Crooks, & Paton, 2008; Belet & Güven, 2011; Nbina & Viko, 2010; Topçu & Tüzün, 2009).

Epistemological beliefs are also considered a fundamental and important source of information about metacognition, because metacognition is used to differentiate between good and weak readers, students who are able to learn and those who are not, as well as the gifted and non-gifted. A person's beliefs about the nature of knowledge will be important in learning, problem-solving, and making conclusions (Schommer, 1994). Furthermore, the studies by Chan (1996); Schommer and Dunnell (1994, 1997); and Schommer and Neber (2002) confirmed that gifted students use metacognitive strategy, have more sophisticated beliefs about the nature of knowledge, and are less likely to believe in simple knowledge, quick learning, and "innate ability".

Costa (1984) affirmed the need to understand students' techniques of solving problems, awareness of what is known and what is needed to be known, making a work plan before beginning, observing themselves during the implementation stage, making corrections whenever needed, and evaluating the range of their success upon completion or implementation of work.

As described by Costa, the components on thinking emphasize its necessity for the gifted, which indicates the value of educational enrichment content: to learn about brain function, for example, as well as the relationship between learning and memory, emotions, dreams, imbalances and mental disorders. This continues in relation to reasoning, models of thinking, and personal dimensions, such as brain hemisphericity and specialization. Other

considerations include the processes of thought, spontaneous thinking, meditative versus compulsory thinking, and global versus analytical thinking. This also covers discussions on the center of control considering that thinking is linked to achievement, attainment, and professional success. Individuals with central interior control feel that they are responsible for their success, failure, and destiny compared with a person with exterior control, who blames others for their failures and refer success to chance.

Sternberg and Davidson (1986) explained that gifted students differ from non-gifted students in terms of working memory speed and capacity. Gifted learners monitor their comprehension more effectively than non-gifted learners (Bouffard-Bouchard, Parent, & Larivee 1993). Risemberg and Zimmerman (1992) also indicated that gifted students often use self-regulated learning strategies more than non-gifted students; and they can transfer these strategies to novel tasks and enhance academic achievement.

Epistemological beliefs

Epistemological beliefs refer to the concepts of individuals about the nature of knowledge and the nature of the learning process. This reflects the viewpoint of the individual about what and how knowledge can be acquired and the degree of certainty, determinants, and criteria used to determine and define knowledge (Bendixen, Dunkle, & Schraw, 1994; Hofer & Pintrich, 1997; Pintrich, 2002; Schommer, 1990). In addition, it works toward facilitating changes in the process of learning and teaching, and improving it in the attitudes of teacher training (Shaver, 1992).

Schommer (1990) noticed that these beliefs are more than one-dimensional, and worked on the description of these beliefs, as follows:

- Quick learning (believing in swiftly learning).
- Certain knowledge (believing in the certainty of knowledge).
- Omniscient authority (believing in the source of knowledge)
- Innate ability (believing firmly in knowledge).
- Simple knowledge (believing in the structure of knowledge).

Later, Schommer (1993) noted that epistemological beliefs are more likely to be characterized by a multidimensional set of essentially independent beliefs. This means that individuals may hold both sophisticated and naive views about the nature of knowing. Students with simple epistemological beliefs view knowledge as absolute, handed down by authority, acquired quickly or not at all, and that the ability to learn is fixed at birth. However, students with sophisticated epistemological beliefs "embrace knowledge as complex and tentative" and the "source of knowledge shifts from the simple transfer of knowledge from authority to processes of rational thinking."

Metacognitive thinking

Several definitions of metacognitive thinking exist. For example, Bonds (1992) defines it as the knowledge and awareness of the individual processes of knowledge, and the ability to organize, evaluate, and control thinking. Wilson (1998) defines it as an individual knowledge and awareness of processes and thinking strategies. It also indicates the ability to evaluate and organize the thinking processes, which include questions addressing how and why individuals commit actions. Lang (2013) gives examples of how teachers can enhance student metacognitive ability in the classroom.

According to Flavel (1979), metacognitive thinking can be divided into several components such as experience knowledge and metacognitive knowledge, which includes personal knowledge, task knowledge, and strategy knowledge.

Metacognition is a crucial component of effective learning because it enables individuals to monitor and regulate their cognitive performance (Bouffard-Bouchard, Parent, & Larivee, 1993). Furthermore, it focuses on the skills and strategies that should be included in instruction programs for promoting metacognition among gifted and talented students.

1.1 Statement Of The Problem

We have been building and implementing special programs for the gifted. We have isolated them to help the gifted balance their development in all aspects (the motor, mental, and emotional orders) to create conditions appropriate for each student to maximize their energies. This study is aimed at examining the reality of gifted students in special programs. We also investigated the extent of the differences between them and between students who are studying in regular programs, and whether these programs have been effective in developing their mental abilities.

Furthermore, this study is aimed at examining the relationship between epistemological beliefs and metacognition for gifted and non-gifted students. We propose the following questions:

- What is the degree of possession of epistemological beliefs and megacognitive skills between gifted students and non-gifted students?
- Is there a statistically significant difference at the level of $p \leqslant .05$ between the correlation in the measurement of epistemological beliefs as a whole and the measurement of megacognitive thinking as a whole due to the student variable (gifted and non-gifted)?

2. Definition of Terms

Epistemological beliefs - the concepts of individuals about the nature of knowledge and the nature of the learning process. In this study, the degree to which the student obtains the measurements prepared for this purpose.

Metacognitive - a person's awareness of learning by understanding the extent of their knowledge and thoughts on learning. In this study, the degree to which the student obtains the measurements prepared for this purpose.

Gifted - the students who are admitted to the King Abdullah II Schools for Excellence via principles and standards set by the Ministry of Education. These schools aim to develop teaching practices for gifted students to meet their needs and develop their innovative ability.

3. Method

3.1 Population and sample of the study

The population of the study includes all Irbid City elementary school students who applied for tests ascertaining gifted abilities and excellence. Certain students were admitted to the King Abdullah Schools for Excellence (gifted students), whereas others failed the test and were not given the opportunity to join these schools (non-gifted students). The study was limited to gifted and non-gifted students in grades 10 and 11. The sample collected from the gifted students was 166 students, distributed as follows: grade 10 (45) males and (46) females, grade 11 science stream (35) males and (40) females.

The sample of non-gifted students was collected based on convenience from the population of non-gifted students because of the difficulty in obtaining access to all students. Via field research, 110 students were selected and distributed as follows: grade 10 (29) males and (25) females, grade 11 (31) males and (25) females. Table (1) shows the distribution of the study sample according to the type of student.

Table 1. Distribution of the study sample according to type of student

Variable		Number	Average
Type of student	gifted	166	%55,2
	Non gifted	110	%44,8
total		267	%100

3.2 Instruments

The following tools were used in this study:

A Metacognitive Questionnaire Scale and Epistemological Beliefs Questionnaire were used. To determine validity and reliability, we used content validity, Test-Retest, and Cronbach's alpha. The test-retest period between the administration of the tests was three weeks. The factor of stability of the epistemological beliefs instrument as a whole was found to be 77% in Test-Retest methods and 83% in the homogeneity method. The consistency factors in metacognition instrument as a whole were found to be 81% in Test-Retest methods and 83% in the homogeneity method, as shown in the table (2, 3).

Table 2. The coefficient reliability of Metacognitive Questionnaire Scale

Scale	The coefficient reliability		**number**
	retest ranged	internal consistency ranged	
palpable/ serial	0.81	0.77	15
palpable /random	0.83	0.70	15
abstract/ serial	0.85	0.81	15
abstract/ random	0.79	0.89	15
metacognitive	**0.81**	**0.83**	**60**

Table 3 The coefficient reliability of Epistemological Beliefs Questionnaire

Scale	The coefficient reliability		Number
	retest ranged	internal consistency ranged	
Quick learning	0.78	0.83	10
Certain knowledge	0.83	0.74	9
Omniscient authority	0.82	0.80	9
innate ability	0.78	0.76	12
Simple knowledge	0.75	0.82	15
Epistemological beliefs	0.77	0.83	55

3.3 Data Analysis

To answer the first question, mean and standard deviations were calculated on the epistemological beliefs and metacognition scale.

To answer the second question, correlations were computed between each of the epistemological belief dimensions with the metacognitive beliefs and their factors. Fisher's z test was used to examine the differences between the correlation coefficients in the gifted and non-gifted students.

4.1 Results

The study answers the following three questions:

The first question

What is the degree of possession of epistemological beliefs and megacognitive skills between gifted students and non-gifted students?

To answer this question, we calculated means and standard deviations of the study sample responses on epistemological belief scale as whole and the four areas of this measure, as shown in Table (4).

Table 4. Mean and standard deviations of gifted and non-gifted students on the epistemological belief scale as a whole and on factors

Epistemological beliefs factors	Student type					
	Gifted			Non gifted		
	Rank	Average	Standard Deviation	rank	Average	Standard deviation
Quick learning	4	2.55	0.38	4	2.53	0.38
Certain knowledge	1	3.21	0.45	1	3.22	0.46
Omniscient authority	5	2.50	0.39	5	2.53	0.37
innate ability	3	2.58	0.37	3	2.54	0.35
Simple knowledge	2	2.74	0.33	2	2.78	0.30
Epistemological beliefs		2.7	0.21		2.7	0.21

The mean scores of gifted and non-gifted students on the epistemological belief scale as a whole (quick learning, certain knowledge, omniscient authority, innate ability, simple knowledge) were 2.72 and 2.76, respectively. The mean range of the four factors of the gifted students was 2.55 to 2.74, and the mean range of the non-gifted students was 2.53 to 2.91.

To answer this question, we calculated means and standard deviations of the study sample responses on metacognitive thinking skills as whole and the four areas of this measure, as shown in Table (5).

Table 5. Means and standard deviations scores on themetacognition scale as a whole and its factors

metacognitive factors	Student type					
	Gifted			Non gifted		
	Rank	Average	Standard Deviation	rank	Average	Standard deviation
Palpable/serial	3	2.70	0.40	2	2.82	0.43
palpable /random	4	2.34	0.35	4	2.28	0.31
abstract/ serial	2	2.76	0.47	3	2.73	0.46
abstract/ random	1	2.91	0.44	1	2.91	0.42
metacognitive		2.68	0.33		2.69	0.31

The mean scores of gifted and non-gifted students on the metacognitive factors as a whole (serial/palpable, random /palpable, serial/abstract, random/abstract) were 2.68 and 2.69, respectively.

The mean range of the four factors of the gifted students was 2.34 to 2.91, and the mean range of the non-gifted students was 2.28 to 2.91.

The third question

Do statistically significant differences occur at the level of $p \leqslant 0.05$ between the correlation in the measurement of epistemological beliefs as a whole and the measurement of megacognitive thinking as a whole and its fields due to the student variable (gifted and non-gifted)?

We computed the two-sided correlation coefficients between epistemological beliefs as a whole and their factors, and megacognitive thinking as a whole and its fields for gifted and non-gifted students. These were then converted to Fisher's z values to indentify the significant differences derived from the types of student variable (gifted and non-gifted), as shown in Table (6).

Table 6: Showing linear correlations between epistemological beliefs scores and its factors and metacognition thinking scores and its factors, and the decimal values of z corresponding to it.

First scale	Second scale	student type	Correlation Coefficient	indicator	number	Z Decimal values	Z	Statistically Significance
Quick Learn	palpable serial	gifted	0.063	0.454	143	0.063	0.386	0.350
		Non gifted	0.014	0.879	116	0.014		
	palpable random	gifted	-0.101	0.230	143	-0.101	0.933	0.175
		Non gifted	-0.216*	0.020	116	-0.219		
	Abstract serial	gifted	-0.079	0.351	143	-0.079	1.179	0.119
		Non gifted	-0.224*	0.016	116	-0.228		
	abstract random	gifted	-0.088	0.294	143	-0.089	0.643	0.260
		Non gifted	-0.168	0.071	116	-0.170		
	metacognition	gifted	-0.065	0.442	143	-0.065	0.984	0.163
		Non gifted	-0.187*	0.044	116	-0.189		
certain knowledge	palpable serial	gifted	0.108	0.198	143	0.109	1.188	0.117
		Non gifted	-0.041	0.659	116	-0.041		
	palpable random	gifted	-0.150	0.074	143	-0.151	-0.920	0.179
		Non gifted	-0.035	0.711	116	-0.035		
	Abstract serial	gifted	-0.036	0.667	143	-0.036	1.100	0.136
		Non gifted	-0.174*	0.062	116	-0.175		
	Abstract random	gifted	-0.146	0.083	143	-0.147	-0.527	0.299
		Non gifted	-0.080	0.394	116	-0.080		
	Metacognition	gifted	-0.063	0.456	143	-0.063	0.389	0.349
		Non gifted	-0.112	0.233	116	-0.112		
Omniscient authority	palpable serial	gifted	-0.122	0.146	143	-0.123	-2.347*	0.009
		Non gifted	0.172	0.064	116	0.174		
	palpable random	gifted	-0.230*	0.006	143	-0.234	-0.781	0.218
		Non gifted	-0.135	0.150	116	-0.135		
	Abstract serial	gifted	-0.262*	0.002	143	-0.268	-0.960	0.169
		Non gifted	-0.146	0.118	116	-0.147		
	Abstract random	gifted	-0.122	0.148	143	-0.122	0.237	0.406
		Non gifted	-0.151	0.105	116	-0.152		
	metacognition	gifted	-0.235*	0.005	143	-0.239	-1.284	0.100
		Non gifted	-0.077	0.411	116	-0.077		
Innate ability	palpable serial	gifted	-0.001	0.993	143	-0.001	0.461	0.322
		Non gifted	-0.059	0.529	116	-0.059		
	palpable random	gifted	-0.086	0.306	143	-0.086	0.521	0.301
		Non gifted	-0.151	0.105	116	-0.152		
	Abstract serial	gifted	-0.143	0.089	143	-0.144	0.475	0.318
		Non gifted	-0.201*	0.031	116	-0.204		
	Abstract random	gifted	-0.091	0.277	143	-0.092	0.150	0.440
		Non gifted	-0.110	0.239	116	-0.111		
	Metacog-nition thinking	gifted	-0.108	0.198	143	-0.109	0.465	0.321
		Non gifted	-0.166	0.075	116	-0.167		
Simple knowledge	palpable serial	gifted	-0.028	0.742	143	-0.028	0.259	0.398
		Non gifted	-0.061	0.519	116	-0.061		
	palpable random	gifted	-0.113	0.179	143	-0.113	0.773	0.220
		Non gifted	-0.208*	0.025	116	-0.211		
	Abstract serial	gifted	-0.188*	0.025	143	-0.190	-0.207	0.418
		Non gifted	-0.163	0.081	116	-0.164		
	Abstract random	gifted	-0.078	0.353	143	-0.078	0.328	0.371
		Non gifted	-0.119	0.202	116	-0.120		
	Metacog-nition thinking	gifted	-0.129	0.123	143	-0.130	0.353	0.362
		Non gifted	-0.173	0.063	116	-0.175		
Epist-mological beliefs	palpable serial	gifted	0.009	0.917	143	0.009	0.111	0.456
		Non gifted	-0.005	0.955	116	-0.005		
	palpable random	gifted	-0.234*	0.005	143	-0.238	0.194	0.423
		Non gifted	-0.257*	0.005	116	-0.263		
	Abstract serial	gifted	-0.250*	0.003	143	-0.255	0.533	0.297
		Non gifted	-0.312*	0.001	116	-0.323		
	Abstract random	gifted	-0.183*	0.029	143	-0.185	0.239	0.406
		Non gifted	-0.212*	0.022	116	-0.215		
	Metacognition thinking	gifted	-0.209*	0.012	143	-0.212	0.342	0.366
		Non gifted	-0.250*	0.007	116	-0.255		

The values of Fisher's z indicate the existence of statistically significant differences at the level of p⩽.05 in favor of the gifted students. In terms of the correlation between the measurement omniscient authority factor of the epistemological beliefs and palpable serial factor of the metacognition scale, the decimal value of Fisher's z was 2.347.

5. Discussion

The results indicate that the range of mean sores of gifted and non-gifted students on the epistemological beliefs scores was homogeneous. The mean range (2.5 to 3.2) falls within the degree of frequency.

To discuss these results, the procedural definition of the non-gifted students is applied here. Those who applied for tests of excellence, but failed, were not accepted in the King Abdullah Schools of Excellence. Notably, one of the conditions of testing excellence was that the student's cumulative average was above 95%, indicating that gifted and non-gifted students were at the same academic GPA level. However, based on the test, they were classified as gifted and non-gifted. We can infer that these students possess similar characteristics. To examine the differences among these students, we must simultaneously compare more than one variable via correlation.

Results indicate that the degree of perception to epistemological beliefs that may be attributed to the beliefs of students is not fixed. For example, believing in relativity or changing of cognition cannot be determined by the students. They have faith that their belief cannot be changed, which is why mediation and hesitancy are manifested by student beliefs. It is similar to the belief of omniscient authority. Students believe that certain facts cannot be searched, discussed, or protested whereas other forms of evidence can be searched. This phenomenon can be attributed to the instability of education in schools and the use of traditional instructional strategies by the teachers, which weaken the personality of a gifted student, disallowing them from searching, exploring, and giving their opinions. Students may also face this obstacle in their study habits at home, in their communities, and their living environments.

The results of this study differ from those of Schommer and Dunnell (1994), which indicate that gifted students develop their beliefs about the nature of knowledge following quick learning and simple knowledge during their formal education. However, among non-gifted students, this remains unchanged. The results showed that epistemological beliefs about the speed of knowledge acquisition predicted achievement goals. Students who believed that learning occurs quickly or not at all were less likely to adopt mastery goals and more likely to adopt performance-avoidance goals.

Mean scores of gifted and non-gifted students on the metacognitive thinking factors as a whole were homogeneous. These findings are different from those of Carr and Borkowski (1987) and Alexander (1995), which indicated that gifted students use metacognition concepts more than ordinary students.

The results revealed a significant difference in the relationship between the field of "omniscient authority" and "serial palpable" in favor of non-gifted students. The value of Fisher's z was -2.347; this value is statistically significant.

The relationship appears logical, which is clearly shown in the results of the analysis for items of the fields "omniscient authority" and "serial palpable". For example, non-gifted students obtained a higher rank than gifted students on Item 6 of the field "omniscient authority", which states "You believe almost everything you read". Furthermore, the result of Item 4 of the field "serial palpable", stating "I think in clear beginnings and endings", is consistent with Item 6. The relationship between the two items is directly proportional in the case of non-gifted students. This indicates that students who think in clear beginnings and endings can believe almost everything they read.

By contrast, non-gifted students obtained a lower rank than gifted students on Item 34 of the field "omniscient authority" stating that "You need to evaluate the accuracy of the information in the textbook if the theme is familiar to you" and on Item 7 of the field "serial palpable" stating that "I have the ability to link common sequent parts". The relationship connectivity between these two items is inverse in terms of students. This indicates that non-gifted students do not have the ability to connect parts and find a relationship between them. They believe that all they read is true, and they believe that evaluating the accuracy of information in any book is unnecessary, regardless of familiarity. This is contrary to what gifted students believed, as indicated by the presentation of these two examples.

These examples and correlation results show that gifted students indicated signs of excellence and development in their beliefs, as well as in using strategies and metacognitive skills, as compared to non-gifted students. In the case of the first question, equality has emerged between gifted and non-gifted students due to the convergence of their characteristics. Conducting comparisons using more than one variable or the correlation between the variables is necessary to determine the factors of discrimination and development that operate between them.

Corresponding Author:
Dr. Wail Muil
Faculty of Education,
University of Malaya,
50603 Kuala Lumpur, Malaysia.
E-mail: Wail77@yahoo.com

References

1. Alexander, J. M. (1995). Development of metacognition in gifted children: Directions for future research. Developmental Review, 15(1), 1-37.
2. Barnard, Lucy, Lan, W. Y., Crooks, S. M., & Paton, Valerie Osland. (2008). The Relationship Between Epistemological Beliefs and Self-regulated Learning Skills in the Online Course Environment. MERLOT Journal of Online Learning and Teaching, 4(3), 261-266.
3. Belet, D., & Güven, M. (2011). Meta-cognitive Strategy Usage and Epistemological Beliefs of Primary School Teacher Trainees. Educational Sciences: Theory & Practice,11(1), 51-57.
4. Bendixen, L. D., Dunkle, M. E., & Schraw, G. (1994). Epistemological beliefs and reflective judgment. Psychological Reports, 75, 1595–1600.
5. Bonds, C. W., & Bonds, L. G. (1992). Metacognition: Development of independence in learning . Clearing House, 66(1), 56-60.
6. Bouffard-Bouchard, Thérèse, Parent, Sophie, & Lavirée, S. (1993). Self-regulation on a concept-formation task among average and gifted students. Journal of Experimental Child Psychology, 56(1), 115–134.
7. Carr, M., & Borkowski, J. G. (1987). Metamemory in gifted children. Gifted Child Quarterly, 31(1), 40-44.
8. Chan, L. K. (1996). Motivational orientation and metacognitive abilities of intellectually gifted students. Gifted Child Quarterly, 40(4), 184-193.
9. Costa, A. L. (1984). Mediting the metacognitive. Educational leadership, 42(3), 57-62.
10. Hofer, B., & Pintrich, P. R. (1997). The development of epistemological theories: beliefs about knowledge and knowing and their relation to learning. Review of Educational Research, 67 (1), pp. 88-144.
11. Kitchener, K. S. (1983). Cognition, metacognition, and epistemic cognition. Human Development, 26, 222-232.
12. Lang, J. (2013, July 17). Metacognition and student learning. The Chronicle of Higher Education. Retrieved from http://chronicle.com/article/MetacognitionStudent/130327/
13. Moos, D. C., & Finley, A. (2013, April). Self-regulated learning and Epistemological beliefs: A developmental perspective of pre-service teachers. Paper presented at the 2013 annual meeting of the American Educational Research Association, San Francisco, CA.
14. Nbina, J. B., & Viko, B. (2010, November). Effect of instruction in metacognitive self assessment strategy on Chemistry students self efficacy and achievement. Academia Arena, 2(1), 1-10.
15. Ozgelen, Sinan. (2012). Exploring the relationships among epistemological beliefs, metacognitive awareness and nature of science. International Journal of Environmental & Science Education,7(3), 409-431.
16. Pieschl, Stephanie, Stahl, E., & Bromme, R. (2009). Effects of task difficulty and epistemological beliefs on metacognitive calibration: A pilot-study. Proceedings of the 7th International Conference on Learning Sciences (pp. 529-535).
17. Rayn, M. P. (1984). Monitoring test comprehension: Individual differences in epistemological standards. Journal of Educational Psychology, 76, 248-258.
18. Risemberg, R., & Zimmerman, B. J. (1992). Self-regulated learning in gifted students. Paper Review, 15(2), 98-101.
19. Schommer, M. A. (1990). Effects of beliefs about the nature of knowledge on comprehension. Journal of Educational Psychology, 82(3), 498-504.
20. Schommer, M. A. (1993). Comparisons of beliefs about the nature of knowledge and learning among postsecondary students. Research in Higher Education, 34, 355–370.
21. Schommer, M. A. (1994). Synthesising epistemological belief research: tentative understanding and provocative confusions. Educational Psychology Review, 6(4), 293-319.
22. Schommer, M., & Dunnell, P. (1994). A comparison of epistemological beliefs between gifted and non-gifted high school students. Roeper Review,16(3), 207 – 2010.
23. Schommer, M., & Dunnell, P. (1997). Epistemological beliefs of gifted high school students. Roeper Review,19(3), 153 - 156.
24. Schommer, M., & Neber H. (2002). Self-regulated science learning with highly gifted students: the role of cognitive, motivational, epistemological, and environmental variables. High ability studies, 13(16), 59-74.
25. Shaver, J. P. (1992, July). Epistemology and the education of social science teachers. Paper presented at the International Conference on Subject-Specific Teaching Methods and Teacher Education, Santiago de Compostela, Spain.
26. Sternberg, R. G., & Davidson, J. E. (1986). Conceptions of giftedness. New York, NY: Cambridge University Press.
27. Topçu, Mustafa Sami; 1 Tüzün, Özgül Yilmaz. (2009). Elementary students' metacognition and epistemological beliefs considering science achievement, gender and socioeconomic status. Elementary Education Online, 8(3), 676-693.
28. Tsai, C. C., & Chuang, S. C. (2005). The correlation between epistemological beliefs and preferencestoward Internet-based learning environments. British Journal of Educational Technology, 36(1), 97-100.
29. Wilson, J. (1998). Assessing metacognition: Legitimizing metacognition as a teaching goal. Reflect, 4(1), 14-20.

9/6/2013