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Structural Modeling of Metacognitive Beliefs Affecting the Creativity of High School Students Farashband City

Mahboobe Ahmadi[1]*, Saeed Ahmadi[2]

[1] Master's degree in Educational Management, Islamic Azad University, Firoozabad, Iran.
[2] Associate Professor, Islamic Azad University, Firoozabat Branch, Faculty of Educational Sciences, Firoozabat, Iran.

***Corresponding Author**

Abstract: *Goal: the present research with the goal of structural modeling of metacognitive beliefs affecting the creativity of high school students was done among high school students of farashband city. Research method: research's statistical population were all the high school students of farashband 330 of whom were selected by stratified random sampling. The used tools in this study were metacognition questionnaire by Wells and cartwright-hatton (2004), and Torrance test of creative thinking (1989). Their validity and reliability, was calculated and confirmed using variable analysis and chronbach's alpha. Data analysis was done using structural equation method and Lisrel software. Results: the results of structural equation showed that metacognitive beliefs, is a positive predictive value of creativity in students (β=0.19, p>0.05). Conclusion: metacognitive beliefs are considered as one of the important tools in improving students' creativity and it is suggested that teachers use these beliefs for increasing creativity of students.*

Keywords: *Metacognitive Beliefs, Creativity, High School Students*

INTRODUCTION

Creativity is a dimension of cognition that had an effective role in the development of individuals and civilization. It is the infrastructure of invention and achievements in science and art (Sternberg, 2014). Studies about creativity also show that creativity is not a gift that specific people have because you can train it using suitable methods (Becker and colleagues, 2010). However in the explanation of creativity there are several theories that in their place have provided intellectual explanations for factors affecting the creativity (Yazarloo, 2013). Some people like Guilford (2008) believe that creativity has a metacognitive dimension and is related to processes excellent mental such as of thinking, intelligence, imagination and processing information. A group like Sternberg (2011) believe that creativity is a multivariable phenomenon factors such as community, family, character and cognitive abilities affect it at the same time (quoting Karamy, Karamy and Hashemi, 2013).

Some researchers including Baron (2013), believe that creativity is a structure that is combines with emotional and cognitive components (Survay and standard, 2010; quotes Kazemi, 2011). Sternberg (1988) also says that creativity is not a one dimensional concept and believes that the multidimensional cognitive and emotional abilities are the factors in creativity's emerging. He introduces creativity as thinking about matters

in an unusual way and reaching unique ways. He also considers thinking styles, knowledge, character, and the environment effective in creativity (quoting Fatehi, Abdekhodai, Pourgholami and Azarafrooz, 2014).
Regardless of multiple definitions in this area, metacognition is a very effective variable in the process of learning and education. Metacognitive beliefs is a variables that can be connected to creativity and also be influenced by changes caused by teaching cognitive and metacognitive strategies. (Kazemi, 2011).
Cognitive and metacognitive strategies are measures that help learning and reminding (Vafaii, 2013; Wells, 2013). Flavell (2000) defines metacognition as any knowledge or cognitive process that its subject aspect of the actions of cognitive and set is. In other words, he believes this issue since metacognition is the original meaning it knowledge about knowing (Niaz Azari, 2003) in fact, can be said if cognition includes receiving, processing, maintaining and transferring the information, metacognition is an action that encompasses and monitors the mentioned four elements (Karamy and colleagues, 2013).
Metacognition theory, is considered a dominant approach among a variety of learning theories (Mirza beigi, 2015). In fact, the education systems of developed countries try to make their education program and teaching method planning and also learning activity edition and student creativity based on metacognition theory (Lotfi, 2016). for nearly a decade the application of metacognition theory in teaching and growth of student's creativity ability has drawn a lot of attention in iran. To understand why the development of metacognitive beliefs is important we should analyze the process that observe the cognitive activities and lead them (Fooladband, 2016). These skills are effective and useful in evaluating the problem, finding creative learning strategies to solve them, evaluating the effectiveness of chosen strategies and changing strategies to improve metacognitive learning process. (Gholtash, Oji Nejad and Barzegar, 2010).
Studies in metacognition have made it quite clear that teaching metacognition methods and beliefs to students, can lead to considerable progress in their learning and growth of their creativity (Carcareglow, 2011). If creative thinking, is a stable fact, teaching methods of increasing the ability of metacognition in education programs of schools should be included in the present and future decades so that education system can benefit from its results more. Metacognitive beliefs improve the comprehension and other cognitive actions in students (Gasper, 2011). Metacognitive beliefs make students put all involved activities in a cognitive action under observation, from the beginning to the end and lead their learning path in a way that not only his mental processes efficiency is increased considering the available time and resources but he tries to find creative problem solving ways. (Teymoorifard and colleagues, 2012). Such trainings are useful tools for extending learning to other situations, and affects the growth of creativity ability in students (will, 2010).
On the other hand experts believe intelligence and creativity, is necessary for society's development and stable efficiency (Will, 2010). Therefore, increasing creativity and knowing its related factors, have been on the education systems' agenda for a long time. Studying researches related to creativity in Iran and also researcher's experiences in farashband's schools over the years show that creativity has been neglected in teaching and learning process in this city's schools, like other schools in iran. This matter has limited training creative people and entrepreneurs who are prerequisites of developing jobs in this city so much that despite having a lot of potential and suitable environment for entrepreneurship in this city, they are not used well and they're going to waste due to negligence of creativity in curriculum and lack of training creative people. This behavior, has turned schools to a factory in which it receives empty minds from one end and deliver them full of theoretical concepts without capabilities and certain skills from the other to society. Hence, in this research the relationship between metacognitive beliefs and creativity of students is going to be reviewed in the form of a structural model so that using the result teachers and school principles can identify and determine the dimensions of effective metacognition in the growth of creativity in students, before implementing solutions in schools that can lead to growth in student's creativity in the coming years in this city. certainly growth of creativity ability in the students who are supposed to build the future will also increase creative and entrepreneur people in the society and answers to the following questions:

1. Is there a significant relationship between the different aspects of metacognitive beliefs and creativity of students?
2. What dimensions of metacognitive beliefs are predictive values of creativity in students?

Theoretical foundations

creativity

Creativity has always been a mysterious, large and complex concept. Perhaps creativity can be considered the highest level of human learning, the greatest thinking capability and the final product of human mind and thought. But regardless of this old belief that considers creativity a result of mythical and metaphysical force, in the territory of new science and psychology and praxeology because of vagueness and the complexity of the nature of creativity, there are lots of disagreements among psychologists and mind and mental researchers in its definition and explanation. Accordingly, so far no definition has been presented comprehensive and complete enough that can include all dimensions and aspects of it. (soleymani, 2010).

According to the presented definitions we can mention some obvious features about creativity that can describe it well. The features include:

1. Creativity is a mental and psychological process.
2. The product of creativity can emerge in the form of an influence, idea, solution or any other things.
3. The product of creativity, is something new.
4. The product of creativity in addition to novelty, has value as well.
5. Creativity is a general ability and everyone has it more or less.
6. Creativity is trainable and is directly connected to the social and cultural environment.

Table 1: creativity definitions

Guilford (2008)	Creativity is a set of abilities and traits that lead to creative thinking
Mednick (1962)	Shaping associating elements into new combinations that are conformed to certain necessities or are useful in a certain way
Ghiselin (1954)	Creativity is presenting new qualities of concepts
Taylor (1998)	Considers creativity shaping experiences in new organizations
Bentley (2002)	Creativity includes using knowledge and abilities in new ways for reaching valuable results
Torrance (1998)	Creativity includes apprehending problems and difficulties, guessing and theorizing about deficiencies and evaluating and testing these guesses and theories, reconsidering and re-examining them and finally transferring results

Metacognition

The desire to know and struggle to understand are inseparable features of man's existence. Hence, man has always been involved in a huge selection of questions. In the meantime, this fundemental question, what a person knows about knowing, and how and how much he knows has always been important. This kind of questions lead us to the concept that is known today in learning psychology as metacognition. Metacognition expression was first used in the 1976 by flavell to describe a person's knowledge about processes and cognitive products or anything related it (Ashouri et al., 2009).

A diversity of definitions have been presented for metacognition. For example: a person's awareness of cognitive processes and strategies (Masters,1981; quote Flavell, 1985); thinking about thinking (Brown, 1984; quotes Glover and Browning 1990), the knowledge and control that is applied about thinking and learning activities (Cross and Paris 1998); knowledge about knowing (Miller 2002, quotes 2009) and person's knowledge about how to learn (Slavin, 2006, quotes Saif, 2007). Metacognition is a key for cognitive ability, which allows people control and reconstruct their thoughts and plays a fundamental role in learning (Gus and Wiley, 2007; quotes atarkhame, 2009).

Table 2: metacognition definitions

Masters (1981)	Person's knowledge of cognitive processes and strategies
Brown (1984)	Thinking about thinking
Cross and Paris (1988)	The knowledge and control that is applied about thinking and learning process
Miller (2002)	Knowledge about knowing
Slavin (2006)	A persons knowledge about the way of his learning
Gus and Willy(2011)	It's a key for cognitive ability, that allows people to control and rebuild their thoughts and plays a fundamental role in learning
Cacareglow (2011)	Means a person's knowledge from his thinking process and his ability to control this process

Gholami (2016) did a research called identifying the impact of teaching metacognition methods on creativity and educational improvement of high school juniors (girls) in science courses. The results showed that the rate of creativity and educational improvement of the experimental group in science courses who had been taught using metacognition method, was higher compared to the control group who had been taught using traditional method and the difference in their averages was significant.

In the another research Fooladvand (2016) did a research on effectiveness of teaching metacognitive beliefs on anxiety of exam in Birjand university students. Results showed that teaching metacognitive beliefs and states significantly reduced anxiety of exam and state-trait anxiety inventory.

In another research Gholamshahian (2015) studied the effect of metacognitive teaching on creativity, educational function and self-directed learning of sixth grade students (girls) in Shiraz. The results showed that after teaching metacognition to experimental group their creativity, educational function and self-directed learning was more than the control group. So its impact was significant.

Meybodi (2015) studied the relationship between creativity and metacognitive beliefs with teaching style of professors in associate degree in Meybod technical college for girls. Results showed that there is a positive and significant relationship between creativity and magisterial teaching method and creativity and fluid level inventory but there is no significant relationship with originality and elaboration and flexibility. There is a significant relationship between the primary teaching method and fluid level inventory and elaboration but not between originality and flexibility. Metacognition beliefs and positive beliefs and cognitive assurance have a positive and significant relationship with magisterial teaching method but cognitive self-consciousness and controlling negative thoughts don't.

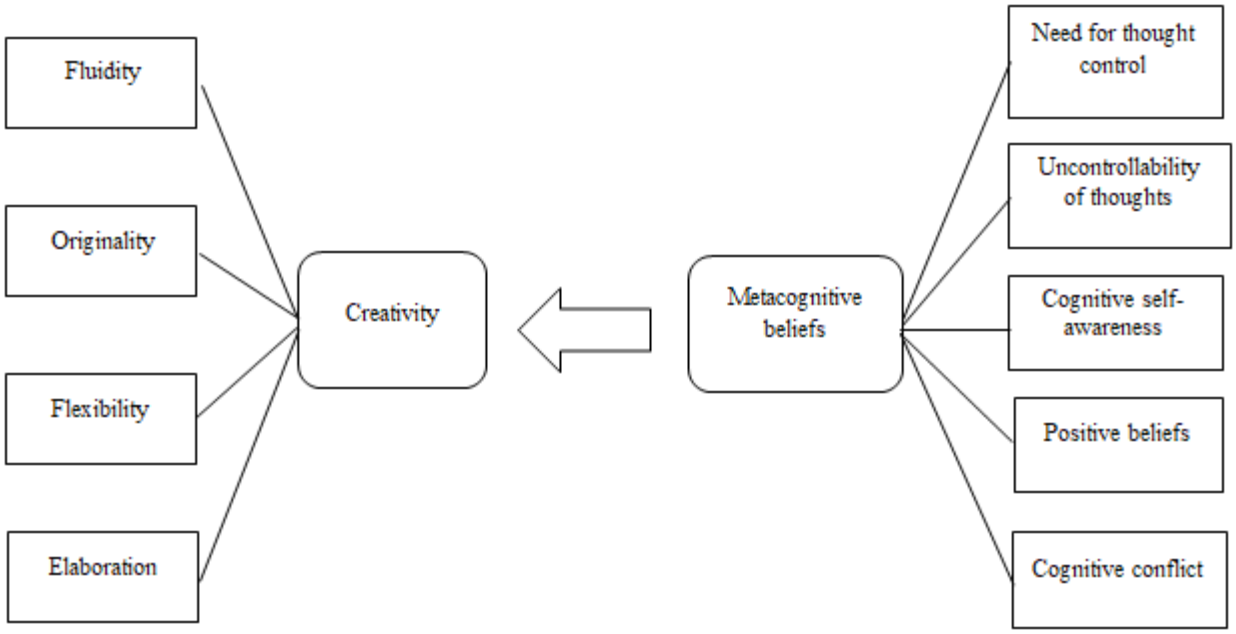
Ozsoy (2016) did a research with the purpose of describing metacognition as awareness and control over self-recognition, on high school students in Malaysia. He realized that the students who use metacognitive strategies are more successful and creative than students who don't.

Another research called determining the effective components of metacognition on creativity and successful learning by Eswanson (2015) was done. This research was done among teachers and students of a few colleges for boys in Spain. In his researches he came to the conclusion that metacognition plays the major role in successful learning. To evaluate the metacognitive activity and determine the effective components of metacognition, studying creativity and successful learning are both important.

In another research Dilekmen, Ada and Alver (2014) evaluated metacognitive strategies, processing information and growth of creativity in high school students in Canada's Ontario . In their research they found that metacognitive strategies cause efficiency, improvement of information process in memory and goal oriented and consciously learning and has an important role in the improvement, transfer and extension of learning from a position to a new one and also firm maintenance of learned content and creativity leads to a new and different point of view to the nature of a subject. There is no doubt that metacognitive strategies and

creativity are a preface to success in homework, earning and thus educational improvement and the experience of success in education creates a sense of self-esteem and value and capability in the student.

Conceptual model of research



Research Method

According to the fact that the present research deals with structural modeling of metacognitive beliefs that are effective on high school students' creativity, in terms of practical purpose and descriptive method is considered correlational, in this research creativity is considered as predictor variable and metacognitive beliefs as criterion variable. Statistical population of the research includes all the 1117 high school students in Farashband city who were studying in the 17-18 school year. It should be noted that 681 of them were girls and 436 were boys. In order to choose members, stratified random sampling was used. For this matter, first based on Morgan table sample size eas estimated 345 people. Then on the basis of students' gender, (61% girls and 39% boys) among city's high schools city 4 schools for girls and 2 schools for boys were selected randomly and questionnaires were distributed among their students. It should be noted that in order to make sure of getting back a high amount of complete questionnaires, 350 questionnaires were distributed among students and finally 330 completed ones were collected. For gathering information metacognitive beliefs questionnaire by Wells and Cartwright-Hatton (2004), and creativity test questionnaire by Abedi (1993) were used. Wells and Cartwright-Hatton (2004) metacognitive beliefs questionnaire is a self-reported scale of 30 variables that evaluates individual differences about metacognition beliefs, judgments and regulation tendencies. This questionnaire includes 5 subscales: 1- cognitive conflict 4- positive beliefs 3- cognitive self-consciousness 2- uncontrollability and the risk of thoughts (uncontrollability and danger cognitive confidence) 5- need for taught control. each variable is graded on Likeret's four sum scale. This questionnaire has acceptable reliability and validity. Obtained reliability through cronbach's Alpha coefficient for subscales in the range of 0.72 to 0.93 and reliability of retest for the total score, after 22 to 118 days, 0.75 and for subscales 0.59 to 0.87 have been reported.

In this research, validity and reliability of metacognitive beliefs questionnaire, were calculated using variables and chronbach's Alpha analysis by researcher (table 3). All variables showed a positive an significant relationship with total score under the following scales wich was the validity verification of this

questionnaire. Also high coefficients of Chronbach's Alpha, was the reliability verification of this questionnaire. The results of valiables and Alpha coefficient analysis are presented in table (3).

Table 3: calculate the validity and reliability of beliefs questionnaire

Reliability	Validity	Variable
0.87	0.0001 / 0.68 – 0.85	Metacognitive beliefs

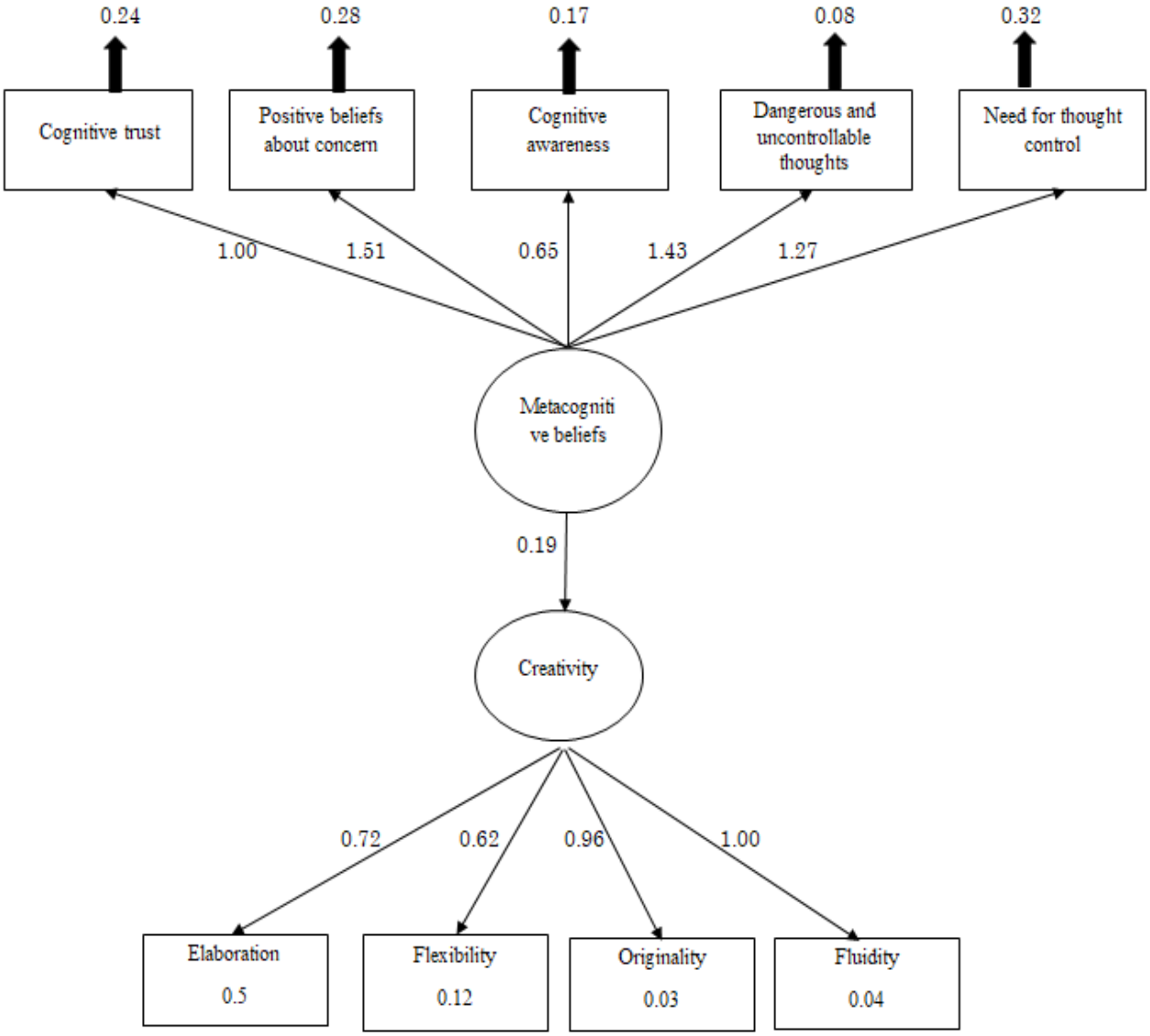
Creativity test questionnaire by Abedi (1993) has four factors that make creativity, including: fluid level inventory, originality, flexibility and elaboration that respectively includes 16, 22, 11 and 11 variables.
According to Abedi's (1998) research running his test with the main creativity test of Torrance simultaneously shows the significant correlation between both test's four factors (for example, the correlation between the two originality subtests was (r=497%) and between the two fluidity subtests was (r=468%)). Also the used test was confirmed in terms of validity of content (experts' opinion) confirmed. Abedi (1993) noted the reliability coefficient of the test between 80% to 90%. Based on the results of his research the reliability of the used creativity test that is concluded through re-examination on middle school students of Tehran in 1984, in four sections is as followed: reliability coefficient of fluidity section 85%, originality section 82%, flexibility section 85%, elaboration 80%.
It should be noted that due to the high credit of this questionnaire and its fitness in Iran and also its authority in evaluating creativity, it was not re-validated in this research.
At the end results analysis was done using Pearson correlation coefficient and multiple regression.

Findings

Table 4: test correlation Matrix for evaluating the relationship between different aspects of metacognitive beliefs and students' creativity

variable	Cognitive trust	Positive beliefs about concern	Cognitive awareness	Dangerous and uncontrollable thoughts	Need for thought control	Fluidity	Originality	Flexibility	Elaboration
Cognitive trust	1								
Positive beliefs about concern	0.19	1							
Cognitive awareness	0.14	0.15	1						
Dangerous and uncontrollable thoughts	0.22	0.34	0.17	1					
Need for thought control	NS	NS	0.35	0.30	1				
Fluidity	NS	NS	NS	NS	0.11	1			
Originality	NS	0.11	NS	0.17	0.11	0.33	1		
Flexibility	NS	0.11	NS	NS	NS	0.38	0.37	1	
Elaboration	NS	NS	NS	NS	NS	0.42	0.30	0.55	1

As it is shown in the table above the results showed that there is a significant and positive relationship between cognitive trust dimension and dimensions of positive beliefs about concern, cognitive awareness and dangerous and uncontrollable thoughts. But there is no significant relationship between cognitive trust dimension with the need to control thoughts, fluidity, originality, flexibility and elaboration dimensions.



Based on chart (1), metacognitive beliefs is a positive predictive value for creativity in the students (ß=0.19, p<0.05). In the metacognitive beliefs variables, positive beliefs about concern (with 1.51 loading), dangerous and controllable thoughts (factor loading 1.43), the need for thoughts control (with time 1.27), cognitive trust (with 1.00 loading) and cognitive awareness (with 0.65loading), respectively have the highest to the lowest explanation power and in creativity variable, fluidity (with 1.00 factor loading), originality (with 0.96 factor loading), flexibility (with 0.94 factor loading) and elaboration (with 0.74 factor loading), respectively have the highest to the lowest explanation power.

To determine the model fitting, using the 8.54 lisrel software, different values of fitness was calculated (table 6). Based on the table we can see that due to the elevation of the parameters of fitness, normed fit index (NFI), Comparative fit index (CFI), Incremenetal fit index (IFI), Root mean residual (RMR) and goodness of fit index (GFI) and deficiency of mean squared error (SRMR) the mensioned model has appropriate fitting.

Discussion and Conclusion

the results of analysis showed that there is a positive and significant relationship between cognitive trust dimension and positive beliefs about concern, cognitive awareness and dangerous and uncontrollable thoughts

and. This relationship also exists between positive beliefs about concern dimension and cognitive awareness, dangerous and uncontrollable thoughts, originality and flexibility, between cognitive awareness dimension and dangerous and uncontrollable thoughts and need for thought control dimensions, between dangerous and uncontrollable thoughts dimension and need for thought control and originality dimensions, between need for thought control dimension and fluidity and originality dimensions, Between fluidity dimension and originality, flexibility and elaboration dimensions, between originality dimension and flexibility and elaboration, and between flexibility dimension and elaboration dimension. But there is no significant relationship between cognitive trust dimension and need for thought control, fluidity, originality, flexibility and elaboration dimensons. this relationship does not exist between positive beliefs about concern and need for thought control, fluidity and elaboration dimensions, or between dangerous and uncontrollable thoughts dimension and fluidity, flexibility and elaboration. Relationship between metacognitive beliefs and creative of people has been approved in the researches of gholami (2016), Aghai meybodi (2015), Gholamshahian (2015), Sadatmirbod (2013), Eswanson (2015), Dilekmen and colleagues (2014), Linda (2011) dicot and oszoy (2010).
Metacognition beliefs is applied to a part of metacognition knowledge that connects a person's beliefs about cognition and cognitive and emotional beliefs. Metacognitive model has identified two types of metacognitive beliefs:

A. Positive metacognitive beliefs, are beliefs that related to the benefits and engaging in specific cognitive activities like concern, rumination, threat monitoring and etc. like (worrying about future helps me avoid danger).
B. Negative metacognitive beliefs, are beliefs that are related to uncontrollability, the importance and danger of thoughts and cognitive experiences. For example, if I have unfriendly thoughts I may act on them against my will. In metacognitive approach, metacognitive beliefs, are keys and tips that effect people's way of responding to negative thoughts, beliefs, symptoms and emotions (Wells, 2013) that this strategies, according to the nature of creativity process find a significant relationship with it because creativity is more acceptance power of experience. Responsiveness of mind towards experience requires conflict ambiguity and tolerance, lack of nonflexible comprehension and rejection of this belief that it knows all answers.

Also in the modeling part of the research according to chart (1), metacognitive beliefs, are positive predictive value of creativity in the students (β=0.19, $p<0.05$). In this field no similar studies were found from the researcher. In this regard, Novak (1998) considers metacognitive beliefs including, meta learning or learning about significant learning, and meta knowledge or learning the nature of knowledge. Metacognitive beliefs help the learners to understand that meaning comes from concepts and communication between the concepts and communication that we observe in the framework of our knowledge. Also learner is notified of his short-term memory's limited capacity and the important role that knowledge organization plays in long-term memory. In fact metacognitive beliefs help students to understand that the concepts of made of observed order in the objects or events, and language or symbolic tags we use to determine this order. In the making of new concepts creativity is involved and significant learning is the man process through which people get most of their significant knowledge (quoting Ozsoy and Ataman, 2012). Niaz Azri (2003) also believes that metacognitive beliefs, are consecutive processes that a person uses to control the cognitive activities and ensure fulfilment of cognitive goals. This process helps arrangement and review of learning and include planning and monitoring cognitive activities and evaluation of those activities' efficiency.
Accordingly in explanation of the obtained results it can be said that the cognitive and metacognitive beliefs come together. Cognitive strategies, are the necessary tools to learn content and text of lessons and metacognitive beliefs, provides monitoring and specific direction to use them and production of creative ideas. In other words, students can be trained to use different cognitive strategies more, but if they don't have the skills and basic and essential beliefs of metacognition to help them in the creative diagnosis use of any

strategy at its own specific situation and also the necessity of creating innovation in some of them, they won't be successful learners. At confirmation of this entry, Guilford (2005) also believes that creativity has a metacognitive dimension and is related to high mental activities such as thinking, intelligence, imagination and processing information. (quoting Sternberg, 2014).

At the end based on the results of the present study it can be suggested that:

- encouraging students frequently for the production of multiple ideas. They should be reminded that their the ones who must create various ideas and try to do it through the ways in which they find themselves.
- creating and providing a healthy environment by teachers in which there is no criticism and blame for suggesting creative ideas and everyone can suggest their ideas freely.
- teachers should provide a multipurpose space in class so that the student doesn't think that he is only supposed think about a specific field. In fact, teachers should not offer students packages of information and subjects, and ask them to think about them only. They can be creative when they are able to be find connections between different topics, and in other words, achieve a combination of knowledge.
- all students have the ability and talent to be creative and enjoy the experience of providing a ideas and it is possible if that teachers induce capability and ability in them through their attitudes and behaviors.
- basically learning in class should be in a way that learners learn to ask questions and questioning should be a part of their daily work. But most importantly is that they learn what questions to ask and how to do this do which it demands the effort of sympathetic teachers.
- growth of creativity like any other variable needs appropriate physical facilities. In fact, equipping school with smart classes, different Laboratories, up to date libraries, computer labs and etc. can play an important role in the growth of students' creativity.
- one of the reasons for lack of innovative thoughts among students, is the lack of understanding creativity, the nature of it, ways of education it and barriers of demonstrating creativity from the teachers. Undoubtedly, holding practical workshops for teachers in this area besides raising their awareness and understanding of creativity can help them in the introduction of the principles of increasing creativity in the classroom.
- a lot of learning difficulties and its transfer are due to lack of skills and metacognitive beliefs in students. So it's necessary that learners get the proper training in the field of skills such as positive beliefs about worries, cognitive awareness, dangerous and uncontrollable thoughts and the need for thought control. Hence increasing the awareness of students in this field through different formal and informal training is recommended.

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