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Developing a casual model of literacy based on metacognitive skills, self-regulated learning strategies and self-efficacy with the meditation of creative thinking in students

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ABSTRACT

Background and Aim: Some research has been conducted on the determinant of media literacy. However, this is less done in a causal mode. Therefore, the aim of this study was to develop a causal model of media literacy based on metacognitive skills, self-regulatory learning strategies and self-efficacy mediated by creative thinking in students. **Methods:** For this purpose, 318 students of Azad University, North Tehran Branch were selected as the subjects by available sampling method. Data were collected using the Media Literacy Questionnaire, Wells Metacognitive Skills, Pintrich and De Groot Self-Regulatory Learning Strategies, Schwarzer Self-Efficacy, and Abedi's Creative Thinking. Data were analyzed with the aid of structural equation modeling and AMOS-graphic software **Results:** The results showed that the fit of the proposed conceptual model of the research is approved, and all the three predictor variables of metacognitive skills, self-regulated learning strategies and self-efficacy mediated by creative thinking effect on media literacy. **Conclusion:** The findings of the present study can be used by universities, educational centers, IRIB, cultural centers and other related experts and can play a role in the development and improvement of media literacy.

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Introduction

In today's world, the media have gradually defined life for people and guided people's behaviors, attitudes and emotions in this way. Due to their continuous and effective presence in creating and shaping new lifestyles, the media have objective and at the same time virtual attractions. The media can satisfy people's social needs in a way and even beyond that, they can have a serious impact on building new collective thinking and culture (Parsakia et al., 2023).

In general, the power of thought and knowledge is one of the distinctive features of man and the main axis of his life; Throughout his life, man has never been free from thinking and has made decisions with the power of correct thinking and has been able to solve issues and problems and achieve growth and excellence (Dashti, 2015). Metacognitive skills are actually the ways by which we notice and recognize different information, decode it and store it in memory to recall and use it whenever needed. Self-regulation is an active and organized process in which learners choose goals for themselves, then try to regulate, control, and monitor their cognition, motivation, and behavior in order to achieve those goals. Self-regulated learning strategies include strategies that people use to regulate their knowledge and also use them to acquire various information. Identifying and strengthening these strategies will help people to learn more effectively by relying on their abilities and discovering and strengthening them. Self-efficacy beliefs affect people's feeling, thinking, behavior and motivation and mostly refers to people's perception of their abilities to do work and activities. Self-efficacy affects various aspects of human life, such as choosing goals, making decisions, level of effort, and the level of persistence and stability of a person when dealing with problems (Shams et al., 2011).

The concept of self-efficacy was first proposed by Albert Bandura (1977) in an effort to provide a unified theory for behavior change. Several decades of research have shown that self-efficacy beliefs have positive effects on various areas of people's lives and are used as an important mechanism in the treatment of mental illnesses. People with low self-efficacy feel helpless and unable to control their life events. People who have clear, well-defined, harmonious and stable self-efficacy beliefs have more mental health. These people have reached a clear view about themselves and are less affected by daily events and evaluations of these events.

One of the most prominent cognitive activities, which is considered by the World Health Organization as one of the pillars of the five basic life skills, is creativity (Farahani et al., 2010). Creative thinking means connecting unrelated things, finding a new way to solve a problem. Creative thinking enables a person to use his previous experiences and relate them to new successes; Also, the person will be able to find the connection between things that were previously unrelated, which is new and meaningful to the person; Finally, a person can use non-traditional methods to solve the problem (Ponki et al., 2016). On the other hand, according to the conducted researches, the problems of the young generation are mostly reported in the field of damage caused by weak thinking, quick belief, following advertisements, weakness in analysis and incorrect judgment about the opinions and opinions of others. Therefore, it can be said that having the skill of open and creative thinking in the young generation, especially when dealing with the media, is one of the most effective tools for young people. These lead to the prevention of social harms by preventing incorrect choices and incorrect judgments, as well as achieving the ability to solve problems (Jensen and Helles, 2011).

Achieving media literacy will give people the ability to split media definitions, decode the code lines that the media has programmed in people's minds, and replace their attitudes and insights with media programming. Studies indicate that in the field of education and learning, the way of knowing, cultivating discernment, how to learn, analysis and creative thinking are not emphasized enough and needed. In this regard, the need to increase creative thinking skills is felt as a prerequisite for solving problems as best as possible and facing the messages of the media world. Media literacy is somehow related to creative thinking (Shabani et al., 2011). As a result, the presence of creative thinking can help the media audience to make the best decisions regarding the selection of different contents. Of course, there are other variables that influence media literacy through the mediation of creative thinking.

According to what was described, the purpose of this research is to examine the fit of the causal model of media literacy based on metacognitive skills, self-regulation learning strategies and self-efficacy with the mediation of creative thinking in students.

Method

In terms of its purpose, this research is a part of applied research, descriptive-correlation method and structural equation modeling. In this research, the relationships between the variables have been investigated in the form of a causal model. The criterion variable (media literacy) has been explained using predictor variables (metacognitive skills, self-regulated learning strategies and self-efficacy) along with considering the mediation of creative thinking. The statistical population of this research included all students who were studying in the first and second semesters of the 2020-21 academic year in North Tehran branch of Azad Universities. The sampling method was available. In the structural equation modeling methodology, the sample size can be between 5 and 15 observations for each measured variable. In this research, we tried to select 15 people for each variable, and the total number of selected students is 318 (Homan, 2016).

Materials

1. Media Literacy Questionnaire: In order to collect data related to media literacy, media literacy test (MLT-35) was used. This test was developed and standardized by Ghorbani et al. (Ghorbani et al., 2016). At first, the questionnaire was reviewed by a group of experts in terms of logical validity, and then it was implemented after a trial run among the sample population with a volume of 662 people. In the analysis of the results, a number of questions were removed due to lack of correlation with the total score of the test, and 35 questions remained with a reliability of 84%. Confirmatory factor analysis and divergent verification were also used in the verification of the test structure. Cronbach's alpha coefficients for the subscales of "variety and skill of use" were 80%, "positive feedback to gathering and producing information" was 70%, and "critical view" was 66%.

2. Wells Metacognitive Skills Questionnaire: This questionnaire was developed by Wells in 1997 and consists of a 30-item self-report scale that measures people's beliefs about their thoughts. Answers to its questions are calculated using a four-point Likert scale from 1-I don't agree to 4-I completely agree. This scale has five subscales including: 1- Positive beliefs about worry; 2- uncontrollable and dangerous beliefs of worry; 3-Beliefs about cognitive adequacy; 4-General negative beliefs (including responsibility, superstitions, etc.); 5-Cognitive self-awareness. To calculate the score for each dimension, the scores for each question of that dimension are added together. Shirinzadeh (2006) has translated and prepared this questionnaire for the population of Iran. The Cronbach's alpha coefficient of the whole scale in the Iranian sample is reported to be 91%. For the subscales of uncontrollability, positive beliefs, cognitive self-awareness, cognitive confidence, and the need to control negative thoughts, 87%, 86%, 81%, 80%, and 71% were reported in the Iranian sample, respectively. In the validity of its instruments, which was done using factor analysis, they have been confirmed and its reliability with Cronbach's alpha for our total and subscales has been reported between 76% and 93% (Gordan and Yousefi, 2006).

3. Questionnaire of self-regulated learning strategies: Pintrich and de Groot (1990) were used to measure self-regulated learning strategies. This scale has 47 statements that are arranged in two parts: self-regulated learning strategies and motivational beliefs. The subscale of self-regulated learning strategies has 22 items and measures the three aspects of cognitive strategies, metacognitive strategies and resource management. The scoring method of this test is based on a five-point Likert scale. The reliability of the whole questionnaire is reported by Cronbach's alpha coefficient and is higher than 70%.

4. Self-efficacy questionnaire: To measure self-efficacy, Schwartz's self-efficacy questionnaire (1999; quoted by Kardani, 2010) was used. This questionnaire was compiled by Schwartz (1999; quoted by Kardani, 2019) and contains 10 items. The terms of this questionnaire measure people's general self-efficacy. Each statement is based on the concept of self-efficacy in Bandura's theory. In this questionnaire, people answer the questions based on a 4-point Likert scale (not at all correct, somewhat correct, somewhat correct, completely correct). The result of the validity

evaluation of Schwartz self-efficacy content shows the conformity of the test items with some cognitive components and the increase of self-efficacy in Bandura's theory. The correlation of this test with Scherer's self-efficacy test is 78%, and with Jerusalem and Schwarzer's general self-efficacy test is 75%, which is a sign of the convergent validity of this test. In terms of reliability, Schwartz's self-efficacy scale was standardized by Kerami (2013) and its reliability was reported as 91% through Cronbach's alpha coefficient. Kardani (2010) also obtained the reliability coefficient of Schwartz's self-efficacy test with Cronbach's alpha coefficient of 88%.

5. Abedi's Creative Thinking Questionnaire: The creativity assessment questionnaire, which is known as Abedi's creativity assessment test (CT), is based on Torrance's theory about creativity and was made by Abedi in Tehran in 1984. This questionnaire was revised several times and finally its 60-question form was compiled by Abedi at the University of California. This test has 60 three-choice questions, which consists of four sub-tests: fluency, development, innovation and flexibility. The reliability of Abedi's creativity test was obtained through the retesting of middle school students in Tehran in 1984 in four parts of the test as follows: The reliability coefficient of the fluid part is 85%, innovation is 82%, flexibility is 84% and expansion is 80% (Abadi, 1994). The internal consistency coefficient using Cronbach's alpha for the subtests of fluency, flexibility, initiative and elaboration on 2,270 Spanish students was obtained as 75%, 66%, 61% and 61%, respectively (Auzmendi et al., 1999).

Implementation

Due to the spread of the corona disease and the closing of face-to-face classes in universities and the absence of students in university environments, the questionnaire link was provided to the students through google form and the students clicked on it and were directed to the questionnaire completion page and proceeded to complete the questionnaires. Structural equation modeling method and AMOS-graphic software were used for data analysis.

Results

In terms of demographic findings, the statistical sample of the research was homogeneous. Descriptive results are given in Table 1.

Table 1: Descriptive statistics related to the investigated variables

Variable	Mean	SD	Min.	Max.	N
media literacy	63/42	11/03	31	91	318
Critical Thinking	92/10	13/25	26	130	318
Creative Thinking	134/81	15/86	68	180	318
Efficacy	29/37	4/96	17	40	318
Learning strategies	167/56	17/80	101	213	318
Self-regulatory	71/92	13/24	42	114	

The results of the fit indices of the proposed model are shown in Table 2. The initial fit check shows that only two indices CMIN/DF and PNFI have fit. However, GFI, IFI, AGFI, TLI, CFI and RMSEA indicators show the lack of fit of the model and, as a result, the need to modify the model.

Table 2: Examining the fit of the proposed model before and after the modifications

Index	CMIN/DF	GFI	AGFI	IFI	TLI	CFI	PNFI	RMSEA
Acceptable Range	1 to 5	>0/90	>0/80	>0/90	>0/90	>0/90	>0/50	<0/08
Initial proposed model	4/32	0/851	0/791	0/849	0/812	0/848	0/657	0/102
fit condition	Confirmed	Rejected	Rejected	Rejected	Rejected	Rejected	Confirmed	Rejected

Final modified model	2/92	0/907	0/863	0/918	0/891	0/917	0/675	0/078
fit condition	Confirmed	Confirmed	Confirmed	Confirmed	Rejected	Confirmed	Confirmed	Confirmed

In order to correlate the paths of errors, the proposed model was modified by adding four paths of error covariance and the fit of the model was re-evaluated, and in the re-evaluation of the fit, only the TLI index showed a lower fit (0.891). The results of fitting the model (before and after modification) are shown in Table No. 2. Therefore, the research model (causal model of media literacy based on metacognitive skills, self-regulation learning strategies and self-efficacy with the mediation of creative thinking among students is valid) was confirmed.

In order to investigate the causal-structural relationships between media literacy and metacognitive skills, self-regulation learning strategies and self-efficacy with the mediation of creative thinking, path analysis was used, and the results of direct paths are shown in Table 3. It shows that the direct correlation of metacognitive skills with creative thinking and media literacy, the direct correlation of self-regulated learning strategies with creative thinking, self-efficacy with creative thinking, and the direct correlation of creative thinking with media literacy is significant (01/ 0 > P). However, the direct relationship of self-regulation learning strategies with media literacy and self-efficacy with media literacy is not significant.

In order to check the significance of mediation relationships, bootstrap test was used in AMOS software. In this research, 1000 items have been selected for resampling. The confidence interval is also 95%. The examination of indirect paths is shown in Table 4

Table 3: Examination of standard and non-standard regression weights of direct paths

Path		Non-standard estimate	Standard Estimate	SD	Critical Ratio	Sig
From	To					
Metacognitive skills	Creative Thinking	-0/31	-0/81	0/19	-4/27	0/001
	media literacy	0/25	0/24	0/08	2/85	0/004
Self-regulated learning strategies	Creative Thinking	0/28	0/33	0/08	4/04	0/001
	media literacy	0/11	0/05	0/03	1/32	0/186
Self-efficacy	Creative Thinking	0/58	0/72	0/06	10/73	0/001
	media literacy	-0/02	-0/01	0/03	-0/34	0/737
Creative Thinking	media literacy	0/33	0/12	0/03	3/66	0/001

Table 4: Summary of the results of the bootstrap test to investigate the indirect paths

Predictive Variable	Mediating Variable	Criteria Variable	Non-standard estimate	Standard Estimate	Lower bound	Upper bound	Sig
Metacognitive skills	Creative Thinking	media literacy	-0/087	-0/082	-0/195	-0/033	0/001
Self-regulated learning strategies	Creative Thinking	media literacy	0/043	0/086	0/015	0/089	0/001
Self-efficacy	Creative Thinking	media literacy	0/089	0/190	0/040	0/148	0/001

The results of Table 4 show that the indirect effect of metacognitive skills with the mediation of creative thinking is significant indirectly on media literacy. Its effect with the mediation of creative thinking has a lower limit of -0.195 and an upper limit of -0.033, which according to the rule, zero is outside the range of the lower limit and the upper limit. This amount is significant at the 0.01 level. The indirect effect of self-regulation learning strategies through creative thinking on media literacy is significant (P < 0.01). The lower and upper limits of the bootstrap test are 0.015 and 0.089, respectively, and zero is outside this range. The indirect effect of self-efficacy through creative thinking on media literacy is significant, the lower and upper limits of the bootstrap test are 0.040 and 0.148, respectively, and zero is outside this range.

Conclusion

The general hypothesis of the research (causal model of media literacy based on metacognitive skills, self-regulation learning strategies and self-efficacy with the mediation of creative thinking among students is valid) was confirmed. In explaining this hypothesis, it can be said that media literacy is a variable that is significantly more influential than other variables. In today's world, as mentioned earlier, the young generation is facing a world of communication, especially in the virtual space. If the person has not learned how to use and function it well, or in other words has low media literacy, it is possible to be more exposed to social, psychological, etc. harms. Metacognition has a more important role in learning processes than intelligence, socio-economic background and motivation. He states that metacognitive skills can be increased and strengthened by using instructions and teaching specific exercises, thereby leading to improved learning performance (Van der Steele & Weinman, 2014). Metacognition plays an essential role in successful learning, and the higher the comprehensive cognitive abilities, the more successful the learning process will be (Dinsmore et al., 2008). Metacognition is key to cognitive ability, which allows people to control and reconstruct their thoughts and plays an essential role in learning. Also, metacognition can be understood as a person's awareness of his thinking process and his ability to control this process. Metacognition is a cognitive model that operates at a higher level and is based on monitoring and control (Khamene and Saif, 2009). Self-efficacy is one of the concepts emphasized in learning theories. Self-efficacy (a person's judgment about his abilities to successfully perform a task or task) is called (Wolfleck, 2004). Bandura's theory of self-efficacy (1977) emphasizes the role of confidence and self-esteem of a person in relation to his abilities in performing the desired behavior. Self-efficacy beliefs determine how much energy people spend on their activities and how much they resist obstacles. Self-efficacy is very effective on a person's behavior. For example, a student with a low level of self-efficacy may not even prepare for an exam because he thinks that no matter how hard he tries, it will not be useful (Ghanizadeh & Maufian, 2011).

Self-efficacy is one of the positive strengths of a person, which, in parallel with the development of positive psychology, has attracted the attention of many psychologists (Seligman et al., 2005). Self-efficacy forms the basis of human agency and is a key personal resource in transformation, adaptation and personal change. It means a person's effective judgment and judgments about his capabilities and abilities to organize and implement courses of action needed to manage the antecedent situations affecting his life. This issue affects how people think: self-esteem or humiliation, how motivated and persistent they are in facing problems, how healthy their emotional quality is and how vulnerable they are in dealing with depression and tension (Bandura, 2001).

Self-regulated learning is a suitable tool for gaining full knowledge of a skill that includes self-awareness, self-motivation, and behavioral skills. He considers self-regulation to be a set of skills that include "the ability to choose a goal, choose a strategy, self-monitor, change behavior to achieve a goal, manage time, self-evaluate, take responsibility and prepare for the future. Self-regulated learners are those who attribute their success to themselves and to the correct use of strategies rather than to uncontrollable factors such as luck. These learners evaluate the results of their performance (Moradi & Aghdasi, 2015). On the other hand, people with creative thinking are actively able to direct their desires and interests and manage them in the right and logical direction. Agha Mohammadi (2012) believes that creativity is the ability of mental processes that lead to the creation of new

and unique solutions, ideas and theories. On the other hand, it should be said that the ability to think critically and think creatively is essential for students; Shabani et al. (2011) believe that it is better for students to learn how to think and how to make decisions and judge about different issues instead of engaging their minds in learning scientific facts and be able to create their own new and innovative points of view in be different fields, which actually means having creative thinking.

Another part of the research results showed that metacognitive skills have an effect on students' media literacy through the mediation of creative thinking. The indirect effect of metacognitive skills with the mediation of creative thinking on media literacy is significant. By reviewing the research background, no research was found that directly investigated this issue, but it can be said that this finding is somewhat similar to the findings of Jacobson and Vico (2010), Akstrand (2009) and Piskina et al. (2011) is aligned.

In other words, when students have higher creative thinking, their metacognitive skills and media literacy will increase. In this context, Jacobsen and Vico (2010) believe that metacognitive skills are influenced by other factors, including the effective use of media and information tools. On the other hand, Akstrand (2009) has pointed out that media literacy strengthens problem-solving ability, creativity and metacognition. Therefore, it can be said that improving media literacy and then using metacognitive skills can have a significant impact on students' creativity.

It should also be noted that based on the findings of this research, as mentioned earlier, there is a positive relationship between media literacy and creative thinking, and with the increase of media literacy, students' creativity score increases. Also, the media literacy fund equips students with tools that they can use in the fields and situations where there is a possibility of creativity and show their abilities in this field. Also, they can link the obtained information with their previous knowledge in a way that leads to the production of new knowledge, and this itself can be the basis for creative thinking.

Another result obtained in this research is that self-regulated learning strategies with the mediation of creative thinking have an effect on students' media literacy. The indirect effect of this variable through creative thinking on media literacy is significant. By reviewing the research history, no research was found that was conducted directly and precisely with this title, but it can be said that it is somewhat in line with the findings of Zilinska et al. (2021).

On this basis, as mentioned before, the spread of information technology and the penetration of mass communication tools into the depth of society has also transformed the tools and methods of education in society. This evolution is in the direction that every person can learn at any time and place with special facilities. Media literacy is a variable that can be taught to people to control and analyze all kinds of messages received from this space, so that people can use this information well and in the right direction. Self-regulation is also a process that helps the learner acquire certain skills to improve his performance (Phan, 2010). Therefore, it can be concluded that when a person has high creative thinking skills, he will be able to learn skills such as media literacy and self-regulation learning strategies better and faster and use these trainings optimally and correctly in different situations.

Another part of the research findings shows the confirmation of this hypothesis that self-efficacy has an effect on students' media literacy through the mediation of creative thinking. The indirect effect of self-efficacy through creative thinking on media literacy is significant. This finding is somewhat in line with the findings of Bagto (2006).

In explaining this finding, it should be said that, as mentioned earlier, self-efficacy, when it is present in a person along with creative thinking skills, will be able to influence or predict the level of media literacy. Media literacy in students, as it was examined before, as a capability will allow them to effectively interact with the media and other information providers and act actively and dynamically during such situations. Creative thinking is also a skill with which a person can make a significant amount of correct decisions and solve problems and face the upcoming challenges well. On the other hand, self-efficacy also refers to people's perceptions of their abilities to perform various tasks and activities. People with high self-efficacy believe in their abilities and consider difficult issues as challenges to be mastered (Bong, 2008). Therefore, when these two

components appear together, they can have a positive effect on each other and also predict each other's level.

One of the limitations that can be seen in the current research is that most of the participants in the research are female students. Therefore, other researchers who intend to conduct such research are suggested to consider these factors (unmatched number of groups) which may have distorted the research results in some cases. Another limitation of this research is that the largest number of subjects are related to undergraduate studies, so it is suggested that students studying in post-graduate courses should also be examined and evaluated in future research. According to the results of the research, it is suggested to establish effective, useful and productive communication between universities and educational centers and media organizations, including radio and television, regarding the holding of brainstorming sessions. Then, in the fields of developing metacognitive skills and creativity, taking advantage of promoting media literacy, necessary measures should be taken. Also, according to the results of the research, the strengthening of self-regulated learning strategies in students, which is one of the most effective factors for their success in the education stages, is possible through familiarity with cognitive and metacognitive skills. Considering that the practical training of such skills is limited in universities, the formation of numerous classes and workshops in this field should be given more attention. Therefore, it seems that it is necessary to teach a series of skills in providing suitable solutions for learning in the educational environment.

Conflict of Interest

According to the authors, this article has no financial sponsor or conflict of interest.

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