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The Effectiveness of Meta-cognitive Skills Training on the Motivational Structure and Academic Performance of Drop-out Students

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Abstract
Background: Meta-cognitive skills training through giving meaning to information and making a logical connection between new and previously learned content, enables students to learn better and improve their academic performance. The present study was carried out to investigate the effectiveness of meta-cognitive skills training on the motivational structure and academic performance of drop-out students.
Methods: This study considered as semi-experimental research which has used the pretest-post-test with control group design. In this study, the statistical population included all drop-out male and female students of the Sari Agricultural Sciences and Natural Resources University (They entered the university in 2014 and considered as drop-out students for at least two years). Thirty students were selected using the purposive sampling method, who randomly divided into two groups of experimental (n=15) and control (n=15). Meta-cognitive skills taught to the experimental group within four sessions. The Motivational Structure Questionnaire (MSQ) and academic performance report card were used to collect data. Covariance analysis and SPSS-24 software used for data analysis.
Results: According to the results of covariance analysis, there is a significant difference between the experimental and control groups ($P<0.001$). Therefore, it can conclude that meta-cognitive skills training a significant effect on the motivational structure and students' academic performance.
Conclusion: Due to the results of this study, it is imperative that university officials pay attention to the effect of the meta-cognitive training program on the motivational structure and performance of drop-out students and provide the proper context for relevant skills training in the counseling department, the department of social affairs and educational field.
Keywords: Meta-cognitive skills training; Motivational structure; Academic performance; Drop-out students.

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Introduction

The students' academic failure, and consequently students drop-out of universities considered as one of the major problems of higher education institutions in the country, which not only leads to a waste of money and time, but also it will be associated with psychological, family and social problems for students.[1] According to the results of the studies, about 12% of university students drop out for at least one semester studying, which not only may it lead to mental problems for students, but also expose them to educational deprivation in terms of academic achievement, so that it may not be possible to compensate for this educational problem for students.[2] There are different active factors on students' academic failure and drop-out, including inappropriate internal and external factors of the educational system. For example teacher teaching methods, invalid evaluation methods,

the lack of educational programming for each semester, the inappropriate physical and social environment of the classroom, as well as the students' interest in the courses and field of study along with the economic, welfare and family status of students.[3] Motivation plays an essential role in students' academic performance and learning occupational and educational skills while studying at the university, in such a way that there is a direct relationship between motivational strategies with the success of the students and needs special attention.[4] Academic motivation considered as one of the requirements of learning that determines the intensity and direction for the behavior and helps the learner to maintain it. The motivation is what gives the energy to the learner and guides his activities.[5] According to Porter et al, the motivation consists of 3 main elements: (A) Activating forces: It refers to forces which make each person behave

in a certain way; (B) Guiding forces: It guides behavior to something, or in other words, the motivation is purposive. (C) Continuing forces: It empowers and sustains human behavior in order to achieve the goal.[6] In the meantime, the motivational structure refers to a set of components that determines the success of individuals in achieving multiple goals in life, including in the family-related goals.[7] Cox and Kelinger believe that there are two types of adaptive and maladaptive motivational structures. They examined the characteristics of each motivational style and concluded that people with maladaptive motivation style tend to stimulate their emotions through unhealthy; they usually seek avoidance goals and believe in pursuing goals. Achieving goal has a little pleasure for them, and failure in achieving the goal will also upset them a bit. Furthermore, these people pursue their goals without thinking about success or failing to achieve them. In general, they seek and pursue their goals in a non-realistic way, and achieving the goals is not essential to them. In contrast, people with an adaptive motivational style use their benefits to pursue healthy goals.[8] This theory has two basic points: (a) Individual's motivational structure plays a vital role in success or failure for achieving the goals; (b) if individuals fail to achieve their goals, they experience unpleasant feelings which can play an essential role in their decisions and behaviors.[8]

It is essential to take the necessary measures to resolve the problems caused by students' academic failure and drop-out. Over the past two decades, a new wave is created in psychology by cognitive-behavioral methods.[9,10] Meta-cognitive skills training is one of these methods. Cognitive and metacognitive awareness is of utmost importance in a modern era because learners need skills to control and set their learning.[11] The meta-cognitive skills include awareness of cognitive processes and achievements. Flavell believes that cognitive skills are used to facilitate learning. However, meta-cognitive skills are used to review advancement in learning. Two main components of meta-cognition are (1) Knowledge and meta-cognition control and (2) study-related methods and skills, each of which has subcomponents that cover meta-cognitive awareness.[12] In general, there are three necessary components of meta-cognition, including meta-cognitive knowledge, meta-cognitive control and monitoring, and control and monitoring of emotions and motivation during learning tasks.[13] Learning meta-cognitive strategies enables the person to monitor all the involved actions in a cognitive process from beginning to end and direct its learning process aimed to increase the productivity of its mental processes in relation with available time and space. These types of training considered as useful tools to generalize learning to other spatial and temporal situations.[14] These strategies refer to reviewing skills that activated during learning, and the tasks are performed more difficult if an individual is not able to check its responses, to spend enough

time for study or to determine the level of information previously learned. The use of meta-cognitive strategies leads to facilitate learning; in other words, meta-cognitive strategies considered as the tools for guiding and monitoring cognitive strategies.[15] De Boer et al, during a study, concluded that metacognitive strategies training in students has a significant effect on improving their long-term academic performance.[16] In 2015, Aydın during a study concluded that the use of meta-cognitive strategies plays an essential role in improving the academic motivation of high school students.[17] Ostovar and Abedi, during a study, concluded that one of the essential factors in academic achievement is having an internal motivation for learning and effective use of cognitive and metacognitive strategies.[18] Also, Sepahvandi et al, during their study, concluded that meta-cognitive skills training leads to increase students' motivation significantly.[19] As a result, as mentioned earlier, it is better to identify and screen students who are at risk of drop-out and the proper context provided for improving their academic status with appropriate educational decisions and changes in educational methods and implementation of skills programs. Therefore, the present study has examined the effectiveness of meta-cognitive skills training on the motivational structure and academic performance of drop-out students.

Methods

This study considered as semi-experimental research which has used pretest-post-test, control group design. In this study, the statistical population included all drop-out male and female students of the Sari Agricultural Sciences University (They entered the university in 2014 and considered as drop-out students for at least 2 years). Thirty students were selected using the purposive sampling method.

The structured motivational questionnaire was distributed among all male and female undergraduate students of Sari University of Agricultural Sciences. Who had two mentioned conditions, then 30 students were randomly selected among the individuals with the lowest academic performance (according to the grade point average of the previous semester) and the level of motivation, and they divided into two groups of experimental and control (15 students in each group). The inclusion criteria included studying for a bachelor degree, entering the university in 2014 and low academic performance and motivational level, informed consent for participation in research and exclusion criteria included: suffering from physical and psychological disorders, previous participation in similar intervention plan and if the participates were absent for more than two sessions. Before the educational program implemented, a pre-test test has taken from both groups in one session. Next the experimental group was subjected to meta-cognitive

skills training in 4 sessions (each session 2 hours), but the control group did not receive any interventions, but they closely monitored in parallel to the experimental group, and the same way was used to select and assign the subjects and implement the questionnaires for both groups (Table 1). The Motivational Structure Questionnaire (MSQ) and academic performance of the students by their report card were used to collect the data. Data analysis was performed using covariance analysis by SPSS-24 software.

Motivational Structure and Personal Concerns Inventory

The personal concerns of this questionnaire were developed by Kelinger in 1995 to measure motivational patterns.[20] Respondents asked about ten significant fields of their lives: home and home-related affairs, financial issues, friendly and family relationships, leisure time, love, health, personal changes, academic affairs, religious affairs, and substance use.

Each person should consider her/his most pressing concern, wish, or goal in each of these fields, and assign scores from one (at all) to ten (completely) to that goal according to 11 following dimensions: 1. Appetitive action (to get, obtain, or accomplish), 2. Aversive action (a rate that wants to avoid it), 3. Perceived control (control limit that shows to reach or avoid from his/her aim), 4. Knowledge (about how to achieve the goal), 5. Chances of success (if I do my best), 6. Chances of success if not try (success probability with no trying), 7. Joy (expected from achieving the goal), 8. Conflict (expected unhappiness from achieving the goal), 9. Sorrow (from failure to achieve the goal), 10. Commitment 11, Goal distance (how long it would take to reach the goal). An indicator obtained after calculating scores for each dimension and a motivational profile can draw for each person — two general factors obtained from the factor analysis of these dimensions. The first factor, the adaptive motivational structure, indicates the existence of the essential elements for achieving the goals and the second factor, the non-adaptive motivational structure that will less successful in achieving the goals and experience more negative emotions. According to the evidence, this questionnaire has an acceptable validity. Klinger and Cox have used Cronbach alpha method to determine the internal

consistency coefficient of the questionnaire in students; it was equal to 0.81.[20] In Iran, the internal consistency of each of the components and for the whole test is appropriate.[21]

Results

Table 2 shows the mean and standard deviation of the motivational structure scores and the average scores of the subjects by the groups' understudy in the two stages of measurement (pre-test and post-test). As listed in this table, the scores of post-test among the experimental and control groups increased compared to the pretest, but in the control group, no significant differences observed in the mean scores in the pre-test compared to the post-test stages.

The covariance analysis was used to investigate the effect of meta-cognitive skills training on the motivational structure and academic performance of the subjects. In order to analyze the covariance, the main assumptions of this test, including the assumption of variance-covariance matrices, homogeneity of variances, and normality of the data, were investigated and confirmed.

According to Table 3, a significant difference observed between the experimental group and the control group in terms of dependent variables at $P < 0.001$. Therefore, it can conclude that there is a significant difference between the two groups at least in one of the dependent variables (motivational structure and academic performance). The multivariate covariance analysis was performed to examine this difference, and the results presented in Tables 4 and 5.

A significant difference was observed between the two groups, as shown in Table 4 (F = 50.64, $P = 0.01$). Therefore, it can conclude that meta-cognitive skills training has a significant effect on the students' motivational structure (Table 4).

Table 2. Mean, and Standard Deviation of Motivational Structure and Mean Scores at 2 Measurement Stages for 2 Groups

Group	Stage	Motivational Structure		GPA	
		Mean	SD	Mean	SD
Experimental	Pre-test	64.30	3.24	10.46	0.91
	Post-test	70.57	2.58	12.02	1.48
Control	Pre-test	64.31	8.90	10.02	1.26
	Post-test	62.18	6.12	10.39	1.01

Table 1. Summary of Meta-Cognitive Skills Training Sessions

Sessions	Session Content
Session 1	The participants were welcomed, expressing the importance of the curriculum outline including definition, cognition and meta-cognition, initial familiarity with major cognitive and meta-cognitive strategies
Session 2	Metacognitive strategies training: planning strategy, control, and supervising strategy, ordering strategy, active teaching of meta-cognitive strategies with operational examples
Session 3	Learning & study Strategies, Content Criticism, Determining the objectives of Study, Estimating and managing the time of supervision on academic achievement, assessing the level of mastery in courses, and determining the tasks and investigating the tasks of the educational implementation of the methods and setting goals and time management, and examining students' mastery of the learning subject
Session 4	Self-directed study techniques, motivation improvement, critical thinking, positive beliefs, responsibility, cognitive self-awareness, self-esteem and self-regulation, technique affecting learning - metacognitive and, finally, reviewing contents

Table 3. Results of Multivariate Tests to Investigate the Effect of Meta-cognitive Skills Training on Motivational Structure and Academic Performance

Test	Value	F	df Hypothesis	df Error	Statistical Power	P
Pillai's trace	0.87	91.83	2	27	1	<0.001
Wilks's lambda	0.12	91.83	2	27	1	<0.001
Hotelling trace	6.81	91.83	2	27	1	<0.001
Roy's largest root	6.81	91.83	2	27	1	<0.001

Table 4. Summary of Covariance Analysis to Investigate the Effect of Meta-cognitive Skills Training on Motivational Structure

Source of Change	Sum of Squares	df	Mean of Squares	F	P	Effect Value
Pre-test	336.97	1	336.97	32.33	0.001	0.24
Group	527.86	1	527.86	50.64	0.001	0.65
Error	281.40	27	10.24			
Total	657	30				

Table 5. Summary of Covariance Analysis to Investigate the Effect of Meta-cognitive Skills Training on Academic Performance

Source of Change	Sum of Squares	df	Mean of Squares	F	P	Effect Value
Pre-test	15.37	1	15.37	11.79	0.002	0.24
Group	12.92	1	12.92	14.03	0.001	0.30
Error	29.58	27	1.09			
Total	73	30				

Also, according to the results of covariance analysis in Table 5, there is a significant difference between the two groups (F = 14.03, P = 0.001). Therefore, it can conclude that meta-cognitive training has a significant effect on students' academic performance.

Discussion

This study was carried out to investigate the effectiveness of meta-cognitive skills training on the motivational structure and academic performance of drop-out students. According to the results of this study, meta-cognitive skills training has a significant effect on the motivational structure and academic performance of drop-out students. Therefore, it can conclude that meta-cognitive skills training has a significant effect on improving the motivational structure of students. This result is consistent with the results of the studies conducted by Aydin,[17] Jiang and Kleitman,[22] Sepahvandi et al,[19] Karimi et al,[23] and Rostami and Ali Abadi.[24] In explaining this result, many students have problems with motivation and depression during their studies due to various reasons.[25]

It can say that meta-cognitive skills will facilitate achieving the goals by influencing the components of the motivational structure components such as the amount of passion and motivation, the way of achieving the goal, control, avoiding situations that prevent achieving the goal, and also efforts, commitment, and satisfaction. This training enables students to strengthen their motivational strategies by gaining thinking skills to maintain its result.[26] In fact, students earned a high score after meta-cognitive skills training in the adaptive motivational structure, and had an optimistic view toward achieving their goals, had much commitment to achieve their goals, and was able to control the situations well, and they also predicted their the rate of success in achieving the goal in the near future. They were involved with their goals emotionally; that is, they would be glad if they succeeded and would be very sad if they did not achieve their goals. Also, they reported an enthusiastic pattern for achieving their goals; according to this pattern, a person tends to try to achieve their goals instead of avoiding desirable things.[27] Meta-cognitive skills improve the ability of students to control their thoughts and cognitive regulation, which creates a sense of optimism and domination of the environment. Therefore, such individuals are more motivated to grow and develop. There is a significant relationship between a sense of greater control, which considered as one of the consequences of the learning of meta-cognitive skills, and the motivation for high academic achievement.[28]

According to another result of this study, training of meta-cognitive skills has a significant effect on improving students' academic performance. This result is consistent with the results of studies conducted by De Boer et al,[16] Alcı and Yuksel,[28] Kocak and Boyaci,[29] Schleifer et al,[30] Noori et al,[31] Ostovar and Abedi.[18] In explaining this finding, it can be noted that meta-cognitive skills training enables students to gain by thinking and to develop new thinking skills and learning transfer skills to new situations. The learning process can be facilitated through meta-cognitive strategies training by helping to organize intellectual, behavioral, social, self-evaluation, oral practice, self-learning, and self-awareness patterns. An active approach to education can be created by the meta-cognitive strategies training, which helps the learner understand the importance of the application of cognitive strategies and processes. The most important advantage of meta-cognitive knowledge is to make possible the learner to be aware of his/her learning activity every moment and his/

her progress and to be able to identify his/her weaknesses and strengths, and in this way, he/she will be willing to advance and improve academic performance. Also, meta-cognitive skills training helps the learner control his/her progress during learning. He will be able to evaluate his/her efforts and measure his mastery of the contents learned, and finally, the learner will be able to acquire a better understanding of the contents.[32] Also, academic performance can be improved by metacognitive strategies training through learning skills training, repeated practice on skills learning, organizing and storing knowledge and ease of use of the skills, planning, monitoring and control, management in time setting, how to make efforts, selecting the right environment for studying, getting help from other people, controlling anxiety, avoiding procrastination, highlighting information and revising them. The strategies above make the learners enable to master their learning and study process and plan for it by regulating the mind and the type of study of individuals. It seems that repeated practice on these skills improves academic performance in the long run.[33] Meta-cognitive skills training enables learners, students, to learn the contents by giving meaning to information, making a logical connection with previous contents, controlling this process and creating an appropriate learning environment when teaching by professors and teachers or when studying, finally, they will be able to improve their academic performance. Also, meta-cognitive skills develop the intellectual and mental processes of learners dynamically, and given that some dimensions of meta-cognition are affected by rational processes directly,[32] thus, it is not unexpected the confirmation of the effect of meta-cognition and its training on academic achievement. The present study has associated with some limitations, including generalizing the results. This study was carried out on students studying for a bachelor degree at Sari Agricultural Sciences and Natural Resources University. Therefore there are limitations to generalize the results to students of other degrees and disciplines.

Conclusion

According to the results of this study, meta-cognitive skills training plays an essential role in the motivational structure and academic performance of students. Due to the results of this study, it is imperative that university officials pay attention to the effect of the meta-cognitive training program on the motivational structure and performance of drop-out students and provide the proper context for relevant skills training in the counseling department, the department of social affairs and educational field.

Conflict of Interest Disclosures
The authors declare that they have no conflict of interests.

Ethical Statement
All ethical principles were considered in this research. The

participants were informed about the purpose of the research and its implementation stages and signed the informed consent; they were also assured about the confidentiality of their information; Moreover, they were allowed to leave the study whenever they wish, and if desired, the results of the research would be available to them.

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