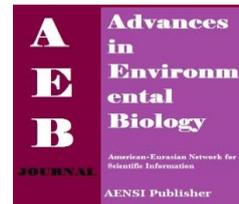




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### The Influence of Self-Regulation Skills Training and Self-Efficacy on Academic Achievement of High School Students

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#### ABSTRACT

Objective: The present study investigated the skills of self-regulation and self-efficacy beliefs and their effects on academic performance of students in a qualitative/quantitative method. Male and female students in the secondary schools of boys and girls in Fasa were selected initially and responded to a questionnaire with open questions. Through content analysis of the responses to questions, the type and frequency of self-regulation strategies were explored. The main strategies were the inner dialogue of performance, environmental control, inner dialogue of domination and non-productive strategies. Strategies of self-reinforcement to interest creation and self-efficacy were reported as less frequent respectively. Cognitive strategy of mental rehearsal was reported more than complex strategies like organizing or critical thinking.

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#### INTRODUCTION

It is one of the most important concerns in twenty-first century on how to train students to have self-regulation and self-efficacy and to be able to adapt themselves to the changes and unpredictable events. Such learners can actively participate in the learning process confidently and accept the responsibility of their learning. Some experts believe that the self-regulated learners are more prepared for life in the community of the changing future [1]. Self-regulation and self-efficacy are two key concepts in social cognitive theory argues that self-regulation learning models have been proposed after the 1980s and their simultaneous emphasis on spontaneity, meta-cognition, behavioral and learning activities enabled them to find great popularity among educators and experts[2]. Moreover, the theory covers a wide range of theories and research in the area of cognitive science, behavioral, motivational, and social areas and this led to the complexity and importance of understanding self-regulatory learning. Historically, over the past two decades, research on learning about self-regulatory learning has been done and educational psychologists have offered some models in this regard3.

In addition, cultural and longitudinal studies have been conducted in this area, but the problem with this phenomenon and similar ones is related to the differences between theoretical orientation and background of researchers involved which have influenced the definition of self-regulation, the method of investigating self-regulation learning and even its naming. Boekaerts4 believes that self-regulation is not an event but a series of cognitive and emotional processes interacting with each other in an information processing system. The present research is based on social cognitive theory. Social cognitive theory emphasizes the importance of motivational factors such as self-efficacy beliefs, documents, and purposeful behavior in purposeful goals setting. When a person is engaged in a purposeful behavior, he should review his behavior, judge the consequences, and react to the consequences of actions to set up his behavior.

These researchers consider objectives that students have and believe that a learner may be aware of his options in terms of meta-cognitive learning and know how to use necessary resources in special environments but be reluctant in using these meta-cognitive skills. Such a student may present a reason for the lack of willingness to use metacognitive skills. He cannot spend too much time planning, monitoring and evaluation of

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the learning process. They state that if students feel that any of their psychological needs are not satisfied in a learning environment, they may adapt themselves to the goals and values of that situation. Educational attainment and studying factors affecting it are important topics as a bulk of research in education is allocated to it. Among the various approaches that have been selected in order to investigate the determinants of academic achievement, there are two major approaches raised in the last few years which accentuate the processes affecting academic achievement. The first approach examines the influence of family environment processes on achievement, and the second approach considers specific learning processes of students, such as self-regulation and self-efficacy.

Both approaches lead to substantial progress in the field of education and have shown different aspects of learning and academic achievement. Studies done based on the first approach suggest a relationship between the parenting style and academic performance i.e. children raised in the firm families would gain higher academic achievement scores compared to children in other families. For example, Steinberg ET al [5]. have observed that firm parents are facilitator of children's educational attainment so that all three aspects of firm parenting namely parental acceptance, psychological self-regulation and behavioral control have significant shares in the academic achievement of children. They believe that teens that rate their parents as warm, democrats, and firm probably will have a positive attitude toward school, resulting in better performance on the courses compared with other counterparts.

The research carried out based on these two approaches so far indicate a significant effect of family processes on academic performance and significant relationship between self-regulation and academic achievement of students [6]. However, the uncertainty exists in the relative influence of each of these variables. In fact, few studies have attempted to investigate the three variables simultaneously and their interactions with each other using the Path analysis. In other words, it is necessary to make clear which types of parental behavior are effective in students' self-regulation and to reveal the relative influence of each family processes on the achievement of students. In Martinez Pons's [7] proposed model, key components of self-regulation are motivation, goal setting, strategy use, self-monitoring, and strategy modification. Parents' self-regulation is also defined based on four types of the parents' behavior namely the role models, encouragement, facilitation, and children's good behavior reinforcement.

Many experts and scholars believe that self-regulation of cognition and behavior is an important aspect of learning and school performance and can affect human performance and behavior 8. Of course, the importance of self-regulation is not the same at all levels of school, for example, Zimmerman<sup>8</sup> has stated that the autonomous reading becomes more important in higher levels because high school students are expected to study most materials in the environments other than school. They should structure their study environment and design an optimal structure for various courses of study addressing a scheduling for entertainment, and using motivational strategies to force themselves to study in presence of other stimulations and do planning and reviewing. Therefore, the necessity and importance of self-regulation skills in high school level are much more than the previous levels. Evidence of the weakness of self-regulation skills among high school students and higher level students have been mentioned in some studies. For example, in a study by Presley et al.<sup>9</sup>, students overestimated their ability to respond to questions more than usual and were not aware of their deliberate major errors. Many students do not know that whether they are ready for a test even before the end of exam<sup>10</sup>. Gate et al observed that if students believe that homework is easy, do a deficient review and show over-confidence in their learning. Some studies suggest that if we leave learners alone in the regulated learning, they cannot do a correct reviewing about depth of their learning.

While, the findings indicate the importance of self-regulation and self-efficacy in learning situations, but the existing studies are of correlation type and based on self-rating questionnaires. These types of studies compared with the experimental studies and qualitative research possess a lower validity. Because it is not clear whether respondents have done the activity which they report or not. As requested by many researchers, there is a need of in depth qualitative research along the breadth of quantitative research methods [11]. Have accentuated the need for classroom research in this regard. Lack of research in this area and the need for teaching self-regulation skills among high school students were the main reasons for doing this research. Bandura [12] developed social learning theory by introducing several new concepts and proposed social cognitive theory. He stated in 1986 that people have beliefs that can help them control their thoughts, feelings, and actions. Bandura [13] assumed a picture of human behavior and motivation that regards peoples' beliefs about themselves as the main elements.

#### *Investigation into the role of self-regulation in academic performance:*

Studies in the field of self-regulation imply that self-regulated students have greater academic achievement. For example, Zimmerman [14] noted that the self-regulated students show more efforts and use more elements related to their own self. In the study self-regulated learners reported that they use 15 to 20 various strategies throughout the study. These individuals also were more successful in school assignments.

Based on the results of Pint rich and De Groot [15] those who had more Meta cognitive activities were more successful. In addition, self-regulation was the most important predictor of classroom performance in all assignments and assessments. This shows that the use of self-regulation strategies such as understanding monitoring, goal setting, planning, and efforts management were the basis of successful performance in all academic assignments. Another finding of Pint rich and De Groot [16] was that the use of cognitive strategies to increase academic achievement is not possible without self-regulation strategies .concluded that there is a significant positive relationship between the use of self-regulatory strategies and academic achievement in mathematics [17]. Further based on, there was a relationship between teaching learning strategies and self-efficacy beliefs and academic achievement[18].

In this regard, other research suggests that students should not only know strategies but also be familiar to how and when to implement them[19]. Found that if students be given an opportunity to learn strategies, self-monitoring and self-correction, their performance can improve directly and as a result of increase in self-efficacy.

In study conducted on many students of final year of high school, it was assumed that self-regulation was the mediator of the effect of self-efficacy on math achievement but the path analysis indicated that no significant relationship existed between self-regulation and academic achievement in mathematics [20]. Self-regulation in this study consisted of two components of effort, meta-cognition and a self-evaluation questionnaire were used to measure them. In another study conducted on high school students, it was found that the self-regulation learning explained [12] of the variance in students' achievement this study used path analysis. To measure self-regulation, a questionnaire by Martinez Pons [21] was used and to measure academic achievement the final scores of math and Persian literature courses were used. In another study, students who were forced to use cognitive processing were more successful than the other groups in problem solving skills and transfer of learning [22].

Investigation into the role of self-efficacy in academic performance: Collins [23] classified mathematical abilities in three categories: high, low and medium. Within each category students were divided into two groups in terms of mathematics self-efficacy as high and low. In this study, after training, the students were presented new problems to solve, and then re-training opportunities on issues that were mistakenly solved were provided. Collins found that the ability has relation to individuals' performance. But without attention to ability level, people who have higher self-efficacy, solve more problems, and correct more mistakes in their study concluded that students with higher self-efficacy, regardless of their ability level, use more useful self-efficacy strategies [24]. In Berry's study [25] self-efficacy increased memory performance of students with increasing persistence. Based on existing research, we can say that self-efficacy is the mediator between the previous achievements and academic performance and more than previous achievements such as grades or ability, can predict academic performance.

Zimmerman etal [26] used path analysis to examine the causal impact of self-efficacy beliefs in the reading self-regulation of high school students. Results indicated that self-efficacy has a direct and causal relationship with academic achievement. Additionally, self-efficacy through its impact on the goals individual choose (target) indirectly influences the end of year scores of students (academic achievement). To put clearly, in this study, self-efficacy for self-regulation was predictor of self-efficacy for academic achievement which consequently predicted score targets and final scores of students. In this research, the meaning of self-efficacy for self-regulation was the sense of one's ability to use different learning strategies.

They stated that self- efficacy beliefs are related to academic performance and predict about 14 of variance. Of course, the effect size observed in any of these studies differed due to the specific characteristics of each study and the type of measures used [27]. The strongest effects were reported by researchers who used the self-efficacy sub-scales of a robust motivational scale to predict academic beliefs and practices of people in different levels of ability, but when due attention is paid to theoretical guidance of precise measurement and homework, its predictive value increases. Bandura[28] states that learning environments which consider ability as a skill which can be acquired and have less emphasis on competition and social comparison are very effective in the growth and improvement of self-efficacy.

The research methodology suitable for this study is survey and descriptive. The population was all male and female high school students in Fasa. Among them 141 female students and 139 male students were randomly selected as sample.

#### *Method:*

In this project, the following groups were involved. 1) Control group: The group without any specific training or increased self-efficacy and just participated for comparisons between groups in this study. 2) The Direct Education Group: This group participated in the self-regulation and self-efficacy training sessions held by the class teacher. These skills were taught and practiced during six two-hour sessions. Cooperative learning group: this group, like the previous group, participated in a weeklong training course, during which they learnt self-regulation and self-efficacy, but after this period, they were provided with a supportive

classroom environment. In doing so, a part of class time was devoted to practice and review of self-efficacy through cooperation. Independent learning group: This group also participated in the workshop and learned the self-efficacy and self-regulation strategies but after this period they were required that when studying independently do homework in the course of Biological Sciences in this way. In each session, forms were given to students to study at home, act accordingly, and after completing the form, submit it to the teacher to score it.

#### *Instruments:*

In this study, in addition to using an open questionnaire to determine the status of self-regulation and self-efficacy of learners, other self-evaluation questionnaires such as the Motivational Strategies for Learning Questionnaire (MSLQ), Motivation Inventory adjustment strategies Walters 29, achievement tests of social studies, biology, and environmental science achievement test were used.

#### *To evaluate validity and reliability:*

In this study, inclusive and exclusive classes were developed with clear boundaries and the instructors were presented with the necessary training. Meanwhile, sheet. (28 subjects) of the subjects were given another independent assessment of the grading. Lack of agreement between the two assessments was very little and agreement rate was 97.2. Test-retest and alpha Cronbach coefficients for MSLQ were run based on test-retest on a group of 30 subjects at an interval of one month which coefficient was equal to %83. The Cronbach alpha for the total scale and each subscale scales were also calculated. The Cronbach alpha for the total scale was .90. In addition, the lowest internal consistency of the scale was related to resource management strategies with 0.68 and the highest level was of learning strategies scales .87. Walters29 calculated reliability and validity of MSLQ using Cronbach alpha and factor analysis and the results were reported to be favorable. Further, test-retest on a group of 30 subjects with one-month interval equaled to .84. The reliability and validity of Moshtaghian's, by running extensive tests30, the level of internal consistency with Cronbach's alpha method for the form A was 0.89 and for the Form B 0.88.

#### *Findings of the study:*

Important objectives of the present study were: 1) investigating the status of self-regulation and self-efficacy of the learners 2) investigating the effect of three different training methods of self-regulation and self-efficacy on self-regulation, self-efficacy and academic performance of learners 3) examining the interaction between self- efficacy from one subject to another. To fulfill the aims of the study, qualitative method (open questionnaire) was used and the content analysis was used for analysis. For the second objective, (motivated strategies for learning questionnaire (MSLQ) of Walters, self-efficacy and academic achievement test for biology were used. The statistical analysis of covariance (ANCOVA) was used for data analysis. Finally to achieve the goal of the third objective an ANCOVA was performed based on the comparison between the scores of social studies course and biology.

Exploring the strategies for creating and maintaining the study motivation of the learners In this part, the raised research question was " what kind of motivational strategies do learners use to create and maintain their motivation? " to answer the question, the students were asked to imagine that they had an exam and had to study but there were many activities which attracted them. What would they do to solve the problem? In the first question of open questionnaires, students were to report the strategies used [29].Frequencies and percentages to adjust strategies based on the question raised are presented in Table 1

**Table 1:** Results of the content analysis of motivational strategies.

The motivation setting strategies	Girls		Boys		Total	
	Number	Percent	Number	Percent	Number	Percent
The inner dialogue	38	15.0	25	10.0	63	25.0
Inner dialogue of dominance	14	5.0	11	4.0	25	9.0
Increasing interest	3	1.0	2	7.0.0	5	2.0
Self-reinforcement	1	3.0.0	1	3.0.0	2	7.0.0

As Table 1 shows the frequency use of strategies to create, maintain, and adjust the motivation equals 256, of which, 54 were non-productive strategy (21.0). One noteworthy point was the difference between genders. Girls used more motivational strategies compared with boys. This difference was not statistically significant, but when we extract the number of non-productive strategies for boys and girls i.e. 34 and 20 from the total sum of strategies, the difference becomes statistically significant. In fact, the number of strategies for girls is 124 and boys 81. Square test indicated significant difference between boys and girls (,  $DF = 1$ ,  $P < 0.019$ ). Although boys reported a greater number of non-constructive strategies [34, 20], but this difference was not statistically

significant. Closer scrutiny of sentences helps our better understanding of the processes of self-regulation. Results are presented in tables 2 to 4 -9.

As Table 4.2 indicates, student " A " motivates himself with the assumption of getting good marks, student ' B ' thinking the consequences of his score have to study, the student " C " motivates himself imagining how to satisfy parents or not to be embarrassed in front of teacher and finally, student " D " emphasizing his incentives to compete with other classmates motivates himself .Few pupils said they maintained their motivation through the inner dialogue.

Evaluation of cognitive and metacognitive strategies in learning Second question: What kind of cognitive and metacognitive strategies are used by learners to learn the materials? To explore this question, learners' responses to questions 3 and 4 were analyzed. Results of content analysis are presented in tables 3 to 4 -5. Based on content analysis, 0.58 of answers were related to the use of cognitive strategies, 2 of critical thinking, 0.30 related to meta cognition, and 0.10 relevant to unproductive strategies.

**Table 2:** Results of the content analysis of cognitive and metacognitive strategies.

Cognitive and metacognitive strategies	Girls		Boys		Total	
	Number	Percent	Number	Percent	Number	Percent
Mental rehearsal	117	25.0	93	20.0	210	45.0
Expansion	19	4.0	17	4.0	36	8.0
Organizing	12	5.2.0	13	6.2.0	25	5.0
Critical Thinking	4	8.0.0	5	1.0	9	2.0
Understanding monitoring, self-assessment self-monitoring	86	18.0	54	12.0	140	30.0
Non-productive strategies	26	5.0	20	4.0	46	10.0
Total	264	57.0	202	43.0	466	100.0

**Table 3:** Evaluation of resource management strategies in learning.

Resource Management Strategies	Girls		Boys		Total	
	Number	Percent	Number	Percent	Number	Percent
Time Management	78	17.0	44	9.0	123	26.0
Location Management	61	13.0	41	9.0	101	22.0
Effort management	45	10.0	41	9.0	86	19.0
Help seeking	49	10.0	33	7.0	82	17.0
Counterproductive strategies	31	6.0	45	10.0	76	16.0
Non-productive strategies	31	6.0	45	10.0	76	16.0
Total	264	56.0	204	44.0	468	100.0

This main question of this section was: What strategies are used by learners in resource management? Learners' answers in response to questions related to the above (questions 2, 6, 7 of open questionnaire) were coded and categorized. Table 3 illustrates the number and percentage of students in resource management strategy reported by students.

As Table 3 indicates, 26.0% of time management strategies were related to resource management, 22.0% to location management, 19.0% to effort adjustment, and 17.0 % to help seeking from others .Non-productive strategies also formed 16% of the answers. Time management refers to scheduling, time setting, task priorities, setting a deadline for an assignment, and determining a timetable. It is worth noting that the location management strategies in motivation part are provided under the name of the environment control, because these strategies are linked to creation and increase of motivation.

The findings of statistical analysis examining the impact of different test methods: In this part of the research, findings related to the second main research question are presented. Which of the methods of teaching self-efficacy and self-regulation are more effective in improving these skills and academic achievement of learners? After the treatments, data gathering and running ANCOVA the following results were found.

One question raised in this part: Which methods of teaching self-regulation are more effective in increasing self-regulation of learners?

To answer this question, the post-test scores on MSLQ and strategies of motivation adjustment strategies among the four groups of subjects were compared. Further, to adjust for the pre-existing differences between groups, the pretest scores of questionnaires were used in the statistical analysis. Mean and standard deviation of pre-test and post-test groups on MSLQ are presented.

**Table 4:** Mean and standard deviation of pre-test and post-test groups on MSLQ.

Groups	Pretest			Posttest		
	Average	Standard deviation	Number	Average	Standard deviation	Number
Independent Study	38.211	55.37	70	246	16.37	70
Cooperation	88.207	52.36	67	43.231	38	67

Direct Instruction	87.209	60.38	72	54.231	49.36	72
Control	59.0	45.29	71	02.214	79.33	71
Total	45.209208	35.35	280	67.230	9.37	280

As presented in table 4, the maximum pre-test mean was of the independent study group and the lowest was of cooperation group (211.38 vs. 207.88). In the post-test, the means of groups on MSLQ are different. The highest mean of posttest self-regulation is related to the independent study group and the lowest is related to the control group (246 vs. 214). According to table 4, the difference between groups in the scale MSLQ even when the initial difference between groups at pre-test is adjusted, is significant ( $p < 0.0001$  and  $df=3, 279, F = 10.94$ ).

**Table 5:** Results of covariance analysis of MSLQ (dependent variable: MSLQ test).

Source	Square	degrees of freedom,	mean square F	P
MSLQ pretest		86276 1	86276 85	<b>0001.0</b>
Group		33 308 3 11	102 94.10	<b>0001.0</b>
Error		278859 275	1014	
Total		1.5E +07	280	
Total corrected		401365	279	

The Tukey test was used to compare the posttest mean score of groups in self-regulation strategies. It revealed that the independent study group had higher scores in the tests compared with other groups. Therefore the first hypothesis denoting the priority of self-regulations of independent group was confirmed (The difference between groups was significant independent study with a control group at 0001, with direct instruction at 0.10, and in collaboration group 0.02). The second hypothesis was also confirmed ( $P < 0.0001$ ) and three experimental groups were significantly higher than the control group in self-regulation, but the third hypothesis suggesting the superiority of the cooperative group in comparison to direct instruction was not confirmed and the results did not show significant differences between direct instruction and cooperative groups.

As another test for the above hypothesis, the results of the motivated strategies are presented in Tables 6 and 7.

**Table 6:** Mean and standard deviation of pre-test and post-test groups.

Groups	Pretest			Posttest		
	Average	Standard deviation	Number	Average	Standard deviation	Number
Independent Study	70.93	40.17	70	87.95	67.14	70
Cooperation	96	57.16	67	57.89	39.15	67
Direct Instruction	74.92	55.16	72	48.88	97.14	72
Control	48.93	20.13	70	95.86	22.15	70
Total	44	97.15	279	22.90	36.15	279

As can be seen in Table 6, the highest pretest mean of Motivational subscales were related to the cooperation group and the lowest was related to independent education group (96 vs. 92.74), but in the post-test, the highest mean is of the independent study group and the lowest is related to the control group (86.95 versus 95.87). It is noteworthy that about Table 3 is that although the average of post-test score of MSLQ scale showed significant differences in the three groups, the means in the three groups of control, training and cooperation decreased in comparison to the pre-tests.

**Table 7:** Results of covariance analysis (Dependent variable: the posttest on motivational strategies).

Source	Square	degrees of freedom,	mean square	value F	P
Pretest	66.9295	1	9296	96.47	<b>0001.0</b>
Group	3229	3	1076	55.5	<b>0001.0</b>
Error	53101	274	194		
Total	2336336	279			
Total corrected	65623	278			

In Table 7 we can see that different groups differed significantly in post-test scores of Motivational adjustment even after adjusting for initial group differences in pretest scale ( $F = 5.55, df = 3, 287, P < 0.0001$ ). Tukey test showed that the mean scores of the independent study group were significantly higher than other groups. These findings confirm the first hypothesis. Of the three other groups, although the minimum mean of Motivational adjustment subscales was of the control group and the highest one of the cooperative group, these differences were not significant.

**Table 8:** Mean and SD groups in the pre-test and post-test self-efficacy.

Groups	Pretest	Posttest
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	Average	Standard deviation	Number	Average	Standard deviation	Number
Independent Study	41.21	24.5	70	50.23	36.4	70
Cooperation	91.20	85.4	67	38.5	38.5	67
Direct Instruction	17.21	98.4	72	99.4	99.4	72
Control	95.21	32.5	71	43.4	43.4	71
Total	37.21	09.5	280	18.5	18.5	280

Based on table 8, differences between mean of pretest related to self-efficacy in different groups is negligible, but in the self-efficacy posttest, the highest average is of the independent study group and the lowest is of control group (23.50 vs. 17.88).

**Table 9:** Results of covariance analysis (dependent variable Self-efficacy posttest).

Source	Square	degrees of freedom,	mean square	value F	P
Preview - self-test	24.472	1	24.472	05.22	<b>0001.0</b>
Group	1199	3	79.399	67.18	<b>0001.0</b>
Error	92.5889	275	42.21		
Total	124,161	280			
Total corrected	7513	279			

According to the results of covariance analysis in Table 9, the difference between groups in self-efficacy posttest test, even after adjusting for initial differences on this variable is statistically significant ( $F=22.05 = 3,279$ ,  $P < 0.0001$ ). Tukey test which was used to compare the mean of these groups showed that the independent group had a higher score in self-efficacy beliefs. Therefore, the fourth hypothesis was confirmed. All experimental groups were significantly higher than the control group in self-efficacy beliefs. As for the sixth hypothesis, results showed there is no significant difference between the self-efficacy of cooperation group and direct instruction group. As a result, the hypothesis was not confirmed.

#### Discussion:

The present findings, in line with some previous research suggest that high school students use different strategies to motivate themselves. These students to regulate motivation mainly resort to external sources of motivation, such as getting good grades or making others happy (mental conversation function) and also resort to controlled environment. Above findings are consistent with some existing research. In finding of the present study was the higher frequency of non-productive strategies compared with strategies of learning goals. Based on existing research learning goal orientation correlates with higher frequency of self-efficacy, self-regulation, and academic achievement. Besides, negative and non-adaptive patterns of motivation, cognition and performance, mostly are due to the external adoption. This direction has a negative relationship with the homework value, self-efficacy, and the self-regulation. Therefore, according to the theories, such as the expectation and value, if the goal is only imposed from the outside, self-regulation, motivation, and performance will be damaged. It was also observed in this study that the more learning goal orientation, the less non-productive strategies regarding the avoidance or performance of inefficient task.

One interesting point was the small frequency of such strategies like self-reinforcement, self-efficacy and increase of interest among students; however, based on the existing research [31], successful students motivate themselves mostly through bonuses or promises or punishment.

Additionally, based on the findings, self-efficacy beliefs are the most important predictor of academic achievement [32]. Findings indicate that participants mostly resort to external control rather than self-regulation. In other words, according to self-determination theory, these people due to reasons such as lack of internal interest at the time of study resort to the use of external variables.

#### Conclusions:

This study aimed to investigate what kind of cognitive and metacognitive strategies are used by high school students to learn the course materials? The content analysis indicated that most students used cognitive strategy of "mental rehearsal". Mental rehearsal has been considered as a low level strategy in a lot of research. On the contrary, frequency of more complex cognitive strategies, such as elaboration and organization among the students was very low. As for metacognitive strategies, most students used understanding monitor (75.0 percent of responses to Meta cognition) rather than other strategies such as reform strategies or self-training. As mentioned, critical thinking possesses the lowest frequency may be because the materials in the high school level do not involve critical thinking.

These findings are consistent with some existing research. For instance, Styles, Pintrich, P. W. Rouser [33] report that, based on a semi-structured interviews conducted with the student teachers, most of them use mental rehearsal from the start and only half of these individuals use metacognitive strategies such as planning, reviewing, modifying or adaption in learning. These researchers found that after two years of training, the

frequency of mental rehearsal strategy decreased and the frequency of the organization strategy use increased. As for the low frequency of complex cognitive strategies and learning, an explanation can be provided. High school students are not aware of quality, quantity and the ways to execute these strategies. As such, they mostly resort to mental rehearsal for learning the materials due to their lack of familiarity with the strategies.

In this regard, Borkowski [34] suggests that cognitive tasks presented to students and the assessment of their learning are not in a way that involve the stimulation and the use of more sophisticated strategies other than mental rehearsal. Moreover, with programs that focus more on the content not the process, students do not get enough opportunity to learn to develop effective strategies. In addition, what type of resource management strategies are used by high school students? As mentioned before, strategies of time management as setting a timetable for study or work have maximum frequency (the highest percentage of responses) and the location management strategies were in the next important place. Help seeking strategies, effort management, and non-productive strategies had the same frequency. It is interesting that these strategies have been reported to be very shallow and simple. For example, in the location management part, just a quiet place to study was mentioned but there was no mention of structuring the location when is not suitable. Moreover, while "help seeking from others" is regarded as one of the best indicators of self-regulation, some students with high academic achievement reported that they had no desire to ask help from others.

Non-productive strategies in cognitive - metacognitive and resource management also include "reading aloud" studying with high stress, studying in unsuitable places such as parks, lack of proper timing, and not benefiting from the assistance of others. In this area, non-productive strategies were more among boys than girls.

A) Independent study group was significantly higher than the other three groups' at all three variables of self-efficacy, self-regulation and academic achievement.

B) Experimental groups were significantly higher than the control group in self-regulation and self-efficacy.

C) There was significant difference between direct teaching and cooperation groups in self-efficacy, self-regulation and academic achievement.

D) In terms of academic performance, only independent study group was higher than other groups, and there was no significant difference between the three groups.

The primacy of the independent study showed that by increasing the self-regulation of learners, their school performance and self-efficacy also increase. Additionally, the outperformance of mentioned group reflects the impact of self-regulation as a major component in these groups. The components include goal setting, self-monitoring, and self-consciousness. As observed in the study, the students in this method were continually busy with goal setting and self-monitoring. This lead to developing their self-consciousness. Lack of significant differences between the three groups in terms of academic performance may reflect the point that teaching in oral terms, conditions, and procedures in case of strategies is not enough. According to Brooks [35], teaching self-regulation is not an easy task. Learners who are weak in self-regulation do not change easily. Even when they know what to do, it doesn't mean that they will do them. Learners should have necessary supports for educational self-regulation. The supports are not teaching self-regulation skills. The lack of significant difference between the self-regulation, self-efficacy and academic achievement of direct instruction group and cooperative group necessitates more research and is consistent with some research. Found that in teaching strategies to students, student-centered approaches such as confrontational or cooperative learning methods are not more effective than direct training approaches.

Another finding of the study can be that considering the effect of training on learners' self-efficacy, it can be concluded that teaching self-regulation skills and strategies to students is the most important source of self-efficacy. When self-efficacy increases, it can be generalized to other situations. Jinks and Morgan [36] also support the idea that the greater the similarity between the two activities exist, the possibility of generalizability from one activity to another increases. The findings of the current research offer evidence for the theories of self-regulation, including the effect of self-efficacy and self-regulation on academic achievement. In other words, although existing research, including research by Zimmerman and Martinez Pons [14] denote the relationship between these variables, the current research with its experimental design shows the effects not simple relationships. The findings related to the primacy of independent study group shows evidence that self-monitoring is the main component of self-regulation. This component would be successful when performed in all steps of self-regulation. It must be noted that the independent study group at all levels were busy with goal monitoring, motivation, method, location status, and planning. Some scholars such as LAN [37] also consider self-monitoring as the most important component of self-regulation. Based on recent models of self-regulation such as Zimmerman and Butler [38], self-regulation is included in all stages of self-monitoring.

In line with the evolution of education program in Iran and the need to change teaching methods, the focus is currently on the content of the courses and focus is not on skill or willingness to learn. Such a situation has to change. Currently, skills such as "how to learn", which are considered as generic skills and are necessary to learn all the courses have been neglected. In practice, no one is responsible to train these skills. In any of the courses, assistance should be provided to students to make them familiar with learning strategies and problem

solving. One of the explicit goals of education in all school period should be facilitation of learning strategies growth and problem solving and teaching ways to use these strategies. Zimmerman<sup>39</sup> states that research findings in recent years have lead to the view that individual differences in learning are due to shortcomings in students' self-regulation not factors such as intelligence, aptitude, or cognition alone. If a student does not understand a part of a lesson, he should have consciousness and strategic knowledge to take suitable remedial steps necessary to stop it. He states that if teachers were able to modify the limitations of students' daily limitations, they would damage the growth of one of the main aspects of students namely self-regulation. Research shows that lifelong learning skills develop mostly when teacher pays special attention to evaluation and testing. Create more meaningful concepts of learning and have critical thinking by using their diary reports of learning<sup>40</sup>. Also used this method to expedite the evaluation of the extent of cognitive and metacognitive strategies by the students. Academic advisers can play an important role in this area<sup>8</sup>.

#### *Suggestions for future research:*

The study has implications for future research .It is necessary to pay attention to the ways of teaching and evaluating self-regulation. In addition, it is necessary to increase the effectiveness of interaction of various programs of self-regulation with ability. Self-development process of self-regulation is another area for investigation. Further, it is necessary to review the interaction of components with each other. Finally, follow up studies on motivation and cognition seem rewarding.

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