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SELF-ORGANIZED LEARNING AND ITS RELATIONSHIP TO ACHIEVEMENT IN AUTOMATED ANALYSIS CHEMISTRYFOR STUDENTS OF THE SCIENCE DEPARTMENT

Dr.Zhraa Raouf Jawad

University of Mustansiriyah

College of Basic Education.

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Abstract:

This study aimed to delve into self-regulated learning and knowledge acquisition and its relationship with the scholastic achievement of basic sciences students. The research sample consisted of 60 male and female senior students majoring in organic chemistry in the 2019-2020 academic year. In relation to the research instrument, the researcher employed Ahmad's (2007) self-regulated learning scale and administered it to her own sample having insured its reliability and validity.

The results revealed that the research sample enjoyed a high level of self-regulated learning. Likewise, there was a relationship between this kind of learning and scholastic achievement regarding the organic chemistry field. These results gave birth to some conclusions and recommendations. For example, the syllabus design, teacher development, and teacher training programs of universities should be based on self-regulated learning. Future studies are also suggested to conduct similar investigations by replicating the current research on other samples and educational levels to uncover the relationship between self-regulated learning and other variables.

Introduction:

1. Research Problem:

Self-regulated learning is a process through which students can direct, manage, and control their self-specific learning process. Innate competence and self-efficacy are among the prominent factors that impact the academic endeavors and performance of students. This competence is manifested by a set of thoughts and mindsets that surround the self. The innate perceivable self-efficacy and competence of students disclose their levels of academic performance, i.e., if it is high or low. Ziat (2006) believes that the non-realization of proper, satisfactory, and acceptable education, which meets the educational and scientific goals, gives birth to a problem that complicates many students' attainment of proper education. Therefore, this weakness is not often due to low levels of consciousness, students' reduced efforts and attempts, or their disinclination to carry out research and investigations. It is either owing to their declined skills and information organization or poor equipment with guided, transparent, and regulated learning.

(Al-Ziat, 2006, pp. 344-366)

Hence, the problem is to show self-regulated learning among a sample of students majoring in basic sciences at the University of Mustansiriyah, and the following research question arises:

What is the level Self-organized learning and its relationship to achievement in Automated analysis chemistrFor students of the science department?

Significance of the Research:

The 20th witnessed numerous information-related evolutions, leading to changes in concepts. The most important factor that distinguishes this revolution and the most significant evolutions in terms of information is the appearance of modern technologies in information examination, collection, and storage. As a result, the world beheld many events and incidences in different educational fields, including learning and training. These evolutions provided individuals with a lot of information that no one could attain and have a good command of despite possessing abilities and competencies. The fast and great revolutions in the various branches of science and knowledge made outnumbering individuals be concerned with learning; however, it led specialists in the education and psychology domains to reconsider their educational methods in order to align them with students' needs. One of the pounded solutions is self-regulated learning, a well-known method through which students are given the opportunity to learn and acquire knowledge constantly and continuously by enhancing their independence and activation. That is why the learner is at the center of attention due to his/her effective and major role. Accordingly, it becomes possible to examine the information and put it into an order, in order to make it perceivable and retrievable by the learner. This objective is achieved if the self and education are regulated and organized so that the learner is not a mere recipient of the information in a negative way. It is necessary that students have active and effective participation in achieving educational goals.

(Ibrahim, 1966, p. 39)

Education is more effective and influential when it helps learners to innately and personally pursue the achievement of goals and identification of strategies they pursue in their contacts with educational problems. This contributes to self-confidence enhancement or decline, motivation,

and the rise of concentration power; i.e., what is sometimes useful for improving the learning and knowledge acquiring quality (Ibrahim, 1996, p. 75).

The university period is socially recognized as a contour stage, wherein students learn their responsibilities as the citizens and compatriots of society and develop their cognitive capabilities and competencies, as well as aesthetic, social, and emotional values; therefore, their interaction with the social environment grows (Al-Memari, 2000, p. 2).

Universities work towards polishing individuals' personalities, developing and maximizing their talents, and increasing their creative, innovative, and intellectual facilities. That is why they should raise and develop students' abilities using regulated and the state of art methods in their programs, approaches, methods, and practices (Al-Dardi, 2002, p. 96).

Students' possession of self-regulated learning strategies assists them to control and overcome their thoughts and reflections, enhance their level of insight and awareness, and modify their advancement, success, and education courses towards goal achievement (Jarvan, 1999, p. 381).

Any student who is aware of his/her thought and reflection processes, learning methods and techniques, and scientific structures' prominent properties enjoys more controlling and organizing skills, encouraging his/her insight and awareness to organize the self-efforts, endeavors, and competencies (Abu Riash, 2007, p. 37).

Thus, based on this style and method, education is an innate process developed by learners' engagement with the environment and their diverse skills. It is the first undertaker of reconstructing this recognition and knowledge and organizing through the provision of a method that fits and agrees with the cognitive, intellectual, and scientific structures of learners. Hence, self-regulated education is a purposeful process for achieving effective, useful, and constructive knowledge and recognition and warrants the reflection of the effect of motivational, scientific, and emotional resources (Baumenet et al. 1999, p. 17).

According to what aforementioned, self-regulated learning falls among the topics that have been accepted recently in university and academic learning and paves the way for learners and knowledge acquirers to rely more on their own skill, awareness, knowledge, and cognition rather than those of others. That is, it deals with anything that supports them in controlling their selves, behaviors, and learning environments and helps them to attain higher and more proper degrees and favorable objectives. This kind of learning paves the way for students and assists them with directing their strengths and forces towards their academic outcome, efficacy, functionality, and perseverance, as well as the way they receive education and learn. The positive, useful, and constructive preparation of the educational environment is the consequence of such learning, encouraging students for further learning (Al-Jarah, 2010, p. 59).

In their study, Pinterich and Degroot (1990, p. 44) referred to the presence of a positive, useful, and constructive effect of self-regulated learning and foregrounded paying attention to academic motivation and education.

The results of Ahmad's (2007) study reveal that academic education of students with high –self-regulated learning is better than that of students with low self-regulated learning concerning all its dimensions, goal setting, planning, حفظ مجلات, controlling, supervising, preserving, and social help-seeking (Al-Jarah, 2010, p. 344).

The strategies of self-regulated learning are of utmost importance and contribute to changes in the behavior, the manifestation of the value of learning responsibility, and active and effective participation in learning (Ibrahim, 1996, p. 10).

Purpose of the Study:

This research follows the below purposes:

1. Recognizing self-regulated learning among students majoring in organic chemistry in the faculty of Basic Sciences at the University of Mustansiriyah
2. Recognizing the relationship between self-regulated learning and education among students majoring in organic chemistry in the faculty of Basic Sciences at the University of Mustansiriyah
3.

Limitations and Delimitations of the Study:

This study is limited and unique to senior chemistry students in the faculty of Basic Sciences at the University of Mustansiriyah in the 2019-2020 academic year.

Definition of Key Terms:

1. **Self-regulated learning:**

a) According to Zimmerman (1989, p. 32), self-regulated learning is a set of actions, processes, and operations used for acquiring information and skills that guarantee learners' goals and perceptions of benefits. It also warrants some techniques, including regulation, organization, information transformation, self-pursuance, and information seeking.

b) Bandura (1991) pins down self-regulated learning as behavior controlling, which is realized by observing others' performance, governing and evaluating it through applying personal criteria, and responding to it positively and negatively as a result of encountered stimuli.

2. Education

Shahateh and Al-Najjar (2003, p. 89) define education as the amount of information and knowledge students attain. They express this knowledge and information in the provided test situations, such that their levels can be measured.

Mohammad (2005, p. 29) defines education as an organizational step taken for measuring facts, concepts, and skills achieved by students by virtue of examining a topic or certain educational course.

Chapter 2

Theoretical Framework (for self-regulated learning and previous studies and investigations)

Self-regulated Learning:

During 1989-2000, Zimmerman extended and changed his periodical model in interpreting self-regulated learning. He believed that self-regulated learning comprised the efforts and strategies that learners apply to reach their personal goals as they did in the past. This kind of learning

depends on emotional, motivational, and behavioral nourishment, which modifies and transforms strategies learners employ when they cannot obtain their goals (Zimmerman, 1989, p.330).

Self-regulated learners generally integrate the personal and self-organization processes (like goal-setting, self-controlling, and self-evaluating) with different strategies of educational task and responsibility accomplishment (such as time management, organizational strategies, and practical examination), as well as beliefs and motivational mindsets, which are influenced by self-efficacy, self, and educational inclinations (Clearly, 2004, p. 538). This model assumes that these learners organize their academic behaviors, beliefs, and mindsets in three periodical phases, including forethought, performance, and self-reflection. Figure 1 illustrates this model.

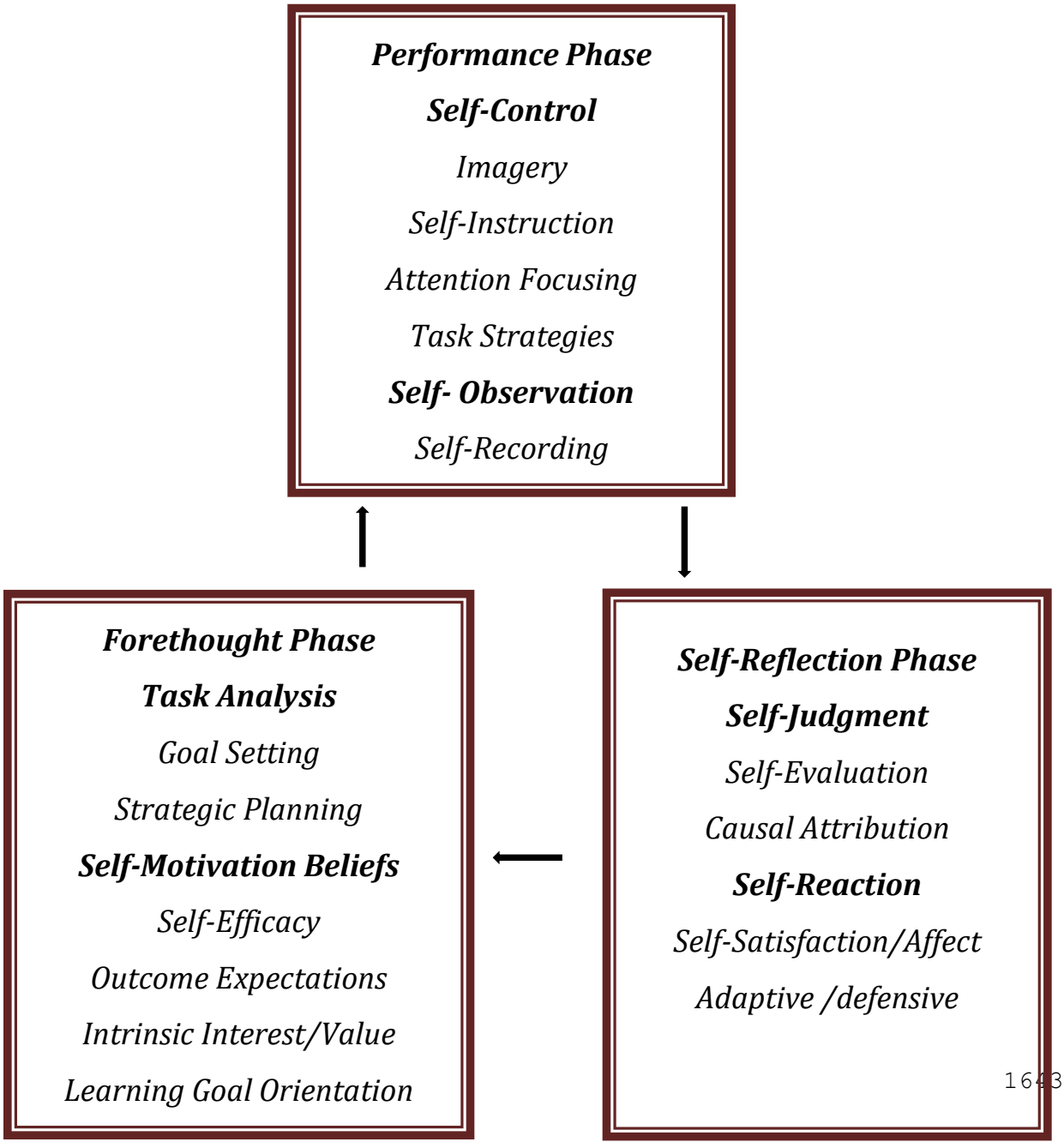

Figure 2.5. Phases and Sub-processes of Regulation (Zimmerman, 2000)

The forethought phase refers to personal and self-organizing processes and operations, which overrun the efforts made for practices and activities and the provision of suitable conditions, such as goal-setting and strategic planning. The performance phase warrants personal and self-organized processes and operations developed at performance time and impacts the learner's attention and task, like applying a certain strategy specific to the learner's efficacy and performance. The self-reflection phase mirrors the self-regulated post-performance operations that impact the person's accountability for that experience, like self-evaluation rules, adaptive and integrated personal reactions, and self-reflection, which in turn affects forethought processes concerned with upcoming learning efforts. Therefore, the educational and self-nourishing period is completed. (Zimmerman & Clearly, 2009, p. 248-249)

It is observed that the first nourishing interpretations connected to the cognitive, scientific, and social models, i.e., self-consideration, self-determination, and autonomy, were extended, and thus they involved sub-processes like self-control and self-supervision, and warranted control of metacognition, metascience, and encryption processes similar to the inclusion of some processes like task analysis, goal setting, and strategic planning in the forethought phase. These additions resulted from a set of increasing studies and research on the importance of these operations and processes in self-regulation. Schuk and Swartzs (1993) referred to the effect of goal-setting processes and operations, and Lodewyk and Winnes (2005) addressed the significance of the task analysis process. Likewise, Zimmerman and Kitsantas (1999) investigated self-organization strategies. (Zimmerman and Clearly, 2004, p. 539)

The self-regulation sub-processes have been designed for the improvement of personal nourishment perception. Bandura (1989) considered self as the first of the three self-regulating processes. Moreover, controlling metacognition and metascience refers to the intellectual learner's pursuance of certain aspects by his/her special performance, surrounding conditions, and consequences. (Zimmerman & Paulsen, 1995, p. 15)

Although learner's effort and possession of skills in attracting attention is sometimes fundamental and crucial, it is not always the case since the amount of information included in complex and ambiguous performances dominates self-controlling processes and gives rise to attractor's self-control. The encryption operation and personal marking refer to the preservation of encrypts, as well as tangible, observable, and transparent signs to improve learners' performance when using the useful kinds of encryption and marking. This strategy reinforces and empowers the determinants of metacognition and metascience, and the personal encrypts and signs intensify the closeness between information and nourishment accuracy. Close encrypts take personal information when it happens, useful encrypts and marks build personal considerations and enjoy further meaning, and accurate encrypts assist with recognizing prior evidence.

(Zimmerman &Kitsantas, 1997, p. 33)

Research Background:

1- Ahmad's (2007) study investigates self-regulated learning and intrinsic motivation and their relationships with academic education in the faculty of basic sciences. The aim of the study is to recognize the nature of self-organized learning and intrinsic motivation and their dimensions. It

also determines the relationship between academic education and every dimension of self-regulated learning and intrinsic motivation, as well as the differences between students with high self-regulation and intrinsic motivation and those with low self-regulation and intrinsic motivation in all their dimensions. The purpose is to reveal the possibility of predicting academic education using the dimensions of both self-regulation and intrinsic motivation. The research sample consists of 128 junior sciences and chemistry students at the University of Mansoureh. The results of this research show that there is a statistical relationship between the educational levels of the samples and their levels of self-regulation and intrinsic motivation. This study illuminates the active and effective roles played by every dimension of self-regulated learning and intrinsic motivation in the academic education of students. It also shows the challenge superiority and independence tendency based on intrinsic motivation, goal setting, planning, self-recording, and controlling based on self-regulated learning. The comparison of the dimensions of self-organized learning and those of intrinsic motivation is useful in academic education. This research suggests setting some programs for the fostering and development of challenge and independence in students and training self-regulation dimensions to them during the learning process; i.e., what helps the enhancement of their performance and efficacy (Ahmad, 2007, p. 77-104-127).

2- Al-Jarah (2010) examined the relationship between self-regulated learning and academic education among the students of Yarmouk University to disclose students' levels of self-regulation dimensions. The research sample comprised 331 male and female B.A. students with different levels at the University of Yarmouk. This researcher relied on a scale to measure self-organized learning. His results showed that males were superior to females with respect to goal setting and planning. Statistically, senior students were superior to junior and sophomore students in terms of recording, controlling, supervising, and asking for social help. Moreover, there was a statistical difference between learners with high and low self-regulation in their academic education (Al-Jarah, 2011, p. 333).

Chapter 3

1- Research Methodology

In this study, the researcher relied on a descriptive-analytical approach to obtain the research objectives and applied it extensively to the areas of social, behavioral, and educational sciences. In its essence, descriptive research is a report and expression, which does not solely describe a phenomenon. It rather interprets and predicts the outcome of the phenomenon and adopts precise policies, actions, and practical programs for the examined phenomenon. This approach is a form of organized and scientific interpretation and analysis used for describing a specific and determined phenomenon or problem in order to delineate, investigate, and explore it by the collection of the data collection and information related to the phenomenon or problem (Al-Jaberi, 2011, p. 278).

2- The population and sample of the research

The research population consisted of all terms the researcher investigated; i.e., all individuals and objects relating to the research problem (Obeidat, 1998, p. 113). Thus, the current population of the research was senior chemistry students. Concerning the conditions of the country due to the outbreak of coronavirus, the researcher depended on communicational electronic sites for the

completion of questionnaires. The number of students participating in filling out the electronic questionnaires was 60.

3- Research Instrument

a) Self-regulated learning scale

The researcher relied on Purdie's (2003) scale, translated into Arabic by Ahmad (2007). This scale consists of 20 expressions that measure four dimensions of self-regulated learning, i.e., goal setting and planning (1, 5, 9, 13, 17, 21, and 25), self-recording, controlling, and supervising (2, 6, 10, 14, 18, 22, and 26), preserving (3, 7, 11, 15, 19, 23, and 27), and asking for help (4, 8, 12, 16, 20, 24, and 8). In fact, there are 7 expressions for every dimension, and students give their answers on a five-point Likert scale, including strongly agree, agree, I'm not sure, disagree, and strongly disagree. The scores given to these alternatives are 1, 2, 3, 4, and 5, respectively.

b) Validity of the scale

Ahmad (2007) ensured the external validity of the scale. This present research also secured the external validity of the scale by presenting it to some reviewers who were specialists in educational psychology, as well as chemistry and biology teaching methods. They proposed us to apply some linguistic and literal modifications to the expressions in order to fit them with the Iraqi environment.

c) Reliability of the scale

Ahmad (2007) claimed that Purdie became assured of the reliability using the test-retest method, which is re-administering the test to the same sample. Our reliability coefficients fluctuated from -0.069 and 0.81).

The reliability of this scale was ensured by the test-retest method; that is, administering the same test after two weeks. This test was conducted on a sample of 50 male and female students external to the research sample, and its magnitude was estimated at 0.78, indicating that the instrument enjoyed an acceptable level of reliability.

d) Statistical Software

Suitable statistical software was used for extracting the results.

Chapter 4

Revealing and examining the results

1. To ensure the realization of the first purpose of the research; i.e., recognizing self-organized learning among senior basic sciences students majoring in chemistry at the University of Mustansiriyah, the researcher conducted the second test on the sample and presented the results in Table 1.

Table 1. Assumed and computed means and estimated assumed and tabular values based on the scales and criteria of the research.

Scale	No.	estimated mean	SD	Assumed mean	Estimated assumed values	Assumed tabular value	Statistical significance
Self-	60	110.84	12.97	84	16.14	2	Signifier

regulated learning							

The results above show a significant difference between the estimated mean and median; that is, the research sample enjoys a high level of self-regulated learning. This study relied on the learner's traits and learning processes rather than resting on the knowledge, wisdom, and information of the professor; i.e., what enabled the learner to be self-regulated and active in his/her learning. This property is among the most important priorities in the learning process; thus, our findings conform to previous investigations like Ahmad (2007) and Al-Jarah (2010). Senior students are aware of reflection processes, learning styles and strategies, and their distinctive scientific schema in such a way that they motivate and encourage their insight and perceptions of regulating and controlling the efforts and competencies of the self. Hence, within this style and method, education is an innate, personal, and practical process developed by the learners' interaction with the environment and their diverse experiences and skills.

2- To ensure the attainment of the second purpose, which was discovering the relationship between self-regulated learning and scholastic achievement among chemistry students, the researcher employed the correlation coefficient with a value of 0.340. We can conclude that there is a relationship between self-regulated learning and scholastic achievement. This result is in line with the results of previous studies, like Ahmad (2007) and Al-Jarah (2011). The researcher claims that the research sample is familiar with self-organized learning, which has a strong relationship with the performance of the learner. Besides, students can perceive when and how to exploit self-regulated learning, and they are motivated in its application.

Table 2. Relationship between self-regulated learning and scholastic achievement

Statistical parameters / Variable	No.	Correlation coefficient	Assumed value		Statistical significance
			Estimated	Tabular	
Self-regulated learning × scholastic achievement	60	0.340	7.566	2	Significant

Chapter 5

Conclusions

- It became clear that the research sample possessed self-regulated learning.
- There was a relationship between self-regulated learning and the scholastic achievement of basic sciences students majoring in organic chemistry.

Implications

1. Determining programs related to educational centers, developing university teaching, and training self-regulated learning-based teaching
2. Including self-regulated learning strategies, to be taught to senior students and applied to teaching, into the programs

Suggestions and recommendations

1. Carrying out similar studies on other samples and educational levels
2. Carrying out studies to discover the relationship between self-regulated learning and other variables

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Appendices

Appendix 1

Self-regulated learning scale

Dear student

This scale consists of 28 expressions. Please, read them carefully and put a mark below the alternative you find appropriate. The alternatives include strongly agree, agree, not sure, disagree, and strongly disagree.

Item No.	Expression	Strongly agree	agree	Not sure	Disagree	Strongly disagree
1	I review the lesson several weeks before the exam.					
2	I identify unknown words and record and collect them in a notebook.					
3	I write down important points several times to keep them in my mind.					
4	If I don't understand a subject, I ask my professor to explain it to me.					
5	I put aside difficult questions until the exam and then refer to them.					
6	I take notes and write down the points related to the discussion, arguments, and examinations posed in conversations and dialogues.					
7	I adopt specific policies in solving examples and follow certain plans that help me to solve similar questions in the exam.					
8	I talk about and discuss about some information and knowledge with my friend on our way to university.					
9	I set my timetable to review all my lessons.					
10	I record the results I obtain.					
11	I repeat difficult words several times to memorize and remember them.					
12	I ask any person who is more knowledgeable than me to explain difficult lesson tasks.					
13	I deal with certain and specific practices to attain my goals.					
14	I intend to collect the examples described by the professor.					
15	I lay down some rules and theories for myself to preserve them.					
16	I ask my classmates and friends to help me with difficult problems.					
17	I set some goals for myself and then divide them into sub-goals.					

18	I write some points related to my behavior several times in order to remember them.	
19	I write down chemical equations several times to keep them in my mind.	
20	I ask the professor to explain the ambiguous components and elements in the talks.	
21	I lay down an idea or supposition to temporally pursue any act I do.	
22	I collect and compile the existing rules and formulas in any subject.	
23	I read the subject several times to stick it in my mind.	
24	When I face a problem in my tasks, I ask knowledgeable ones to help me.	
25	I determine and specify the goal I intend to achieve before I set out.	
26	I control my method when solving my tasks.	
27	I study my lesson several times before the exam.	
28	I employ the skills and experiences of my older friends and individuals that have more knowledge about difficult and problematic subjects.	