

Development and Validation of Academic Self-regulated Learning Questionnaire (ASLQ)

Deepika Nambiar¹ (MSc), Johnson Alex² (PhD), Dan Isaac Pothiyil³ (MSc)

1. Department of Clinical Psychology, Abhayahasta Multispecialty Hospital, Bangalore, India
2. Department of Clinical Psychology, JS Care and Science, Cochin, India
3. Department of Clinical Psychology, Manipal Academy of Higher Education, Manipal, India

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Corresponding Author:

Deepika Nambiar,
Department of Clinical Psychology,
Abhayahasta Multispecialty Hospital,
Bangalore,
India
E-mail: deepikanambiar17@gmail.com

Abstract

Introduction: Academic self-directed learning is a proactive process where students monitor, regulate and control their thoughts, behavior and motivation to accelerate the process of effective learning. The present study aimed to build a reliable and valid tool that measures academic self-regulated learning in young adults in India.

Method: The study used a cross-sectional design. Content validity index, inter-item correlation, interclass correlation coefficient, cronbach's alpha and person's correlation were the statistical tools used for establishing various measures of validity and reliability. Manipal Learning Strategy Inventory and Academic Self-Regulated Learning Scale (ASLS) were used to establish concurrent validity. Academic Self-Regulated Learning Questionnaire (ASLQ) was standardized on a sample of 1032 college students aged between 17 and 25 years (Mean 19.86 and SD \pm 1.73) and consisted of 36 items.

Results: The developed scale has excellent internal consistency with a content validity index of 0.88, Cronbach's Alpha 0.90 and test-retest reliability of 0.96. The internal consistency across domains was: forethought (0.70), performance control (0.82) and self-reflection (0.75).

Conclusion: The findings of the present study show that the ASLQ is a proper instrument for the estimation of self-regulated learning abilities of undergrads.

Keywords: Academic Self-Regulation, Learning, Validity, Reliability, Psychometric Properties, College Students

Introduction

Self-regulation involves self-control on urges, behaviors, feelings and attention. The capacity to self-control is especially fundamental in the advancement of ideal psychological adjustment [1]. The idea of self-regulated learning is a heavily researched topic, especially concerning school and college population. Self-Regulated Learning (SRL) or academic self-regulation is one of the six aspects of self-regulation. It alludes to learning that is guided by metacognition, strategic action, and inspiration to learn [2, 3]. Academic self-regulation can be seen as an integrated learning process, involving the development of a set of constructive behaviors that influences one's learning [4]. Studies have demonstrated that students with elevated levels of self-regulation have reasonable control over the accomplishment of their objectives. They can take up challenging tasks, practice, improvise their learning, build up a profound comprehension, and apply efforts to enhance performance leading to academic success [5].

SRL can assist learners in making improved learning propensities to fortify their academic abilities. It additionally encourages them to apply learning techniques to upgrade their scholarly results, carefully observe their academic performance, and assess their scholastic

advancement [6]. Inspiration, commitment, and self-regulation are the essential determinants of pupil's learning outcomes, and they likewise decide if they will continue through challenging tasks [7]. By instructing learners to be progressively self-regulative, instructors may encounter more noteworthy accomplishment in advancing scholarly achievements, inspiration, and deep-rooted learning. Teaching academic self-regulation to students can help them become more organized and systematic in all other areas of their life. According to Dignath et al. [8], SRL intervention should be applied and taught during the early educational stages to have a better and long-lasting impact. Research further suggests that student's regulation of their behavior can have powerful effects on academic outcomes such as curiosity, persistence, learning, performance and self-esteem [9]. Recent research in the field of academic self-regulation by Sahranavard et al. [10] indicated a significant association between self-regulation and educational performance in students. Carmem and Camelia [11, 12] in their study assessed academic self-regulation and utilization of learning techniques by elementary school students and found that students use of learning strategies while studying were found to be unsatisfactory. They concluded that efficiency in learning is an outcome of an increase in the student's awareness of their learning, making them an active participant in the learning process. Hendriati et al. [13] found that self-regulation of education is positively correlated to academic achievements. The findings from a systematic review of research trends in measurement and intervention tools for self-regulated learning were in tandem with the existing evidence that even now, traditional self-regulation interventions designed for classrooms are used for e-learning platforms [14]. Minimal advancement is found as far as the improvement of assessment tools on self-regulated learning is concerned.

The current scale was developed based on Zimmerman's cyclical model of SRL [15], who is considered one of the pioneers in the area of self-regulated learning. He provided a cyclical model consisting of three cyclical phases of SRL namely; forethought, performance or volitional control, and self-reflection [16]. One of the rationales behind using Zimmerman's cyclical model was that it covers the cognitive, behavioural as well as motivational facets of SRL thereby giving in-depth knowledge about the process and factors contributing to active learning. Review of the existing instruments used to evaluate self-regulated learning reveals that the focus of previous tools has generally been to explore the strategies of self-regulated learning utilized by a person. None of the existing scales demonstrates a robust emphasis on the process of self-regulated learning, the phases through which it occurs.

Moreover, there is no scale in the Indian context that provides a measure of academic self-regulation. Zimmerman's motivational aspects are expected to be much different in the Indian culture which is predominantly a collectivistic society. This collectivism has introduced immense importance to monitoring and

supervising the student's academic activities. In this particular context, how pupils self-regulate themselves needs to be explored and identified. Even the scales that were developed are more focused on the school population. The current tool thus, will help to understand how college students engage in the process of self-regulated learning. The reasons why this population was selected were; firstly, young adults are in a stage where they already have established ideas, values and attitudes due to which they tend to be more resistant to change and must overcome obstacles to learning to a greater extent. Secondly, although we expect adult learners to be autonomous, self-directed and independent, but they often require clear structure and at times, direct guidance. Hence, the current study aims at developing an instrument that measures self-regulated learning in the Indian setting.

Method

The participants for the study were 1032 college students in the age range of 17-25 years (19.86 ± 1.73) selected using purposive sampling technique from different colleges of two South Indian states Karnataka and Kerala. The students belonged to an extensive educational background of courses like engineering, allied health sciences and nursing. Initially the questionnaires were administered on 1062 students from five different institutions. Students were approached based on the educational course. At the onset of the administration phase the participants were debriefed about the purpose of the study and were asked if they are willing to participate in the study. They were requested to sign a consent form if they agree to participate. The scales were administered on the student's during their class hour, with prior permission from the teacher in charge as well as the department head. Each course was assigned with a number used for the purpose of identifying and recording all the instruments. Thirty samples were rejected as they did not meet the inclusion criteria and showed significant score on the screening questionnaire.

The development of the tool began with item generation. The investigators adopted Zimmerman's model of self-regulated learning as a conceptual model. It theorizes self-regulated learning to be a three-phase process consisting of the forethought, performance control and self-reflection phases. The items in the current scale were incorporated within these three phases of self-regulated learning. An extensive review of the literature in the area of self-regulated learning and Focus Group Discussions (FGD) with the students, who formed the target population for the study, was conducted for item generation. The current study adopted the following tools:

Focus Group Discussion: The first author conducted seven FGDs with 7-8 participants in each group with the aid of an FGD guide [17]. Sociogram was prepared during the FGD by the co-author to ensure adequate participation. A total of 52 students participated, and once the FGDs attained saturation, it was transcribed and subjected to content analysis. The responses were coded

referring to the phases of self-regulated learning for item generation. Items generated from qualitative data analysis as well as a review of literature for the first version of the scale consisted of 131 statements.

Manipal Health Questionnaire (MHQ): The MHQ [18] was used as a screening tool to rule out comorbid psychopathology. It is an 18 item questionnaire that is to be answered on a five point Likert scale. It takes 10 min for administration and a score of 63 and above is considered as significant. The scale has good internal consistency with a Cronbach's alpha- 0.88 and a test retest reliability- 0.81

Manipal Learning Strategy Inventory (MLSI): The MLSI [19] is a tool that has been developed in the Indian context to assess the strategy used by students while learning. MLSI is a 90 item self-reported inventory measuring on a five point Likert scale. It is a comprehensive tool comprising dimensions assessing pre-requisite for learning, motivation, learning styles and learning strategies. It also has high internal consistency with Cronbach alpha of 0.84, and excellent test retest reliability of 0.9. One of the reason why this tool was selected for the purpose of concurrent validity was that it is culturally relevant and gives a measure of regulatory components of student's learning.

Academic Self- Regulated Learning Scale (A-SRL-S): The A-SRL-S [20] measures self-regulation of college students within the context of learning in higher education. Each item is responded by a four-point Likert scale (strongly agree, agree, disagree, and strongly disagree). The scale is composed of seven factors: memory strategy (14 items), goal-setting (5 items), self-evaluation (12 items), seeking assistance (8 items), environmental structuring (5 items), learning responsibility (5 items), and planning and organizing (5 items). High internal consistencies were also attained for each factor (.73 to .87). It was used to assess concurrent validity of the current scale.

Results

For face and content validity, seven subject matter experts validated the content of the scale. The experts included two psychiatrists, two clinical psychologists, one educational psychologist and Carlo Mango, the author of a tool used in this study for concurrent validity. The face validity of the tool was established. Based on the suggestions from the subject matter experts, items that require approximations were modified, and similar or irrelevant items were eliminated. A Content Validity Index (CVI) for each statement was obtained, and the scale was revised to 45 items. The scale obtained an average S-CVI of 0.88 indicative of excellent content validity. After establishing the face validity and content validity, the tool of 45 items underwent item analysis.

In the process of item analysis, items having an Inter-Item Correlation (IIC) of 0.2 and less were removed. The IIC inspects the degree to which scores of an item is related to the scores on every other item in the scale. It gives an

appraisal of the item redundancy: the degree to which items on a scale are evaluating the same content [21]. The final pool consisted of 36 items out of which 10 items were under forethought phase, 19 were under performance control and 7 under the phase of self- reflection. The internal consistency or Cronbach's Alpha for the 36-item scale was found to be 0.90. A value of 0.70 or higher is generally considered sufficient for using instruments [22, 23]. Internal consistency gauges identify with item homogeneity or how much items on a test measure a similar concept [24]. Table 1 shows the internal consistency of the domains of academic self- regulated questionnaire.

A synthesis of the sub-factors discussed in the review of the literature (Zimmerman cyclical model, 1998) converges on three phases of self-regulation, namely, forethought, performance proper and self- reflection. Detailed description, number of the items and example item of each sub-factor is shown in Table 2. A 36-item scale (ASLQ) addressing the three aspects of self-regulated learning has been developed to assess students' process of self-regulated learning on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Items were constructed, keeping in mind the sub-processes of a self-regulatory learning cycle. Item analysis of the 36 item tool with the Cronbach alpha for each item is provided in Table 3 demonstrating excellent internal consistency.

The test-retest reliability was computed with a sample consisted of 45 students. The retest was given after two weeks. The interval of time may be as short as within the same day, or it can be as long as several years; however, two weeks is considered to be adequate as per most of the research studies. The Interclass Correlation Coefficient (ICC) was utilized to discover the reliability of the three phases of academic self-regulation. ICC is a distinct measurement that is utilized when a quantitative estimation is made on units that are sorted out into groups. It portrays how emphatically units in similar groups look like one another. It is the evaluation of consistency or reproducibility of quantitative estimation made by various spectators estimating a similar amount. The single measure ICC was .96 with a 95% confidence interval from 0.93-0.97. An ICC of 0.96 means that an estimated 96.3% of the observed score variance is due to true score variance. The balance of the variation (i.e. ICC = 3.7 %) is attributable to error [25]. The single measure ICC value for forethought is .90 with a 95% confidence interval from .83-.94, for the performance control dimension the ICC value was .95 with a 95% confidence interval from .91-.97 and finally for the self- reflection dimension the ICC value was .806 with a 95% confidence interval from .67-.88. Thus, the results show a high degree of test-retest reliability for each of the three dimensions. Thus, the 36-item scale was used for standardization. Of these 36-items, two items (item no. 4 and 16) were reverse scored as these had been negatively worded, while the remaining 34 items which were positively worded were directly scored. Items were randomly organized using a fishbowl technique for the final standardization of the ASLQ.

Table 1. Internal Consistency ASLQ Dimensions

Dimension	Cronbach's Alpha	No. of Items
Forethought	0.72	10
Performance Control	0.85	19
Self-reflection	0.75	7

Table 2. Scope, Number of Items, Example Item and Subscales (phases) Reliability of ASLQ (N = 1032)

Phases	Description	No. of Items	Example	A
Forethought	This stage comes before the actual performance, sets the stage for action, maps out the task to minimize the unknown and helps to develop a positive mindset. Involves tasks such as- initiation, planning, setting goals and distractions or problems that disrupt initiation of the study process.	10	I split my portions while studying	0.72
Performance control	This stage deals with the process during learning. It involves the utilization of various strategies by individuals to enhance their learning, the distractions faced by them during the study process, time management, the conditions facilitating studying and self- motivating techniques employed.	19	I ask for help if I do not understand the study material	0.85
Self-reflection	This phase involves the reflection after a performance, self-evaluation, and evaluation of outcomes compared to goals. Requires evaluation of accomplishment of goal, success or failure of a plan, insufficient time management, and the conditions under which they accomplished the most.	7	I try to learn from the mistakes I made in the exam	0.75

Table 3. Item Analysis of Academic Self-Regulated Learning Questionnaire

Items	Dimension*	Corrected Item-total correlation	Cronbach alpha
1. I study in a suitable place where I can concentrate	P	0.71	0.89
2. When I am reading, I stop once in a while to review what I have read	P	0.52	0.89
3. I make necessary changes in study plan to improve learning	S	0.64	0.89
4. I don't feel motivated to study difficult subjects	F	-0.27	0.91
5. I split my portions while studying	F	0.35	0.89
6. I go through the study material carefully to understand it properly	P	0.46	0.89
7. Before I start studying, I make a schedule	F	0.40	0.89
8. I try to strengthen the strategies that worked for me previously	S	0.58	0.89
9. I study in a manner that makes it more interesting/enjoyable	P	0.40	0.89
10. I use keywords/ abbreviations to improve learning	P	0.44	0.89
11. When my studies are affected, I try to identify my mistakes	S	0.66	0.89
12. I learn by teaching others	P	0.40	0.89
13. I set targets before I start studying	F	0.48	0.89
14. While I am studying, I try to get rid of any distractions that are around me	P	0.61	0.89
15. I keep a track of study areas where I am lacking	S	0.46	0.89
16. I don't have the habit of maintaining notes	P	-0.39	0.91
17. I organize the study material before I start studying	F	0.60	0.89
18. After my exam I reflect back upon areas I could have done better	S	0.24	0.90
19. I make notes to simplify learning	P	0.31	0.89
20. I try to learn from the mistakes I made in exam	S	0.50	0.89
21. I constantly assess the amount of effort I put in studies	S	0.31	0.89
22. I memorize key words to remind me of important concepts	P	0.59	0.89
23. Before I study, I make an outline of the content	F	0.52	0.89
24. I focus more on difficult portions while studying	P	0.53	0.89
25. I organize my time according to difficulty of the task	F	0.52	0.89
26. I make sure that I complete the portions on time	P	0.72	0.89
27. If I miss a class, I take the help of others to cover the portions	P	0.39	0.89
28. I keep my assignments and class notes complete	P	0.36	0.89
29. I motivate myself to do better than before	F	0.56	0.89
30. While studying I utilize different sources of information (lectures, reading and discussions)	P	0.46	0.89
31. I set a goal for how much to study each day	F	0.51	0.89
32. I make simple charts, diagrams or tables while studying	P	0.30	0.90
33. I seek help when unable to understand a concept	P	0.64	0.89
34. When I study I try to understand the concepts.	P	0.59	0.89
35. I refer to my class notes whenever necessary	P	0.56	0.89
36. I make sure that I attend class regularly	F	0.57	0.89

*F = Forethought, P = Performance control, S = Self- reflection

After establishing reliability, the study continued to decide the concurrent validity of the present scale. Concurrent validity alludes to how much the operationalization corresponds with different proportions of a similar construct that are estimated simultaneously. It involves looking at the correlation between scores on the new scale with that of a standard scale. For this purpose, two existing scales related to academic self-regulation were used. First, Manipal Learning Strategy Inventory (MLSI) developed by the second author in the Indian context funded by the Indian Council for Medical Research was used. This tool helps to assess the strategy used by students while learning. The second tool was the Academic Self-Regulated Learning Scale (ASLS) by Carlo Magno [26, 27]. It measures the self-regulation of college students within the context of learning in higher education. These three tools were administered on a sample of 50 students for assessing concurrent validity. Pearson's product-moment correlation, a linear association measure, was used to find the relationship among the dimensions of ASLQ with that of the MLSI and ASLS. It was found that ASLQ, showed a good correlation with the aspects of MLSI and with the total score of MLSI with $p < 0.001$. The Pearson's product-moment correlation coefficient for total ASLQ with total MLSI was found to be .89 as seen in Table 4.

The correlation was also calculated for the dimensions of the two scales. Table 4 shows the relationship between the aspects of ASLQ with the dimensions of MLSI. Pearson's correlation coefficient for the forethought phase was found to be significant with $p < 0.001$ with all the dimensions of MLSI and also with the total MLSI ($r = .71$). Out of all, the forethought dimension had the highest correlation with Metacognitive Learning Strategy ($r = .66$), followed by Motivational Learning Strategy ($r = .66$).

Performance control dimension also had a significant correlation with all the aspects of MLSI as well as the total MLSI ($r = .85$). Performance control had the highest correlation with the metacognitive strategy dimension ($r = .802$), followed by cognitive learning strategy ($r = .79$). The values were found to be significant with $p < 0.001$. Self-reflection was found to have a weak correlation with three out of five MLSI dimensions. It can be due to the fact that self-reflection is an independent process variable which ASLQ measures, while MLSI, although in Indian context measures learning strategies. It also showed a weak correlation with the total MLSI ($r = .50$); however, self-reflection was found to have an adequate association with the metacognitive learning strategy ($r = .61$).

The ASLQ was further subjected to concurrent validity with ASLS by Carlo Magno. Total scale score, as well as the three dimensions, were correlated with the seven dimensions and overall rating of ASLS. Pearson's product-moment correlation was employed to estimate the degree of relationship between the different variables. It was found that ASLQ, on the whole, showed adequate correlation with all the dimensions of ASLS and with the total ASLS at 0.01 significance level. The Pearson's product-moment correlation coefficient for total ASLQ with total ASLS was found to be .68 at 0.01 significance level. Thus, the current tool shows good correlation with ASLS on the whole, as seen in Table 5.

Table 5 also shows the correlation among the dimensions of ASLQ with the dimensions of ASLS. Pearson's correlation coefficient for the forethought phase is significant with all the aspects of ASLS and with the total ASLS ($r = .55$). Forethought had a moderate correlation with memory strategy ($r = .42$), goal setting ($r = .47$), self-evaluation ($r = .45$) and seeking assistance ($r = .40$). It also has an adequate correlation with the total ASLS ($r = .55$).

Table 4. Pearson's Correlation for Concurrent Validity for the Total Scale and Dimensions of ASLQ with Dimensions and Total of MLSI

N=50		COLS	MLS	BLS	COPLS	MCLS	Total MLSI
Total ASLQ	Pearson Correlation	0.81*	0.82*	0.82*	0.73*	0.87*	0.89*
Forethought	Pearson Correlation	0.65*	0.66*	0.65*	0.60*	0.66*	0.71*
Performance control	Pearson Correlation	0.79*	0.77*	0.77*	0.77*	0.80*	0.85*
Self- reflection	Pearson Correlation	0.40*	0.49*	0.47*	0.22	0.61*	0.50*

*Significant $p < 0.001$

** COLS (cognitive learning strategy), MLS (motivational learning strategy), BLS (behavioral learning strategy), COPLS (cooperative learning strategy), MCLS (metacognitive learning strategy), Total MLSI (total score on Manipal learning strategy inventory)

Table 5. Pearson's Correlation Value of Total and the Dimensions of ASLQ with Dimensions and Total of ASLS

Dimension		MS	GS	SE	SA	ES	LR	OR	Total ASLS
Forethought	Pearson Correlation	0.42	0.47	0.45	0.40	0.37	0.36	0.39	0.55*
Performance control	Pearson Correlation	0.61*	0.55*	0.42	0.54*	0.33	0.53*	0.58*	0.69*
Self- Reflection	Pearson Correlation	0.29	0.20	0.22	0.12	0.09	0.14	0.19	0.27
Total ASLQ	Pearson Correlation	0.59*	0.55*	0.47	0.50*	0.35	0.48*	0.54*	0.68*

*significant $p < 0.001$ level

**Memory Strategy (MS), Goal Setting (GS), Self- Evaluation (SE), Seeking Assistance (SA) Environmental Structuring (ES), Learning Responsibility (LR) and Organizing (OR), Total ASLS (total score on academic self-regulated learning scale by Carlo Magno)

Performance control dimension also had a significant correlation with all the dimensions of ASLS. It showed a strong correlation with the total ASLS ($r=.69$). Performance control had a strong association with the memory strategy dimension ($r=.61$). Self-reflection was found to have no significant correlation with any of the aspects of ASLS as well as the total scale. The weak relationship among certain dimensions can be attributed to the cultural differences between the populations in which both scales were validated.

The study further proceeded to establish the score ranges for the population and interpretation of scores. The 36-item scale was administered on 1032 students with an age range between 17 and 25 years. The frequency distribution showed that the data was normally distributed across age, gender and academic courses. The mean age of the sample was 19.86 years ($SD = 1.73$). With regard to gender, 491 were men (i.e. 47.6%) and 541 were women (i.e. 52.4%). The data computed from 1032 participants were subjected to analysis, and the cut-off for the 36-item scale was established. While a score of 150 and above denotes high academic self-regulation, a score of 113 and below indicates deficits in academic self-regulation.

Discussion

The primary purpose of the study was to develop and validate a tool that assesses the academic self-regulated learning of young adults in India. The current study was a success in attempting to move the focus away from learning strategies to a deeper level of understanding about the learning process of students. The tool proved to be fruitful in assessing the specific process domains of self-regulated learning, which in turn will help student's to utilize the learning strategies more adequately. The tool by determining the self-regulated learning of young adults, will help them to understand how far they are intrinsically motivated to carry out their education and how much of control they have over regularizing their study. It will also help them to understand which phase of self-regulation they lack so that necessary corrective measures can be taken to improve those. The current tool can also serve as a screening instrument which can be used by teachers and academicians to help those students who are unable to meet the course demands and are finding it hard to perform well academically.

The implication of the current study is obvious with the findings of various studies which found self-regulated learning to be highly influential in promoting better academic performance, enhancing the confidence of the students thereby improving the overall learning experience. Encouraging students to become self-regulated learners, helps the students to be more focused on their academic goals and enhances goal achievement. Within the clinical context, it has been observed that student's academic stressors mostly originate from the lack of adequate understanding regarding his/her learning process. With the aid of this tool, therapists can identify the phase of academic self-regulation and

facilitate further planning of techniques to enhance student's learning process.

Conclusion

ASLQ fills the void of a culturally appropriate academic self-regulation scale within the Indian context. Unlike other existing tools of academic self-regulation that focuses more on learning strategies, the current tool helps in understanding the process of self-regulated learning which in turn will help students to be more structured and organized in their academic approach.

Although the study utilized a robust approach, one of the limitations of the current study was that it did not attempt to establish the predictive validity of the tool. Even though the dimensions of the instrument were identified from Zimmerman's model of self-regulated learning, this was validated from the major categories emerged from the qualitative data analysis instead of looking for a model fit statistically. Future studies can attempt to explore the cultural differences in self-regulated learning in order to understand whether an individual's environment has a role to play in promoting self-regulated learning. Studies can also attempt to conduct confirmatory factor analysis to assess the model fit.

Conflict of interest

The authors declare no conflicts of interest

Ethical Approval

The study complies with the ethical standards for research on human subjects. Approval from the Institutional Ethics Committee was obtained beforehand the beginning of the study. All participants were given the participant information sheet, explained the details and clarified their queries regarding the research. Written informed consent was obtained from the participants before initiating the data collection. No identifiers were used, ensuring the anonymity of the data collected.

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