

## VALIDATION OF MOTIVATED STRATEGIES FOR LEARNING QUESTIONNAIRE (MSLQ) IN INDIAN CONTEXT

<sup>1</sup>Vijay Kumar , <sup>2</sup>Jyoti Bhalla

*Department of Education, Lovely Professional University, Phagwara, Punjab, India*

### **Abstract**

*The current study was an effort to validate the MSLQ tool developed by Pintrich et al. (1991) in Indian context. In the current study, MSLQ with 15 subscales was administered on the sample (N=1929) of higher education students of Punjab state of India. A confirmatory factor analysis (CFA) was conducted and maximum likelihood estimation procedures were employed to evaluate if the model fits the observed data and the internal consistency of the scale was examined by computing Cronbach's alpha for each subscale of MSLQ. The factor structure of "Motivation" scale of MSLQ was found to fit the observed data but the data of "Learning Strategies" scale displayed unsatisfactory evidence of fit with the hypothesised nine-factor model. Consequently, the two subscales viz. "Effort Regulation" and "Help seeking" were eliminated. Two items from "Metacognitive Self-Regulation" subscale and three items from "Time and Study Environment" were deleted to fit "Metacognitive Self-Regulation" and "Time and Study Environment" subscales of "Learning Strategies" scale.*

**Keywords:** *Self-regulated Learning Strategies, MSLQ, Higher Education Students, Confirmatory Factor Analysis, Motivation, Learning Strategies*

### **INTRODUCTION**

The process of academic self-regulation is the process of controlling the cognitive, metacognitive, affective and motivational aspects all together (Pintrich, 1995; Pintrich & Garcia, 1991; Zimmerman, 1990, 1998; Zimmerman and Bandura, 1994). Researches have shown that academic self-regulation has a positive impact on the academic achievement of the students (DiBenedetto & Bembenuddy, 2011). It was emphasised that the students can be trained to regulate their learning process (Perels et al., 2005 and Azevedo et al., 2010). Thus, the knowledge about self-regulated learning strategies is very much important for a teacher (Kitsantas et al.2008). In order to measure the self-regulation of the students and to suggest necessary interventions, a valid and reliable tool is required. The "Motivated Strategies for Learning Questionnaire" (MSLQ) is one of the commonly used tools to measure the self-regulated learning of the students (Zimmerman, 2008 and Roth et al., 2016). This tool assesses the inclination of students to engage in the process of self-regulation. Different researchers have validated and adapted this tool on diverse sample. However, a handful of studies have raised the issues regarding the problems with the psychometric properties of MSLQ scale. Dunn et al. (2012) argued that the hypothesized model prescribed by Pintrich et al. (1991) has some misspecification but also certain problems on its latent factor structure and recommended further work for re-specifying the latent factor structure of this scale. Malpass et al. (1999) found that it is difficult to distinguish between metacognitive self-regulation and effort regulation subscales. Pintrich and DeGroot (1990) and Yap (1993) showed that the regulation subscales lacked discriminant validity. Rao and Sachs (1999) used translated version of MSLQ instrument and found good signal for a five-factor this model. Meta-analysis of the different subscales of MSLQ was conducted by Crede and Phillips (2011) and found that the subscales named as "Effort Regulation" and "Metacognitive Self-Regulation" were found to be the good predictors of the academic achievement of the students. The MSLQ has been used in various research studies on higher education across western countries (Campbell, 2001 and Suarez et al., 2001). The translated and validated versions of MSLQ were found to be used on diverse population of different countries so far such as Colombia (Ramirez et al., 2016), Iran (Feiz et al., 2012), Turkey (Karadeniz et al., 2008), United States (Chen et al., 2012), China (Rao et al., 1999; Lee et al., 2015), Egypt (Shawer, 2013), Spain (Roces et al. 2013; Martinez, 2000), South Africa (Chen and Whitesel, 2012) and Turkey (Ilker et al., 2014). In India, the most recent study on cross cultural validation of MSLQ was conducted by Chechi et al. (2019) and have proposed parsimonious version of MSLQ.

For measuring self-regulated learning, a relevant tool is required and that tool should be valid and reliable for a diverse population and is sensitive to the variations in the ability levels of students. The present study was an effort to validate the MSLQ tool on the Indian population of higher education. Due to the paucity of research on the validity and reliability of MSLQ on the Indian population of higher education, the present study aimed to address this specific need. The work will contribute to measure and understand the self-regulated learning strategies of higher education students and will be helpful for the teachers to design and implement the strategic training programs to develop effective self-regulated learning skills among the students.

## METHOD

The descriptive survey is a quantitative method, with the help of which investigator can collect quantified information of the population by using the sample of that population. Therefore, the researcher found the survey method as the most suitable method for the present study. The participants were the undergraduate (N=1139) and postgraduate (N= 790) students from the autumn term of 2017. The participants were selected from 2<sup>nd</sup>, 4<sup>th</sup> and 6<sup>th</sup> semesters of BCA, BBA, B. Com, B. Sc programs and 2<sup>nd</sup> semester of MCA, MBA, M. Com, M.Sc. (Chemistry) programs by using convenient sampling technique. The specific courses were considered which have been studied by the participants in their previous semester.

Table-1 Demographics of the sample by Academic level, Gender, Major and Course		
Variable	N	%
<b>Academic Level</b>		
UG	1139	59.0
PG	790	41.0
<b>Gender</b>		
Female	1261	65.4
Male	668	34.6
<b>Program</b>		
B.Com	229	11.9
B.Ed	275	14.3
B.Sc	254	13.2
BBA	167	8.7
BCA	214	11.1
M.Com	152	7.9
M.Ed	157	8.1
M.Sc	152	7.9
MBA	179	9.3
MCA	150	7.8
<b>Semester</b>		
2nd semester	1127	58.4
4th semester	495	25.7
6th semester	307	15.9
<b>Total</b>	1929	100.0
<b>Program</b>		<b>Course studied in previous semester</b>
B.com 2 <sup>nd</sup> Semester		Financial Accounting
B.com 4 <sup>th</sup> Semester		Corporate Accounting
B.com 6 <sup>th</sup> Semester		Management Accounting
B.Sc. 2 <sup>nd</sup> Semester		Inorganic Chemistry
B.Sc. 4 <sup>th</sup> Semester		Physical Chemistry
B.Sc. 6 <sup>th</sup> Semester		Inorganic Chemistry
BBA 2 <sup>nd</sup> Semester		Micro Economics

BBA 4 <sup>th</sup> Semester	Marketing Management
BBA 6 <sup>th</sup> Semester	Business Environment
BCA 2 <sup>nd</sup> Semester	Computer Programming in C
BCA 4 <sup>th</sup> Semester	Object-Oriented Programming through C++
BCA 6 <sup>th</sup> Semester	Java Programming
M.Com 2 <sup>nd</sup> Semester	Organizational Behavior
M. Sc 2 <sup>nd</sup> Semester	Physical Chemistry
MBA 2 <sup>nd</sup> Semester	Managerial Economics
MCA 2 <sup>nd</sup> Semester	Programming in C
MCA 2 <sup>nd</sup> Semester	Programming in Java

The “Motivated Strategies for Learning Questionnaire” (MSLQ) was administered on the sample at UG and PG level. Due permission was taken from the respective authorities and the investigator personally visited various places for getting questionnaires filled. The MSLQ survey was conducted during regular classes. The students were asked to respond to the items of the questionnaire reflecting on the course they have studied in the previous semester. The response rate was approximately 80% of 2500, for a total of 2000 completing the survey. Out of the total, seventy-one incomplete questionnaires were removed from the dataset. The final sample size of 1929 respondents were considered for the purpose of analysis.

The “Motivated Strategies for Learning Questionnaire” (MSLQ) developed by Pintrich et al. (1991) was used to assess the motivation and learning strategies of the students in a particular subject. The MSLQ scale has two dimensions namely “Motivation” (31 items) and “Learning Strategies” (50 items). The “Motivation” scale of MSLQ is comprised of 3 sub-dimensions; “Value component”, “Expectancy Component” and “Affective Component”, further “Value component” has 3 subscales viz. “Intrinsic Goal Orientation” (IGO) (i.e. “In a class like this, I prefer course material that really challenges me so I can learn new things”); “Extrinsic Goal Orientation” (EGO) (i.e. “Getting a good grade in this class is the most satisfying thing for me right now”); “Task Value” (TV) (i.e. “I think I will be able to use what I learn in this course in other courses”), “Expectancy Component” has 2 subscales viz. “Control of learning Beliefs” (CLB) (i.e. “If I study in appropriate ways, then I will be able to learn the material in this course”); “Self-Efficacy for Learning and Performance” (SELP) (i.e. “I believe I will receive an excellent grade in this class”), “Affective Component” has one subscale i.e. “Test Anxiety” (TA) (i.e. “When I take a test I think about how poorly I am doing compared with other students”).

The “Learning Strategies” scale of MSLQ was comprised of two subdimensions; “Cognitive & Metacognitive Strategies” and “Resource Management Strategies”, further, “Cognitive & Metacognitive Strategies” has 5 subscales viz. “Rehearsal” (REH) (i.e. “When I study for this class, I practice saying the material to myself over and over”); “Elaboration” (ELB) (i.e. “When I study for this class, I pull together information from different sources, such as lectures, readings, and discussions”); “Organization” (ORG) ( i.e. “When I study the readings for this course, I outline the material to help me organize my thoughts”); “Critical Thinking” (CT) (i.e. “I often find myself questioning things I hear or read in this course to decide if I find them convincing”); “Metacognitive Self-Regulation” (MSR) (i.e. “During class time I often miss important points because I'm thinking of other things”) and “Resource Management Strategies” has 4 subscales viz. “Time and Study Environment” (TSE) ( i.e. “I usually study in a place where I can concentrate on my course work”); “Effort Regulation” (ER) ( i.e. “I often feel so lazy or bored when I study for this class that I quit before I finish what I planned to do”); “Peer Learning” (PL) ( i.e. “When studying for this course, I often try to explain the material to a classmate or a friend”); “Help-Seeking” (HS) ( i.e. “Even if I have trouble learning the material in this class, I try to do the work on my own, without help from anyone”) All the items were rated on 7-point Likert scale (1= “not at all true of me”, to 7= “very true of me”)

## RESULTS

In order to investigate the psychometric properties of MSLQ, confirmatory factor analysis (CFA) was conducted using “IBM SPSS AMOS ver. 22”. The internal consistency of the scales was examined by calculating the coefficient alpha (Cronbach, 1951). The maximum likelihood estimation procedures were employed to evaluate the fit of the proposed model of MSLQ. For the fit indices, the recommended cut-off values for good model fit considered were as:  $\chi^2/df < 5$  (Hayduk, 1987), GFI, CFI, TLI, IFI  $\geq 0.90$  (Hu and Bentler, 1999), RMSEA, RMR  $\leq 0.08$  (Browne and Cudeck, 1993) and Hoelter's Critical N  $\geq 200$  (Garson, 2009) were considered. The minimum level of factor loading was set at 0.40 and the items with factor loading less than 0.40 were deleted from the questionnaire. The descriptive statistics and intercorrelation of the subscales of MSLQ have been given in table 2 and table 3 respectively.

Dimensions	M	SD	Skew	Kurtosis	Dimensions	M	SD	Skew	Kurtosis
Motivation Scale					Learning Strategies Scale				
IGO	5.02	1.16	-0.35	-0.28	REH	4.87	1.15	-0.24	-0.31
Ego	5.14	1.21	-0.39	-0.45	ELAB	4.94	1.09	-0.24	-0.25
TV	5.08	1.15	-0.43	-0.22	ORG	5	1.17	-0.30	-0.31
CLB	5.02	1.14	-0.26	-0.40	CT	4.82	1.08	-0.29	-0.05
SLEP	5.02	1.04	-0.38	-0.10	MSR	4.86	0.97	-0.27	-0.05
TA	4.39	1.2	-0.29	-0.15	TSE	4.93	1.13	-0.37	-0.17
					PL	4.83	1.24	-0.34	-0.21

	IGO	EGO	TV	CLB	SELP	TA
IGO	1					
EGO	.585**	1				
TV	.724**	.653**	1			
CLB	.546**	.508**	.561**	1		
SELP	.734**	.680**	.777**	.535**	1	
TA	.211**	.246**	.174**	.275**	.163**	1

	REH	ELAB	ORG	CT	MSR	TSE	PL
REH	1						
ELAB	.698**	1					
ORG	.676**	.723**	1				
CT	.663**	.740**	.668**	1			
MSR	.697**	.738**	.706**	.696**	1		
TSE	.481**	.478**	.499**	.440**	.497**	1	
PL	.576**	.616**	.610**	.592**	.569**	.393**	1

\*\* p<0.01

The “Kaiser Mayer Olkin” (KMO) value and “Bartlett test of sphericity” were employed in order to test the adequacy of the data before running the factor analysis. For motivation scale of MSLQ, the “Kaiser Mayer Olkin” (KMO)=0.90 and “Bartlett test of sphericity” with  $\chi^2$  (465, N= 368) = 4525.62, p= 0.000 and for learning strategies scale of MSLQ, the “Kaiser Mayer Olkin” (KMO)= 0.94 and “Bartlett Test of Sphericity”,  $\chi^2$  (1225, N= 368) = 8661.72, p= 0.000, which are found to be significant and confirmed the adequacy of the data to run factor analysis.

The Confirmatory factor analysis (CFA) analysis was done separately for both motivation scale and learning strategies scale in the same way as done by Pintrich et al. (1991). The first CFA analysis

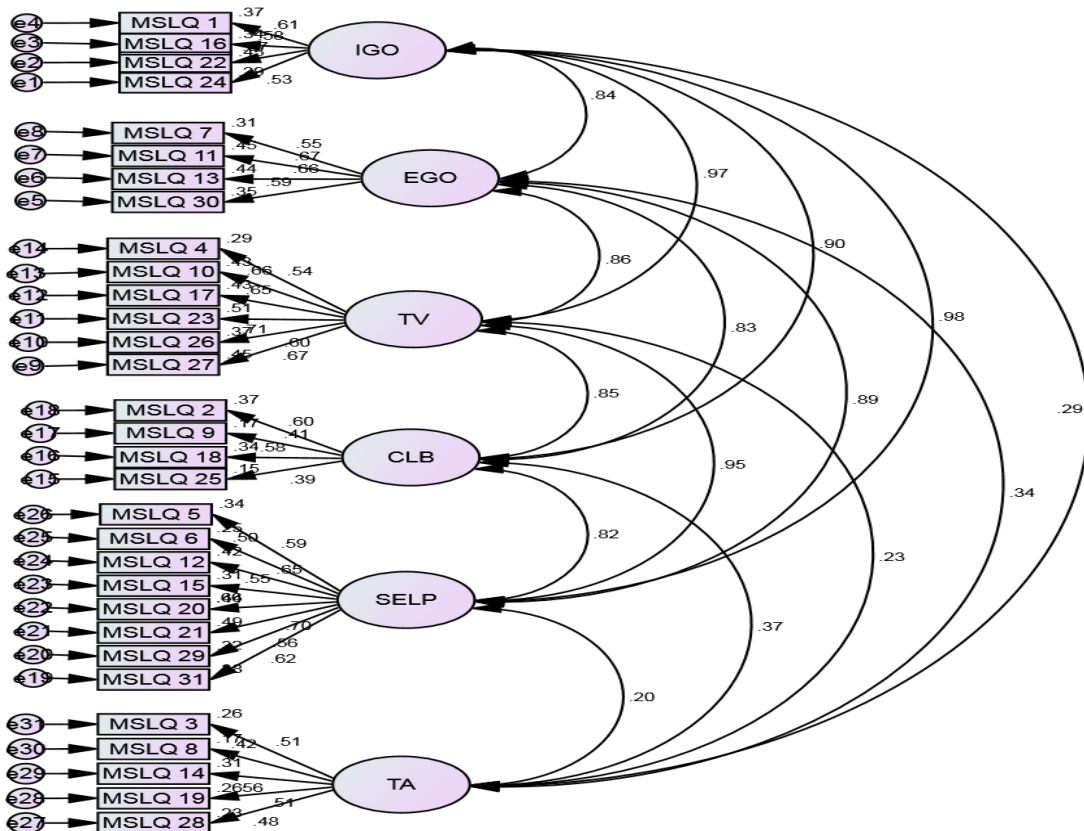
was conducted on 31 items of motivation scale in order to check how well the six-factor model fitted the data. The second CFA analysis was conducted on 50 items of learning strategies scale in order to see how well the nine-factor model fitted the data.

The model fit indices for the “Motivation Scale” of MSLQ were as: CMIN/DF ( $\chi^2/df$ ) = 4, GFI = 0.92, CFI = 0.90, IFI = 0.90, TLI = 0.90, RMSEA = 0.048 and Hoelter’s Critical N = 396. The values of all the model fit indices came out as per the threshold values. Therefore, the present findings confirmed that the six-factor motivation model fitted the observed data. Further, the factor loading of the items of “Motivation” scale ranged from 0.40 to 0.71 (table 4) and Cronbach’s alphas of the subscales ranged from 0.57 to 0.82 (table 5).

Table-4  
Factor Loadings of the items of Motivation and Learning Strategies Scale of MSLQ

Dimension	Items	Factor Loading	Dimension	Items	Factor Loading	
IGO	24	0.54	ELAB	81	0.61	
	22	0.67		69	0.62	
	16	0.58		67	0.62	
	1	0.61		64	0.62	
EGO	30	0.59		62	0.64	
	13	0.67		53	0.61	
	11	0.67		ORG	63	0.64
	7	0.55			49	0.58
TV	27	0.67	42		0.64	
	26	0.60	32		0.57	
	23	0.71	CT	71	0.62	
	17	0.65		66	0.64	
	10	0.66		51	0.64	
4	0.54	47		0.62		
CLB	25	0.39		38	0.54	
	18	0.58		MSR	79	0.53
	9	0.41			78	0.62
	2	0.61			76	0.54
SELP	31	0.62	61		0.64	
	29	0.56	56		0.57	
	21	0.70	55		0.60	
	20	0.66	54		0.53	
	15	0.55	44		0.60	
	12	0.65	41	0.43		
	6	0.50	36	0.55		
	5	0.59	TSE	35	0.57	
TA	28	0.48		43	0.56	
	19	0.51		65	0.53	
	14	0.56		70	0.61	
	8	0.42		73	0.59	
	3	0.51	34	0.54		
REH	72	0.63	PL	45	0.60	
	59	0.57				
	46	0.59				
	39	0.50		50	0.57	

Motivation Scale		Learning Strategies Scale	
Dimension	$\alpha$	Dimension	$\alpha$
IGO	0.69	REH	0.66
Ego	0.70	ELAB	0.79
TV	0.80	ORG	0.70
CLB	0.57	CT	0.75
SLEP	0.82	MSR	0.82
TA	0.61	TSE	0.71
		PL	0.60



**Fig. 1 Path Diagram of Motivation Scale of MSLQ**

IGO- “Intrinsic Goal Orientation”, EGO-“Extrinsic Goal Orientation”, TV-“Task Value”, CLB- “Control of Learning Beliefs”, SELP-“Self Efficacy for Learning and Performance”, TA-“Test Anxiety

The model fit indices for the “Learning Strategies” scale of MSLQ were as CMIN/DF ( $\chi^2/df$ ) = 5.20, GFI = 0.87, CFI = 0.85, IFI = 0.90, TLI = 0.83, RMR = 0.12, RMSEA = 0.04 and Hoelter’s Critical N = 397. The obtained values of measures of fit indices have not found to meet the recommended cut-off values, though value of RMSEA and Hoelter’s Critical N meets accepted threshold value. Therefore, the results pointed out that hypothesized model of “Learning Strategies” scale of MSLQ did not fit the observed data. On analysing the factor loadings of the items, it has been found that the factor loading of item 33 and item 57 of “Metacognitive Self Regulation” dimension, items 52, 77, 80 of “Time and Study Environment” and item 37 and item 60 of the “Effort Regulation” dimension was less than 0.40, consequently, these items were removed from the scales. On analysing the Cronbach’s  $\alpha$  for each subscale it has been observed that after removing the items 33

and 57, the  $\alpha$  for “Metacognitive Self Regulation” was increased from 0.71 to 0.82 and after removing items 52, 77, 80 of “Time and Study Environment” scale, the  $\alpha$  increased from 0.33 to 0.71. Further the Cronbach's  $\alpha$  for “Effort Regulation” and “Help Seeking” have been found to be very poor, so these subscales were removed from the original MSLQ and conducted CFA again.

After removal of the “Effort Regulation” and “Help Seeking” scales, the final model comprised of seven latent factors viz. “Rehearsal”, “Elaboration”, “Organisation”, “Critical Thinking”, “Metacognitive Self Regulation”, “Time and Study Environment” and “Peer Learning”. The final model fit indices for the “Learning Strategies” scale of MSLQ were as CMIN/DF ( $\chi^2/df$ ) = 4.6, GFI = 0.92, CFI = 0.91, IFI = 0.91, TLI = 0.91, RMR = 0.08, RMSEA = 0.043 and Hoelter's Critical N = 457. The values of all of the model fit indices came out as per the threshold values. Therefore, the present findings confirmed that the seven-factor learning strategies model. Further, the Cronbach's  $\alpha$  for different scales of “Learning Strategies” scale ranged from 0.60 to 0.82 giving moderate to good internal consistency index and Cronbach's  $\alpha$  (table 5). Along with this, the factor loading of the learning strategies items was found to range from 0.42 to 0.64 (table 4). This shows that the final seven-factor model of “Learning Strategies” has produced good fit indices.

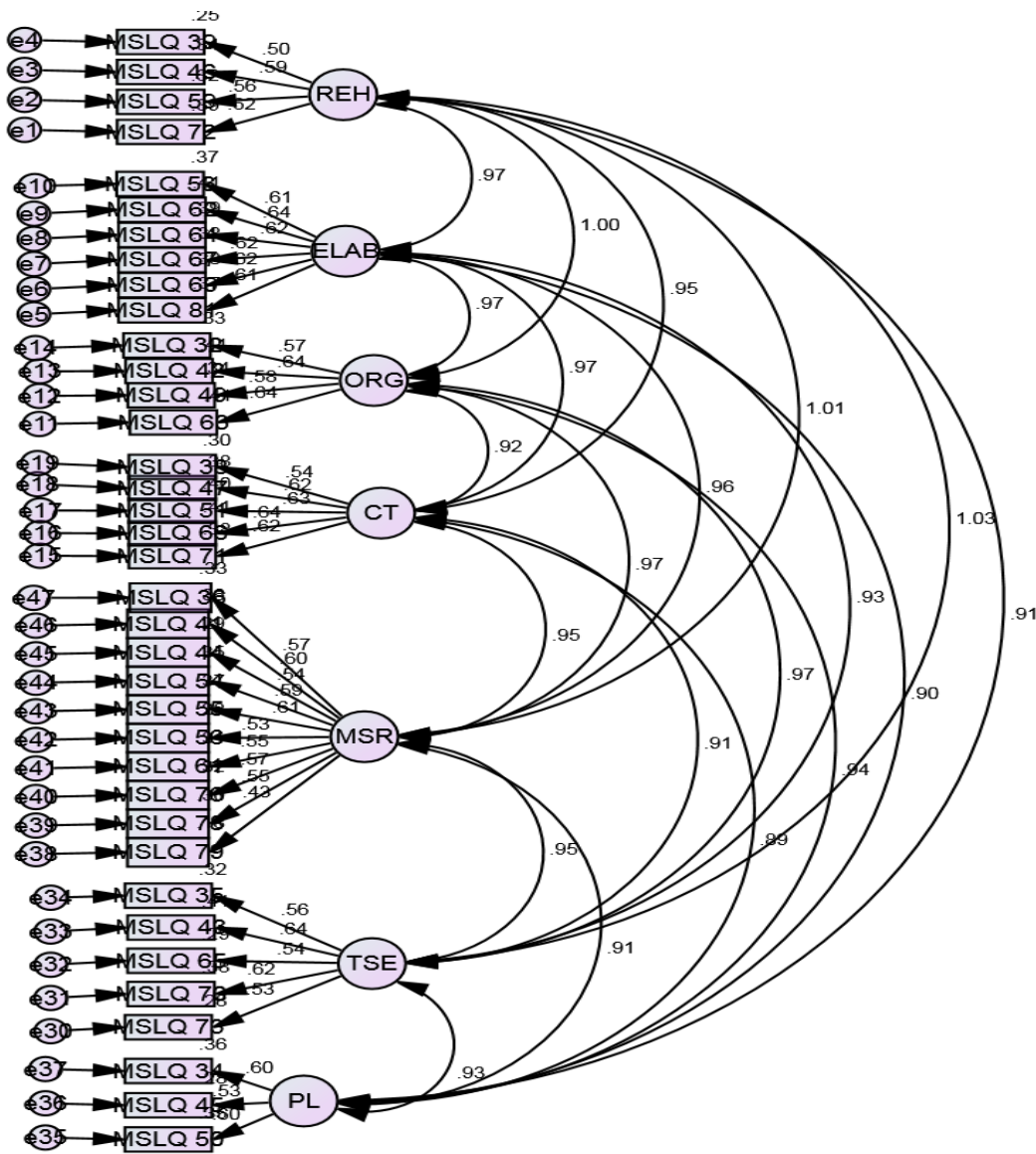


Fig. 2 Path Diagram of Learning Strategies of MSLQ

**Note:** Reh – “Rehearsal”, Elab- “Elaboration”, Org- “Organisation”, CT- “Critical Thinking”, ER- “Effort Regulation”, MSR- “Metacognitive Self-Regulation”, TSE- “Time and Study Environment”, HS- “Help-Seeking”, PL- “Peer Learning”

### Comparison of the psychometric properties of MSLQ-India and MSLQ- Original

The comparison of the psychometric properties of MSLQ validated on Indian sample with the original MSLQ has been reported in table 6.

Table-6 Comparison of Measure of fit indices and Reliability statistics between MSLQ validated in India with the MSLQ original				
MSLQ- Motivation Scale				
Measure Fit	MSLQ- Original		MSLQ-India	
CMIN/DF ( $\chi^2/df$ )	3.49		4	
RMSEA	Not given		0.048	
GFI	0.77		0.92	
Hoelter’s CN	140		396	
MSLQ- Learning Strategies Scale				
CMIN/DF ( $\chi^2/df$ )	2.26		4.6	
RMSEA	Not given		0.043	
GFI	0.78		0.92	
Hoelter’s CN	180		457	
Comparison of Reliability Statistics				
Component	items	$\alpha$ MSLQ-Original	$\alpha$ MSLQ-India	Items/ subscale deleted from MSLQ
IGO	1, 16, 22, 24	0.74	0.69	Retained
EGO	7, 11, 13, 30	0.62	0.70	Retained
TV	4, 10, 17, 23, 26, 27	0.9	0.80	Retained
CLB	2, 9, 8, 25	0.68	0.57	Retained
SELP	5, 6, 12, 15, 20, 21, 29, 31	0.93	0.82	Retained
TA	3, 8, 14, 19, 28	0.8	0.61	Retained
REH	39, 46, 59, 72	0.69	0.66	Retained
ELAB	53, 62, 64, 67, 69, 81	0.76	0.79	Retained
ORG	32, 42, 49, 63	0.64	0.70	Retained
CT	38, 47, 51, 66, 71	0.8	0.75	Retained
MSR	33, 36, 41, 44, 54, 55, 56, 57, 61, 76, 78, 79	0.79	0.82	Items 33, 57 (eliminated)
TSE	35, 43, 52, 65, 70, 73, 77, 80	0.76	0.71	Items 52, 77, 80 (eliminated)
ER	37, 48, 60, 74	0.69	-	Scale eliminated
PL	34, 45, 50	0.76	0.60	Retained
HS	40, 58, 68, 75	0.52	-	Scale Eliminated

The data of table 6 is showing the comparison of the psychometric properties of the MSLQ validated on the Indian population and the MSLQ original. The present results of CFA led to the conclusion that the factor structure of “Motivation Scale” of MSLQ validated on Indian population is



almost consistent with the six-factor structure of MSLQ-Original with slight variations in the values of measure of fit indices and Cronbach's  $\alpha$ . But, in "Learning Strategies" scale for few items (i.e. 33, 57, 52, 77, 80) faced poor factor loading ( $<0.40$ ) and two subscales (i.e. "Effort Regulation" and "Help Seeking") showed poor reliability. Therefore, these items and scales have been removed. Second maximum likelihood was carried out after removal of poor fit items and subscales. The CFA results, the seven-factor model showed the good model fit for the diverse Indian population at UG and PG levels. The previous researches conducted by Jackson (2018) and Chechi et al. (2019) involving the presentation of a parsimonious version of MSLQ, eliminated "Extrinsic Goal Orientation", "Test Anxiety", "Peer Learning" and "Help Seeking" subscales from the original MSLQ of Pintrich et al. (1991), owing to the poor psychometrics of these sub-scales.

## CONCLUSION

The final version of MSLQ contains 31 items in six-factor model of "Motivation" scale and 45 items in seven-factor "Learning Strategies" scale. The research has some limitations also as the scale was validated by targeting the sample of one northern state of India only, hence the research may not claim the generalisation of results to whole India. So, it is advisable to make sure if the social context might influence the results by testing the sample population of other states of India also. Further, the same scale can be validated on a large sample and by targeting the population of other programs like Humanities, Pharmacy, Mathematics Engineering, Agriculture or Architecture etc. As the study was spanning a wide range of programs and courses. The motivational orientations and use of different learning strategies may vary according to the characteristics of different courses and individual differences. Thus, the revised MSLQ model reasonably claimed the validity and reliability in Indian context.

## REFERENCES

1. Azevedo, R., Moos, D. C., Johnson, A. M., & Chauncey, A. D. (2010). Measuring cognitive and metacognitive regulatory processes during hypermedia learning: Issues and challenges. *Educational Psychologist*, 45(4), 210-223. <https://doi.org/10.1080/00461520.2010.515934>
2. Bollen, K. A. (1989). A new incremental fit index for general structural equation models. *Sociological Methods & Research*, 17(3), 303-316. <https://doi.org/10.1177/0049124189017003004>
3. Browne, M. W., & Cudeck, R. (1993). Alternative Ways of Assessing Model Fit. In K. A. Bollen, & J. S. Long (Eds.), *Testing Structural Equation Models* (pp. 136-162). Newbury Park, CA: Sage Publications, Inc.
4. Campbell, M.M. (2001). Motivational strategies, learning strategies and the academic performance of African-American students in a college business environment: A correlational study. *Dissertation Abstracts International*, 62(2-A), 432.
5. Chen, C., & Whitesel, J. (2012). The validity and reliability study of a revised motivated strategy for learning questionnaire (MSLQ) for assessing computer software learning strategies. *International Journal of E-Adoption (IJE)*, 4(2), 28-51.
6. Chechi, V.K., Bhalla, J., Chakraborty, R (2019). Cross Cultural Validation and Adaptation of the Parsimonious Version of Motivated Learning Strategies Questionnaire in the Indian Context. *International Journal of Advanced Science and Technology*, 28(16), 50-90.
7. Crede, M., & Phillips, L. A. (2011). A meta-analytic review of the Motivated Strategies for Learning Questionnaire. *Learning and individual differences*, 21(4), 337-346. <https://doi.org/10.1016/j.lindif.2011.03.002>
8. Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16(3), 297-334
9. DiBenedetto, M. K., & Bembenuity, H. (2011). Within the Pipeline: Self-Regulated Learning and Academic Achievement among College Students in Science Courses. Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans, Louisiana. Retrieved from <https://files.eric.ed.gov/fulltext/ED518505.pdf>

10. Dunn, K. E., Lo, W. J., Mulvenon, S. W., & Sutcliffe, R. (2012). Revisiting the motivated strategies for learning questionnaire: A theoretical and statistical reevaluation of the metacognitive self-regulation and effort regulation subscales. *Educational and Psychological Measurement*, 72(2), 312-331. <https://doi.org/10.1177/0013164411413461>
11. Feiz, P., & Hooman, H. A. (2013). Assessing the Motivated Strategies for Learning Questionnaire (MSLQ) in Iranian students: Construct validity and reliability. *Procedia-Social and Behavioral Sciences*, 84, 1820-1825. <https://doi.org/10.1016/j.sbspro.2013.07.041>
12. Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39-50. <https://doi.org/10.1177/002224378101800104>
13. Garson, G. D. (2009). *Structural equation modelling*. Asheboro USA: Statistical Associates Publishing.
14. Hair Jr, J. F. *Multivariate Data Analysis* Joseph F. Hair Jr. William C. Black Barry J. Babin Rolph E. Anderson Seventh Edition.
15. Hayduk, L. A. (1987). *Structural equations modeling with LISREL: Essentials and advances*. Baltimore: Johns Hopkins Press.
16. Hinton, P. R., McMurray, I., & Brownlow, C. (2014). *SPSS explained*. Routledge.
17. Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1-55. <https://doi.org/10.1080/10705519909540118>
18. Ilker, G., Arslan, Y., & Demirhan, G. (2014). A validity and reliability study of the motivated strategies for learning questionnaire. *Kuram Ve Uygulamada Egitim Bilimleri*, 14(3), 829-833. Retrieved from <https://search.proquest.com/docview/1552719997?accountid=80692>
19. Jackson, C. R. (2018). Validating and Adapting the Motivated Strategies for Learning Questionnaire (MSLQ) for STEM Courses at an HBCU. *AERA Open*, 4(4). <https://doi.org/10.1177/2332858418809346>
20. Karadeniz, S., Buyukozturk, S., Akgun, O. E., Cakmak, E. K., & Demirel, F. (2008). The Turkish Adaptation Study of Motivated Strategies for Learning Questionnaire (MSLQ) for 12-18 Year Old Children: Results of Confirmatory Factor Analysis. *Turkish Online Journal of Educational Technology*, 7(4).
21. Kitsantas, A., Winsler, A., & Huie, F. (2008). Self-regulation and ability predictors of academic success during college: A predictive validity study. *Journal of Advanced Academics*, 20(1), 42-68. <https://doi.org/10.4219/jaa-2008-867>
22. Malpass, J. R., O'Neil, H. F., & Hovevar Jr, D. (1999). Self-regulation, goal orientation, self-efficacy, worry, and high-stakes math achievement for mathematically gifted high school students. *Roeper Review*, 21(4), 281-288. <https://doi.org/10.1080/02783199909553976>
23. Martinez, J. R., & Galan, F. (2000). Estrategias de aprendizaje, motivación y rendimiento académico en alumnos universitarios= Undergraduate students' learning strategies, motivation and academic performance.
24. Perels, F., Gurtler, T., & Schmitz, B. (2005). Training of self-regulatory and problem-solving competence. *Learning and Instruction*, 15(2), 123-139. <https://doi.org/10.1016/j.learninstruc.2005.04.010>
25. Pintrich, P. R. (1995). Understanding self-regulated learning. *New Directions for Teaching and Learning*, 63, 3-12. <https://doi.org/10.1002/tl.37219956304>
26. Pintrich, P. R., & De Groot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology*, 82(1), 33-40.
27. Pintrich, P. R., & Garcia, T. (1991). Student goal orientation and self-regulation in the college classroom. In M. L. Maehr and P. R. Pintrich (Eds.), *Advances in Motivation and Achievement* (pp. 371-402). Greenwich, CT: JAI Press.
28. Pintrich, P. R., Smith, D. A. F., Garcia, T., & McKeachie, W. J. (1991). *A manual for the use of the Motivated Strategies for Learning Questionnaire (MSLQ)*. Ann Arbor: National Center for Research to Improve Postsecondary Teaching and Learning, The University of Michigan.
29. Ramirez Echeverry, J. J., García Carrillo, A., & Olarte Dussan, F. A. (2016). Adaptation and validation of the motivated strategies for learning questionnaire-MSLQ-in engineering students

- in Colombia. *International journal of engineering education*, 32(4), 1774-1787.  
<http://hdl.handle.net/2117/107554>
30. Rao, N., & Sachs, J. (1999). Confirmatory factor analysis of the Chinese version of the motivated strategies for learning questionnaire. *Educational and Psychological Measurement*, 59(6), 1016-1029. <https://doi.org/10.1177/00131649921970206>
  31. Roces, C., Tourón, J., & Gonzalez-Torres, M. C. (1995). Validación preliminar del CEAM II (Cuestionario de Estrategias de Aprendizaje y Motivación II).
  32. Roth, A., Ogrin, S., & Schmitz, B. (2016). Assessing self-regulated learning in higher education: a systematic literature review of self-report instruments. *Educational Assessment, Evaluation and Accountability*, 28(3), 225-250. <https://doi.org/10.1007/s11092-015-9229-2>
  33. Stevens, J. P. (2002). *Applied multivariate statistics for the social sciences*, Mahwah, NJ: Lawrence Erlbaum Associates Publishers.
  34. Suarez Riveiro, J. M., Cabanach, R. G., & Arias, A. V. (2001). Multiple-goal pursuit and its relation to cognitive, self-regulatory, and motivational strategies. *British Journal of Educational Psychology*, 71(4), 561-572. <https://doi.org/10.1348/000709901158677>
  35. Yap, E. G. (1993). A structure model of self-regulated learning in math achievement (Unpublished doctoral dissertation). University of Southern California, Los Angeles.
  36. Zimmerman, B. J. (1990). Self-regulated learning and academic achievement: An overview. *Educational Psychologist*, 25(1), 3-17. [https://doi.org/10.1207/s15326985ep2501\\_2](https://doi.org/10.1207/s15326985ep2501_2)
  37. Zimmerman, B. J. (1998). Academic studying and the development of personal skill: A self-regulatory perspective. *Educational Psychologist*, 33(2-3), 73-86. <https://doi.org/10.1080/00461520.1998.9653292>
  38. Zimmerman, B. J. (2008). Investigating self-regulation and motivation: Historical background, methodological developments, and future prospects. *American Educational Research Journal*, 45(1), 166-183. <https://doi.org/10.3102/0002831207312909>
  39. Zimmerman, B. J., & Bandura, A. (1994). Impact of self-regulatory influences on writing course attainment. *American Educational Research Journal*, 31(4), 845-862. <https://doi.org/10.3102/00028312031004845>