

INTRODUCTION

What is Mastery-Based Learning (MBL)?

An alternative grading approach that:

- Provides students with flexibility to learn course content at their own pace.
- Emphasizes *if* students can demonstrate learning outcomes successfully by the end academic term, not *when*.
- Provides multiple opportunities for practice, feedback, and reassessment.
- Promotes deep foundational understanding, normalizes failure, and encourages students to learn from mistakes.¹

What is the 44-Item Motivated Strategies for Learning Questionnaire (MSLQ)?

The 44-item MSLQ is a well-validated assessment tool that:

- Provides measures of three motivational and two self-regulated learning components of student performance within a specific context (e.g., course, task).²
- Has been used extensively in educational research and in a variety of disciplinary contexts, including undergraduate engineering courses.³⁻⁵

MSLQ Motivational Components

Encompass the reasoning behind a student's engagement with a specific task:

- **Self-Efficacy** → captures students' perceptions of their own ability to guide and control their academic achievement.
- **Intrinsic Value** → captures the level to which students perceive what they are learning to be meaningful, interesting, and worthwhile.
- **Test Anxiety** → assesses students' emotional reactions to a task; reflects the affective component of test anxiety.

MSLQ Self-Regulated Components

Focus on students' choice of methods and strategies to accomplish a given task:

- **Cognitive Strategy Use (CS)** → measures the degree to which students use specific learning strategies, namely rehearsal, elaboration, and organization.
- **Self-Regulation (SR)** → assesses students' ability to self-reflect on their learning and persist through challenges.

What is the Purpose of this Study?

This study analyzes student MSLQ responses collected during a MBL structured Statics course to gain an improved understanding of students' motivational beliefs and learning strategies and the interplay between them.

Research Questions

- How do students' MSLQ scale scores change over the course of a 10-week MBL structured Statics course?
- What correlations exist between the MSLQ scales?

METHODS

Course Structure

- MBL was piloted in the University of Denver's Statics course in Fall 2024 to intentionally foster a learning environment aligned with students taking ownership of their own learning, persevering despite setbacks, and valuing continuous improvement.
- Course content was divided into 13 distinct concepts categorized into three levels of increasing complexity.
- Students had weekly opportunities to demonstrate mastery of concepts by completing quizzes with perfect or near-perfect solutions.
- Final course grades were determined by the number of concepts students successfully met by the end of the academic term.

Assessment of Student Motivation and Strategy Use

- The 44-item MSLQ was distributed via an online Qualtrics survey at three prescribed timepoints: (i) after the first testing opportunity (Week 2); (ii) after multiple testing opportunities (Week 8); (iii) after the final testing opportunity, but before final course grades were released (post-course)
- Students self-rated each questionnaire item on a standard 7-pt Likert scale (1 = not at all true of me; 7 = very true of me) and were instructed to provide responses based on their experience in Statics.
- Responses were analyzed only if students agreed to participate in the IRB-approved study.

Participants

- 44 students consented to and responded to the survey at all three timepoints, yielding a 55% overall participation rate.

Data Analysis

- Descriptive statistics (means, standard deviations)
- Repeated measures analysis of variance (ANOVA) to assess within-subject effects
 - Mauchly's Test (to check assumption of equal variance)
 - Huynh-Feldt corrections (applied when assumption of equal variance was not met)
 - Post-hoc analysis with Bonferroni corrections (to account for multiple comparisons)
- Pearson's *r* (two-tailed) to assess linear correlations
- Significance level was set to 0.05
- Software: MATLAB (R2023a, Mathworks Inc., Natick MA, USA) and IBM SPSS Statistics (v30)

Use this QR Code to
check out the 44-item
MSLQ questionnaire!



RESULTS

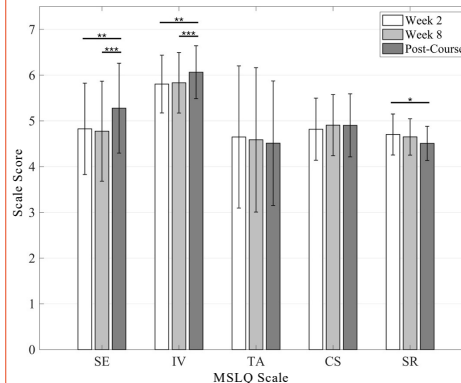


Fig 1. Mean MSLQ scale scores. Higher scores indicate a higher presence of the MSLQ component. Error bars indicate standard deviations around the mean. Average scale scores >4 at every timepoint indicate an overall tendency towards self-reported presence of all components (4 = neutral on a 7-pt Likert scale).

SE = Self-Efficacy, IV = Intrinsic Value, TA = Test Anxiety
CS = Cognitive Strategy Use, SR = Self-Regulation
p*<0.05, *p*<0.01, ****p*<0.001

Table 1. Pearson correlation coefficients and descriptive statistics at Week 2, Week 8, and post-course.

	Factor	Week 2				
		SE	IV	TA	CS	SR
Week 2	SE	—	.690**	-.479**	.097	-.111
	IV	—	—	-.282	.152	.070
	TA	—	—	—	.190	.127
	CS	—	—	—	—	.170
	SR	—	—	—	—	—
	Mean ± SD	4.83 ± 1.00	5.81 ± 0.63	4.65 ± 1.55	4.82 ± 0.68	4.70 ± 0.45
	Factor	Week 8				
		SE	IV	TA	CS	SR
Week 8	SE	—	.600**	-.442**	.244	.093
	IV	—	—	-.031	.396**	.098
	TA	—	—	—	.243	-.117
	CS	—	—	—	—	.407**
	SR	—	—	—	—	—
	Mean ± SD	4.78 ± 1.09	5.83 ± 0.66	4.59 ± 1.58	4.91 ± 0.67	4.65 ± 0.40
	Factor	Post-Course				
		SE	IV	TA	CS	SR
Post-Course	SE	—	.475**	-.358*	.102	.001
	IV	—	—	.194	.214	.213
	TA	—	—	—	.271	.149
	CS	—	—	—	—	.234
	SR	—	—	—	—	—
	Mean ± SD	5.28 ± 0.98	6.06 ± 0.58	4.51 ± 1.36	4.90 ± 0.69	4.51 ± 0.37

CONCLUSIONS

Key Takeaways

Self Efficacy

- Significant ↑ from Weeks 2 and 8 to post-course → increase in students' confidence in their abilities to succeed based on their own efforts.
- Slight (but insignificant) ↓ from Week 2 to 8 → suggests students may have temporarily doubted their abilities or felt uncertain about the implications of their lack of progress towards mastery.

Intrinsic Value

- Significant ↑ from Weeks 2 and 8 to post-course → students' perceptions of the importance of what they were learning increased or students had an increased desire for learning driven by internal factors.
- Consistent, positive correlation with self-efficacy → alludes to a strong link between these scales.

Test Anxiety

- No significant changes, but a consistent negative correlation with self-efficacy → suggests students continued to experience the same level of anxiety despite increased belief in their abilities.

Cognitive Strategy Use

- No significant changes → indicates that students did not change their learning methodology or approach as the course progressed, regardless of their academic performance.

Self-Regulation

- Significant ↓ from Week 2 to post-course → suggests that despite improved self-efficacy and intrinsic value, students had diminished ability to self-reflect on their learning and persevere through challenges.

Future Work

- Incorporate intentional interventions designed to target the aspects of student mindset that impact MSLQ components.
- Explore how students' motivational beliefs and learning strategies vary across multiple contexts (e.g., courses utilizing different assessment tools, an entire curriculum).

ACKNOWLEDGEMENTS

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