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Research Article

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Effect of Mastery learning approach on Academic achievement and Meta cognitive skills in Geography among secondary school students.

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Keywords

Mastery leaning Approach, Academic achievement in geography, meta-cognitive skills, Self-directed learning.

Abstract

Mastery learning is highly effective when combined with drill-based education for students from kindergarten to secondary school, and it can be applied to different subjects. It was introduced by Benjamin S. Bloom in the 1960s. It is an instructional method centered on students that requires complete understanding of a lesson before progressing to the subsequent one. The objective is to identify the impression of mastery learning on learning achievement and metacognitive skills in the Experimental group, distinguishing between boys and girls among 8th standard geography students. In order to compare groups, the researcher used an experimental design. It is only somewhat similar to a True experimental design, though, because there is no randomization. The investigator utilized a purposive sample technique to select 80 students intended for True experimental design that included treatment group and parallel group and then statistical methods applied are Descriptive and Inferential analysis, specifically differential (t-test) analysis. The findings revealed statistically significant distinctions between the treatment group (EG) and the non treatment group, per average marks rising from 18. 45 on the pre-intervention assessment to 30. 90 on the post-intervention assessment. The elevated t-value (11. 843) and a p-value (0. 000) indicated that the mastery learning methods were effective.

Introduction

Teaching is an art form of education that helps students develop their memory, comprehension, and reflective thinking skills(K, 2022; Moradi et al., 2012; Singh, 2025).It is a learning activity that involves teachers and students. (OLADAYO, 2021)it assists in enhancing the quality of education from preschool to tertiary education levels, contributing near the nation-building of a high quality of life for individuals within a broader society.(Nnamani, 2023).Mastery learning is distinctive in how it significantly enhances students' learning in all other subjects(Deepak Agarwal, 2002). Self-learning materials are also available for students to enhance their learning strategies across all types of learners(Joseph, 2021). It can help develop cognitive and metacognitive abilities during the learning phase(Anayochukwu & Chinelo, 2021; Dikmenli & Ünaldi, 2013).This research demonstrates that this approach is more effective for motivation, and it also stimulates the interest of weaker students(Kamalnayan, 2008; Nnamani, 2023). Consequently, these students find it easier to learn various subjects. Additionally, this study is applied to students at primary to secondary levels.(Moradi et al., 2012; Navab, 1993). Mastery learning offers an increasing level of performance with satisfactory outcomes for students in various school mediums such as language, Hindi, Bengali, Malayalam, and so on. (Singh, 2025).It can enhance the metacognitive level in students' knowledge and learning, allowing for remediation learning, small group discussions, and peer assignments with assessments, mastery learning is created as a peer-based learning, teacher-paced approach for educational instruction from primary to higher levels.(DUNCAN, n.d.).mastery ,learning followed by verifying to the 5 steps (Mitee & Obaitan, 2015) .

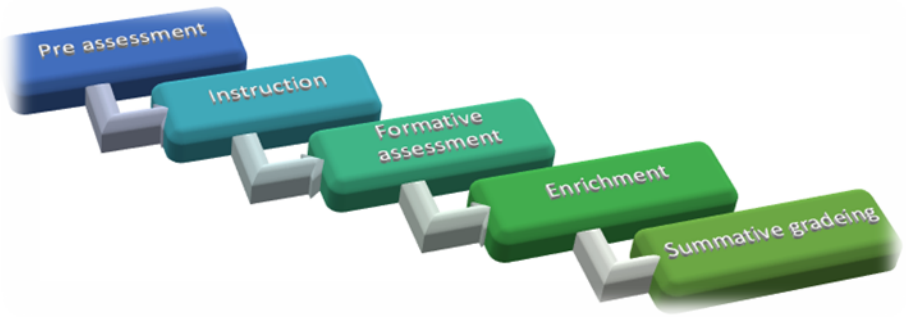


Fig 1.1 steps of Mastery learning

Mastery learning did not develop only memorization level it is offer brainstorm ,own pace learning with problem facing in their learning platforms(Ajayi Prof et al., 2024; Kamalnayan, 2008). The researcher examined issues related to value and value orientation within the framework of philosophical, sociological, and psychological aspects in education.(P. Kumar, 2010; OBAYETIN et al., 2023). Mastery is an instructional strategy that provides multiple opportunities for learners.(Oladayo, 2021)

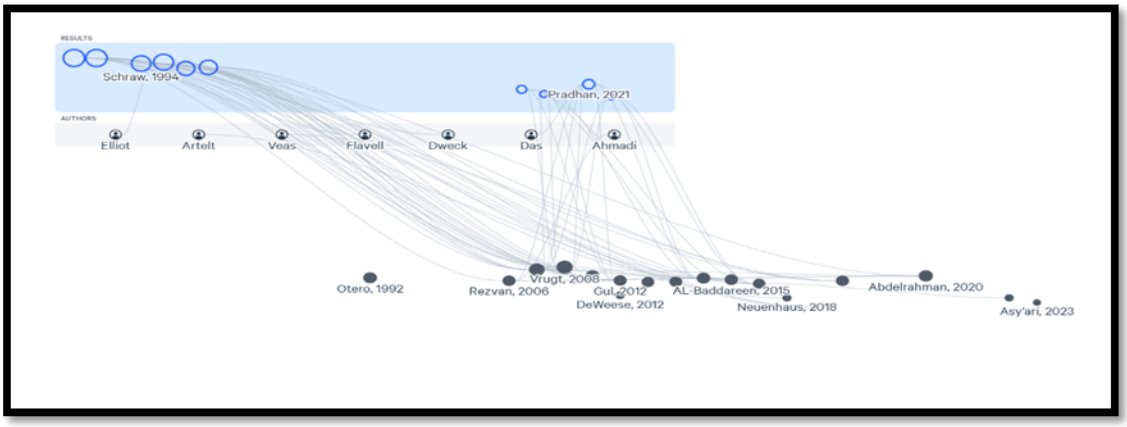


Fig 1.2 metacignative skills and accademic achievement.

The conceptual framework:

The research was guided by the System Approach, which suggests that teaching and learning involve inputs and outputs. A positive learning outcome relies on good teaching materials. The study believes that student failure is often due to the quality of instruction, not student ability. Various factors, such as learner traits, classroom environment, and teacher qualities, affect learning outcomes and should be managed. Teacher training impacts teaching methods and effectiveness. Students' age and school type also shape the content they learn and the results they achieve. The school selected has both boys and girls to reduce the impact of the classroom environment. Students from Government High School Kappagallu Road, Ballari, who are similar in age, took part in the research. The teaching method used in this study influenced the learning outcomes.

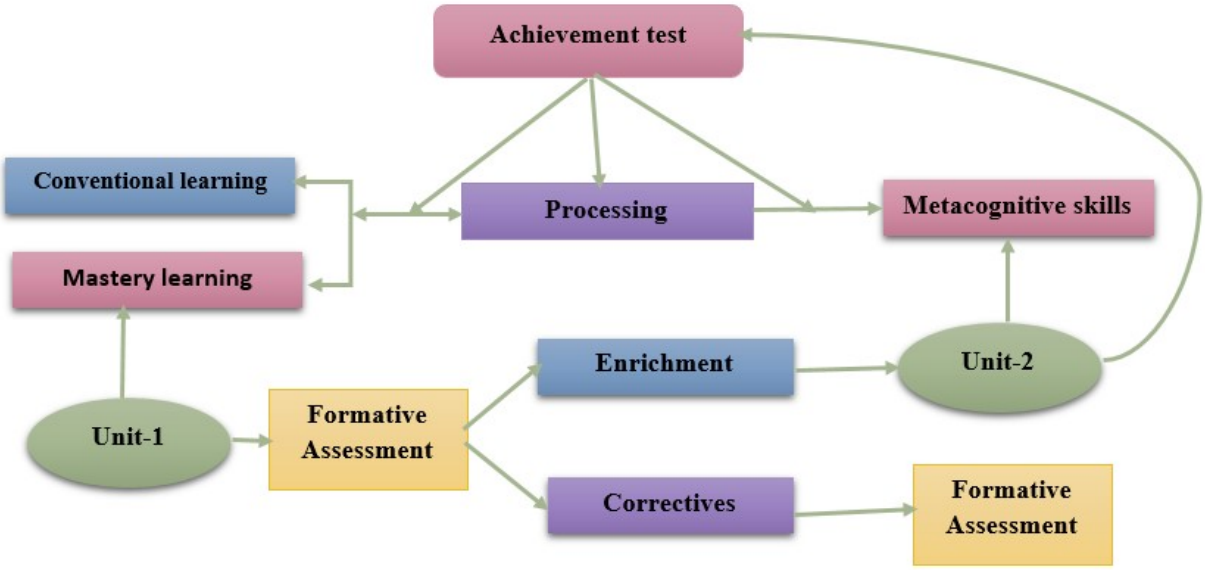


Fig 1.3 Conceptual frame work

Objects:

1. To research the distribution of students in ML and Conventional method of pre and posttest mean scores among selected variables.

2. To determine the notable differences, if any, amongst the average scores of the before intervention after Mastery learning approach, then Control assembly students' self-esteem regarding selected variables.

Hypotheses:

Based on the previously mentioned objective number 2, the following hypotheses have been created.

H_a 1 There is a notable distinction between the mean scores of Mastery learning from pre to post-test, concerning.

i. Attainment in geography
ii. Gender wise Achievement in geography
iii. Metacognitive skills
iv. Gender wise Metacognitive skills

H_a 2 There is a notable distinction between the mean scores of Conventional method from pre to post-test, concerning.

i. Accomplishment in geography
ii. Gender wise Achievement in geography
iii. Metacognitive skills
iv. Gender wise Metacognitive skills

H_a 3 There is a notable distinction between post and delayed post-test average scores of Mastery learning, in terms of.

i. Attainment in geography
ii. Metacognitive skills

Method and Procedure:

True experimental design is utilized to randomly allocate 80 students into a Treatment group of 40 and parallel groups, with each group consisting of 40 students (20 boys and 20 girls in each group). A purposive sampling technique was employed to choose a school situated in Ballari. The researcher performed t-tests to examine the mean scores on the Geography test of Academic achievement and Metacognitive skills.

The present study conducted on 8th -grade students from a Government High School on Kappagallu Road in Ballari. From the total pool of 80 eighth graders attending Government schools in Ballari, 80 students (40 boys and 40 girls split between experimental and control groups) are selected for the intervention. A treatment before test and after treatment test on the Academic achievement geography test is given to both groups. Following this, a 50-day intervention on Metacognitive skills was delivered to the treatment group, while the parallel group received no intervention. After the intervention period, post-tests were administered to measure Metacognitive skills for both groups.

Measures

1. Academic achievement geography test (self-structured tool).

2. Scale to assess Metacognitive skills of adolescents (Developed by Prof. Dr. Madhu Gupta and Ms. Suman).

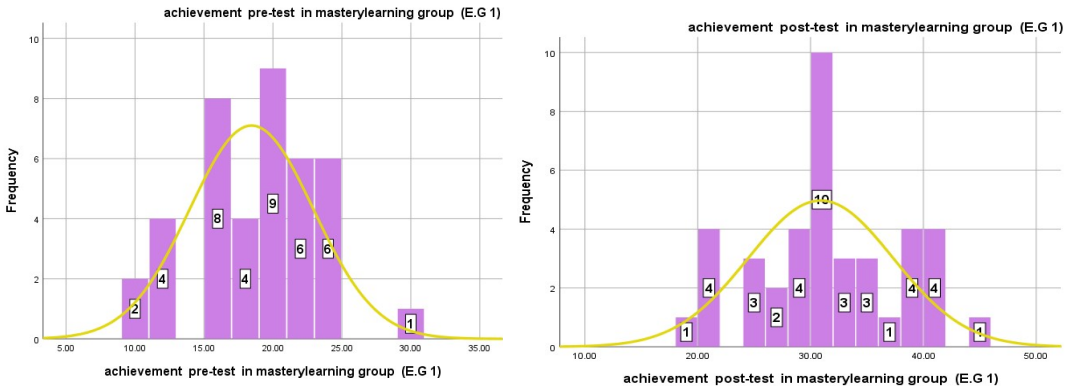
Results and Discussion

Objective 1: To research the distribution of students in ML and Conventional method of pre and posttest mean scores among selected variables.

Descriptive analysis for Academic achievement in geography:

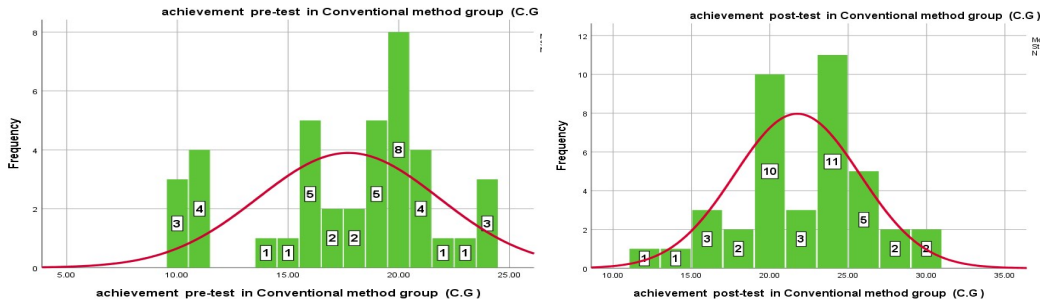
Table 1: Shows Mean, Median, SD, Skewness, Kurtosis of intervention before and after scores on Educational attainment in geography of Mastery learning , Conventional method assembly.

Group	Exam	Sample size	Average	Median	S D	Skewness	Kurtosis
Mastery learning Group	pre-test	40	18.45	20.00	4.494	-.132	.110
	Post-test	40	30.90	30.00	6.420	-.077	-.560
Conventional Group	pre-test	40	17.72	19.00	4.094	-.584	-.522
	Post-test	40	21.75	22.50	4.004	-.248	.087
Total	pre-test	80					
	Post-test	80					



Figures1.4 represent the pre and post GAT in geography in mastery group.

The table 1 and figure 1.4 indicates that the mean and median are not the same for both the pre and post mastery learning groups. The skewness coefficient for GAT reveals a slight negative skew, suggesting a minor left skew and values that are near zero indicate a distribution that is approximately normal.



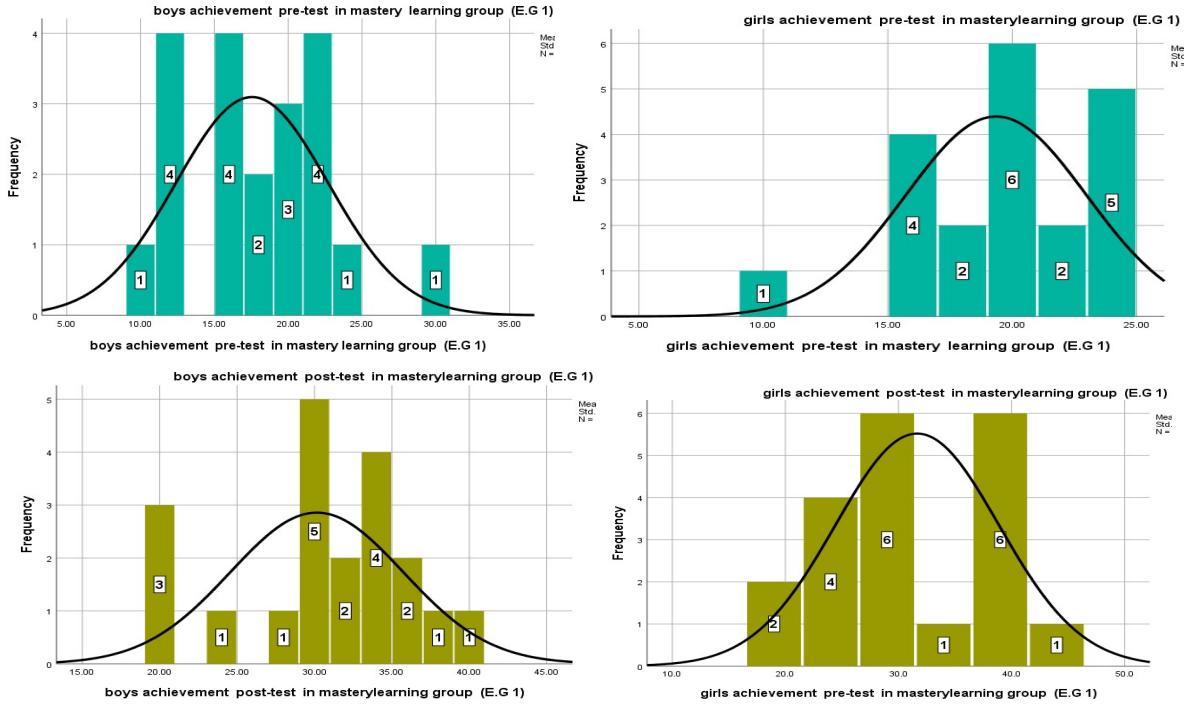
Figures 1.5 represent the pre and post GAT in geography in control group.

The above table 1 and figure 1.5 depicts that the mean and median are not the same for both the pre and post control groups. Skewness evaluates the imbalance of the data, The text explains that negative values show a left-skewed distribution, while positive values indicate a right-skewed distribution.

ii. Gender wise Academic achievement in geography

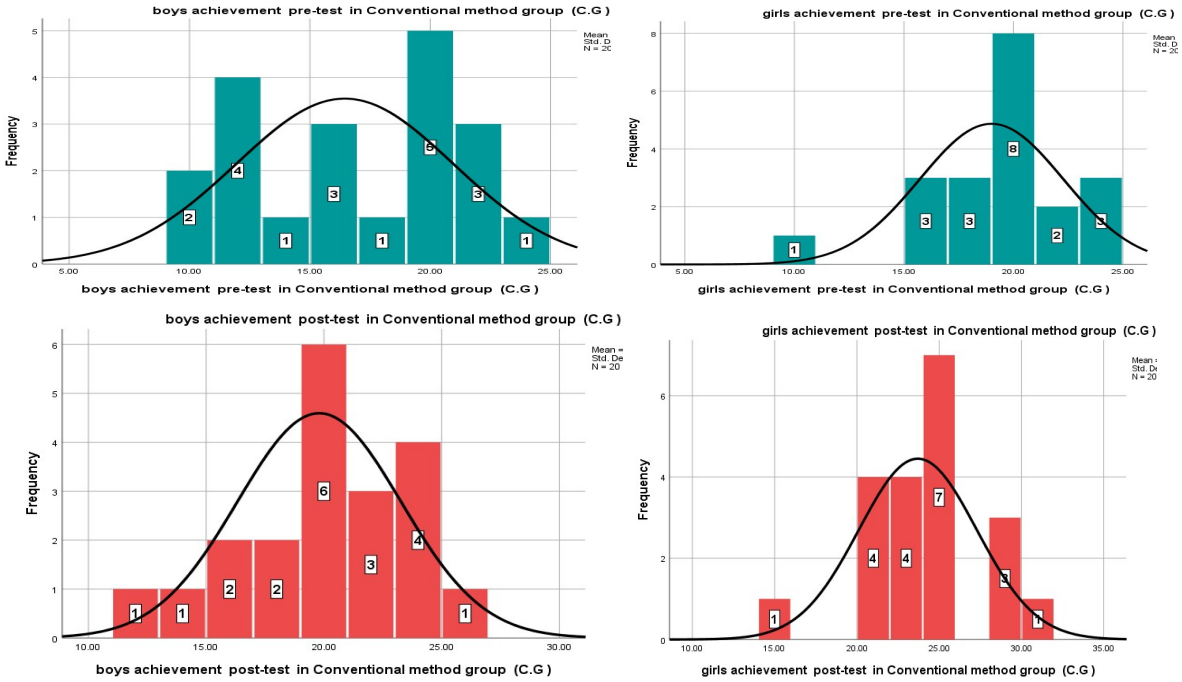
Table 2: Shows Mean, Median, SD, Skewness, Kurtosis of intervention before and after scores on Educational attainment in geography of Mastery learning and Conventional method group.

Group	Exam	Sample size	Average	Median	S D	Skewness	Kurtosis
Experimental Group	pre-test	20	Boys	18.35	19.50	5.659	.133
		20	Girls	19.85	20.00	4.715	.158
	Post-test	20	Boys	33.05	33.50	5.296	-.855
		20	Girls	36.80	37.00	5.454	-.078
Conventional Group	pre-test	20	Boys	16.45	17.00	4.501	-.171
		20	Girls	19.00	20.00	3.276	-.878
	Post-test	20	Boys	19.80	20.00	3.473	-.534
		20	Girls	23.70	24.00	3.585	-.375
Total	pre-test	80	Boys				
	Post-test	80	Girls				



Figures 1.6 represent the pre and post boys and girls GAT in geography in mastery group.

The given table 2 and figures 1.6 shows that the mean and median are not the same for both boys and girls the pre and post Mastery groups. These coefficients assist in evaluating the normality and variation of achievement scores across various groups. Skewness evaluates the The data shows an asymmetry. Negative values indicate a left-skewed distribution, meaning that the tail on the left side is longer or fatter. Positive values suggest a right-skewed distribution, where the tail on the right side is longer or fatter.



Figures 1.7 represent the pre and post boys nd girls GAT in geography in mastery group.

Table 2 and figures 1. 7 show that the mean and median values are different for both boys and girls in the pre and post control groups.The coefficients help to check how normal and varied the achievement scores are for different groups. The histograms show curved shapes for boys and girls' scores in both tests, suggesting a chance of normality with some possible small skewness or outliers. Pearson's correlation coefficient can also evaluate the link between intervention of before and after test scores.(Bala, 2020; Patel, 2021) **and others** Researchers discovered important differences between boys and girls in how they approach mastery learning.

Objective 2: To determine the notable differences, if any, amongst the average scores of the before intervention after Mastery learning approach, then Control assembly students' self-esteem regarding selected variables.

Ha 1: There is a notable distinction between the mean scores of Mastery learning from pre to post-test, concerning.

i. Attainment in geography
ii. Gender wise Accomplishment in geography
iii. Metacognitive skills
iv. Gender wise Metacognitive skills

Attainment in geography

Table 3: shows the Differences in Mean scores of intervention before and after on Educational attainment in geography among Mastery learning approach(EG).

Group	Exam	S.size	Average	S.D	df	t-value	p-value	Hypothesis supported
EG	Pre-test	40	18.45	4.494	39	11.843	.000	Yes
	Post-test	40	30.90	6.420				

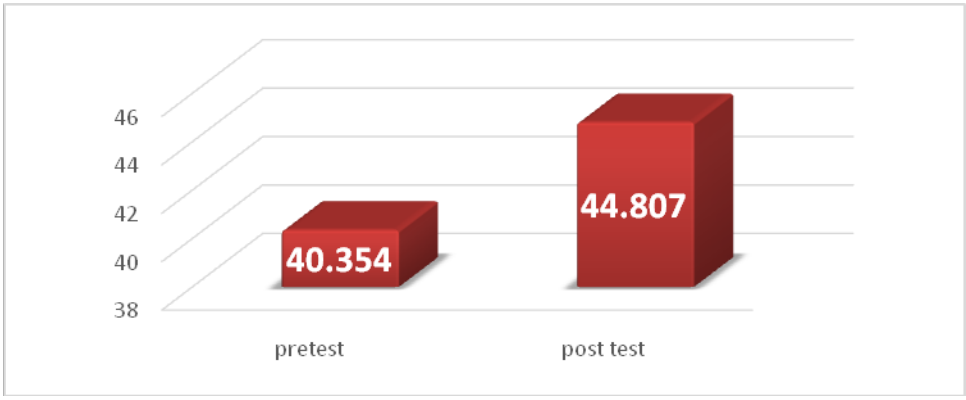


Figure 1.8. : The bar graph represents Mean scores of intervention before and after on Educational attainment of MLA

The difference between pre and post-MLA-EG1 geography academic performance scores is seen in table 3 and figure 1.8 Results shows mean scores prior to and after the test i.e. 18.45 and 30.90, respectively. Statistically significant differences were reported subsequent to mastery learning interventions.(Kamalnayan, 2008; D. Kumar, 1995) (**Manojo praveena 2014, Singh abhai raj 2020,**) and others found stated significant difference in their interventions of mastery lelearning. Mastery learning indicates a more effective comprehensive nature rather than traditional teaching strategies.

Inference: Therefore, the research hypothesis is confirmed and may be retained. The t-value of 11. 843 and the p-value of 0. 000, which is lower than the critical value of p.

1. ii. Gender wise Accomplishment in geography

Table 4: shows **Gender wise Differences in Mean scores of intervention before and after in geography among Mastery learning approach (EG).**

Group	Exam	S.size	Gender	Average	S. D	df	t-worth	p-worth	Hypothesis Supported
EG	Pre-test	20	Boys	17.55	5.155	19	1.150	.264	no
		20	Girls	19.35	3.631				
	Post-test	20	Boys	30.15	5.584	19	2.502	0.022	yes
		20	Girls	34.10	7.608				

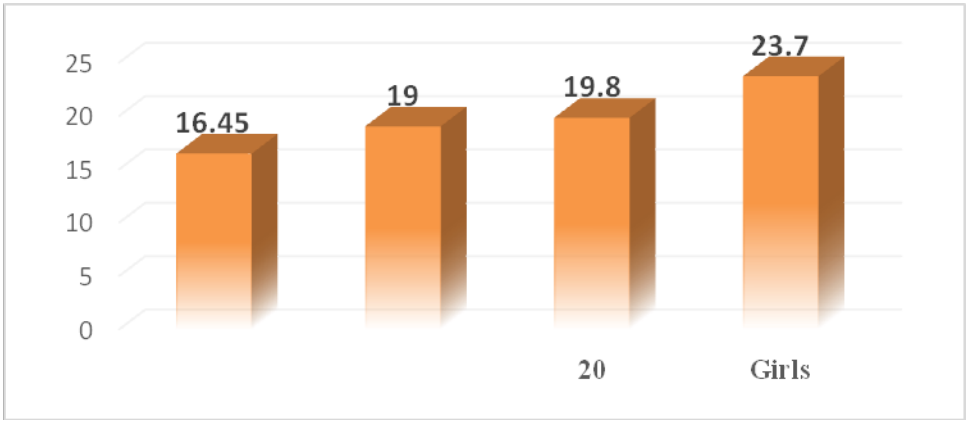


Figure 1.9 The bar graph represents boys and girls Mean scores of intervention before and after in geography among Mastery learning approach (EG).

Table 4 and figure 1.9 show the difference between the pre- and post-MLA-EG geography academic achievement test scores for boys and girls. The before intervention test mean scores of boys were 17.55 , girls were 19.35, which is not significant. The after intervention test mean scores for boys and girls were 30.15 and 34.10, respectively. After mastery learning interventions, statistically significant differences were noted.(Bala, 2020; Patel, 2021)**and others** Researcher found significant differences between boys and girls in their interventions of mastery learning.

Inference: Therefore, the research hypothesis has been approved and is regarded as valid. The pre-test indicated a t-value of 1. 150 with a p-value of 0. 264, whereas the post-test demonstrated a t-value of 2. 502 and a p-value of 0. 022, which is lower than the critical value of 0. 05, signifying statistical significance.

1. iii) Metacognitive skills

Table 5: displays Differences in intervention prior to and following Mean scores of Metacognitive skills among Mastery learning strategy (Experimental Group).

Group	Exam	S. size	Gender	Average	S. D	df	t-worth	p-worth
ML	Pre-test	40	113.42	40.354	39	8.551	.000	Yes
	Post-test	40	139.52	44.807				

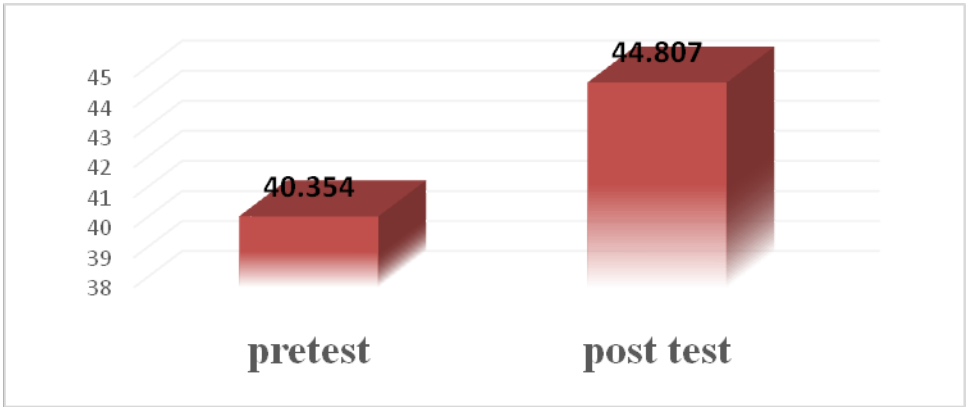


Figure 1.10 : The Bar graph represents intervention prior to and following Mean scores of Metacognitive skills among **MLA**

The difference between pre- and post-MLA-EG Metacognitive skills test scores is seen in table 5 and figure 1.10. Results shows mean scores prior to and after the test of 113.42 and 139.52, respectively. Statistically significant differences were reported subsequent to mastery learning interventions. (Bala, 2020; Manoj Praveen, 2006; Singh, 2025),**Shilan and Eric C. K Cheng 2021 and others** found state significant difference in their interventions of mastery learning.

Inference: Therefore, the previously mentioned research hypothesis is acknowledged. It can be preserved. The t-value is 8. 551 and the p-value is (0. 000) lower than the p.

1.iv) Gender wise Metacognitive skills

Table 6: shows **Gender wise Differences in** intervention prior to and following Mean scores of **Metacognitive skills among Mastery learning approach (E.G).**

Group	Test	N	Gender	Mean	Std. Deviation	df	t-value	p-value	Hypothesis supported
ML	Pre-test	20	Boys	108.45	41.287	19	1.214	.240	No
		20	Girls	118.55	39.782				
	Post-test	20	Boys	122.95	45.728	19	1.841	0.081	Yes
		20	Girls	147.30	44.487				

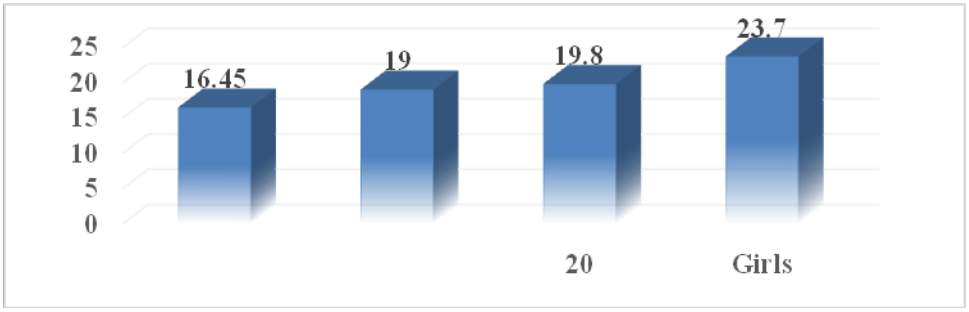


Figure 1.11: The bar graph represents boys and girls intervention prior to and following Mean scores of Metacognitive skills among Mastery learning approach (E.G).

The difference between boys and girls pre- and post-MLA-EG, Metacognitive skills test scores is seen in table 6 and figure 1.11. Results shows the before intervention test mean scores of boys were 108.45, girls were 118.55, which is not significant. The After interventions test mean scores for boys and girls were 122.95and 147.30, respectively. After mastery learning interventions, statistically significant differences were noted.(D. Kumar, 1995; Li, 2016)**,Jody Langdon et..al 2019, Golnaz ostad 2014),** found state significant difference in their interventions of mastery learning.

Inference: Therefore, the research hypothesis presented above has been accepted. It is maintained. The values are statistically significant when the pre-test t-value is t-1. 214 and the p-value is. 240, and the post-test t-value is t-1. 841 and the p-value is (0. 081), which is less than the p.

There is a notable distinction between the mean scores of Conventional method from pre to post-test, concerning.

i. Accomplishment in geography
ii. Gender wise Achievement in geography
iii. Metacognitive skills
iv. Gender wise Metacognitive skills

2.i. Accomplishment in geography

Table 3: shows the Differences in Mean scores of intervention before and after on Educational attainment in geography among Conventional method (C.G).

Group	exam	s.size	Mean	S .D	df	t-worth	p-worth	Hypothesis supported
CM	pretest	40	17.72	4.094	39	9.484	0.000	Yes
	Post test	40	21.75	4.004				

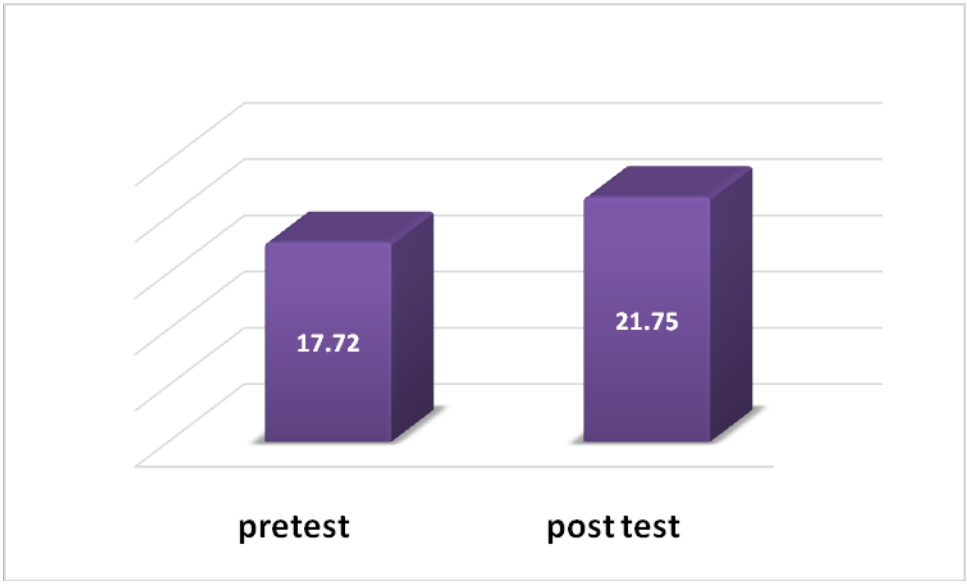


Figure 1.12 :The Bar graph represents Mean scores of intervention before and after on Educational attainment in geography among Conventional method (C.G).

The difference between pre- and post-CM-CG geography academic achievement test scores is seen in table 7 and figure 1.12. Results shows mean scores prior to and after the test i.e . 17.72 and 21.75, singly. Statistically significant differences were reported subsequent to conventional method interventions.

(Dahiya, 1995; N, 2020; OBAYETIN et al., 2023)**Filgona, J., Filgona, J., &. Sababa, L. K., (2017) and others** found stated significant difference in their interventions of conventional method.

Inference: Therefore, the research hypothesis mentioned above is accepted. It can be maintained. The t-9. 484 and p-0. 000 are less than the p.

2.ii) Gender wise Achievement in geography

Table 8: show **Gender wise Differences in Mean scores of intervention before and after on Educational attainment in geography among Conventional method (Control Group).**

Group	exam	s.size	Gender	Average	S. D	Df	t-worth	p-worth	Hypothesis Supported
Conventional Group	Pre-test	20	Boys	16.45	4.501	19	2.170	.043	yes
		20	Girls	19.00	3.276				
	Post-test	20	Boys	19.80	3.473	19	3.831	.001	yes
		20	Girls	23.70	3.585				

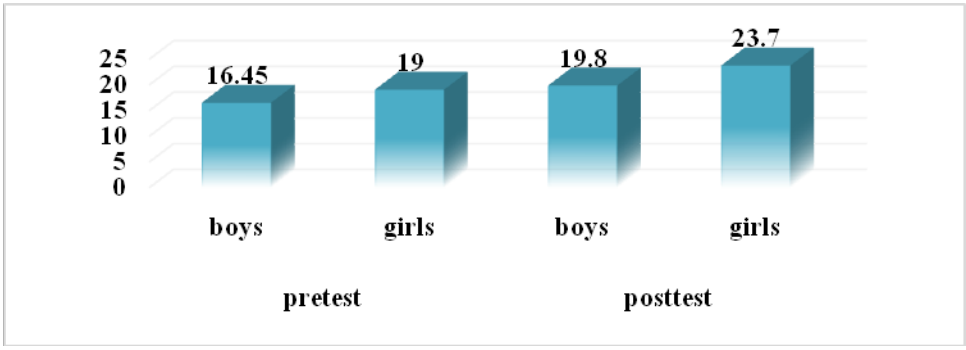


Figure 1.13 :The Bar graph represents boys and girls Mean scores of intervention before and after on Educational attainment in geography among Conventional method (Control Group).

The difference between boys and girls pre- and post-CM-CG geography academic achievement test scores is seen in table and figure 5.3.ii. Results shows the before intervention test mean scores of boys were 16.45 , girls were 19.00, which is not significant. The after intervention test mean scores for boys were 19.80, girls were 23.70, respectively. Statistically significant differences were reported subsequent to conventional method interventions.

(Bozkurt et al., 2021; Deepak Agarwal, 2002)**Lubna Toheed , Arshad Ali 2019, and others** found stated significant of boys and girls in their interventions of conventional method.

Inference: consequently, the previously mentioned research hypothesis is acknowledged. It can be upheld. The t-value for the before test is 2. 170, and for the after test, it is 3. 831, with a p-value of. 043 for the pre-test and. 001 for the post-test, both of which are beneath the p.

3. iii) Metacognitive skills

Table 9 :displays Differences in intervention prior to and following Mean scores of Metacognitive skills among Conventional method (Control Group).

Group	Test	N	Mean	Std. Deviation	df	t-value	p-value	Hypothesis supported
Conventional Group	Pre-test	40	97.60	42.805	39	4.912	.000	Yes
	Post-test	40	128.70	44.957				

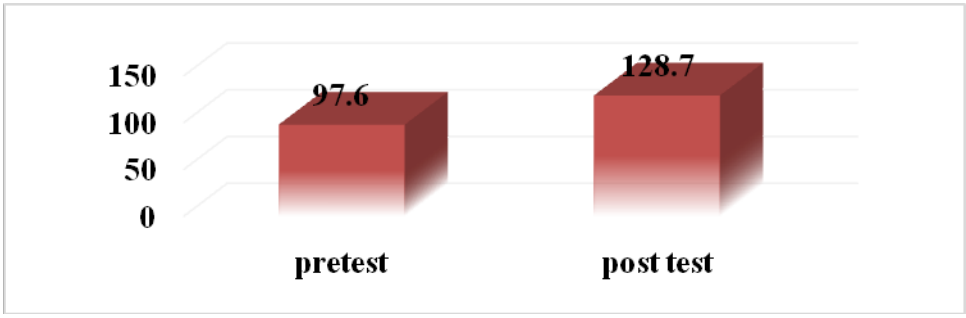


Figure 1.14 :The bar graph represents of intervention prior to and following Mean scores of Metacognitive skills among Conventional method (Control Group).

The difference between pre- and post-CM-CG Metacognitive skills test scores is seen in table 9 and figure 1.14 Results shows mean scores prior to and after the test i.e 97.60 and 128.70, respectively. Statistically significant differences were reported subsequent to conventional method interventions.(Deepak Agarwal, 2002; D. Kumar, 1995; Navab, 1993)**Ram Mehar, R. & Rana, A.(2012)** and othersfound state significant difference in their interventions of conventional method..

Inference: Therefore, the aforementioned research hypothesis is accepted. It can be retained The t-value of 4.912 and p-value of (0.000) less than the $p<0.05$ critical values shows statistically significance.

3.iv) Gender wise Metacognitive skills

Table 10: show **Gender wise Differences in intervention prior to and following Mean scores of Metacognitive skills among Conventional method (Control Group).**

Group	Exam	s.size	Gender	Average	S.D	df	t-worth	p-worth	Hypothesis supported
Conventional Group	Pre-test	20	Boys	93.50	44.490	19	.564	.579	No
		20	Girls	101.70	41.787				
	Post-test	20	Boys	131.70	36.942	19	.378	.709	No
		20	Girls	125.70	52.582				

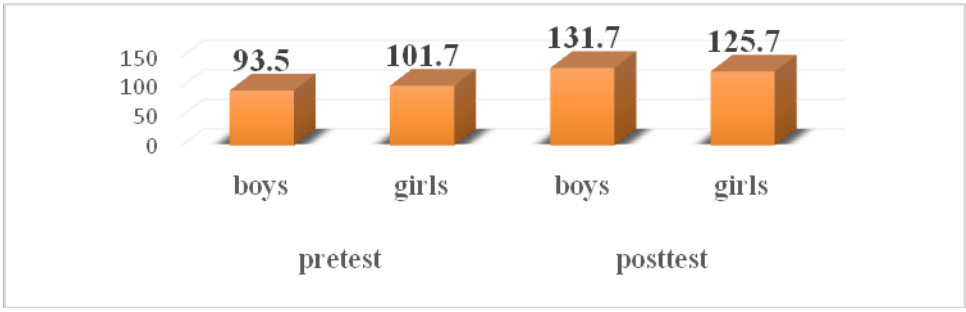


Figure 1.15 The Bar graph 3.iv represents boys and girls intervention prior to and following Mean scores of Metacognitive skills among Conventional method (Control Group).

The difference between boys and girls pre- and post-CM-CG Metacognitive skills test scores is seen in table 10 and figure 1.15. Results shows the treatment of before test mean scores of boys were 93.50 , girls were 101.70, which is not significant. The treatment of after test mean scores of boys were 131.70 , girls were 125.70, respectively. Statistically significant differences were reported subsequent to conventional method interventions(Adeleke & Joshua, 2015; Mitee & Obaitan, 2015)**Tara Nair S 2014, and others** found state significant difference in their interventions of conventional method.

Inference: consequently, the aforementioned research hypothesis is recognized. It may be maintained. The pre test t-value is .564and post test t-value is .378and p-value is pre test (.579) and post test (.709) higher than the $p<0.05$ critical values shows significance statistically.

Ha 2: There exists a significant difference between post and delayed post-test mean scores of Mastery learning (EG), with respect to.

i. Achievement in geography
ii. Metacognitive skills

2. i) Achievement in geography

Table 11: **Differences in after intervention and Delayed post test mean scores of educational attainment in geography among Mastery learning approach (E.G).**

Group	Exam	s.size	Average	S.D	df	t-worth	p-worth	Hypothesis supported
ML	Post test	40	30.90	6.420	39	1.201	.237	No
	Delayed Post-test	40	31.75	6.033				

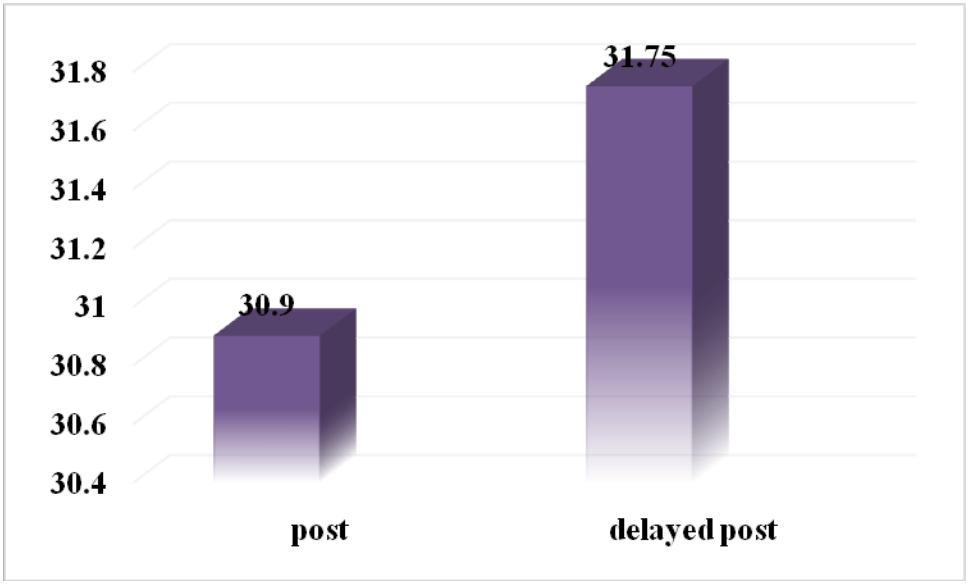


Figure 16 : Bar graph 2.(i) represents mean scores of post and delayed post-test in geography academic achievement of MLA

The difference between post- and delayed post-MLA-EG geography academic performance exam scores is seen in table 11 and figure 16 Results shows mean scores prior to and after the test of 30.90 and 31.75, respectively. Statistically significant differences were reported subsequent to Mastery learning interventions. **Navab abdulkadira 2016,**(Joseph, 2021)**Joshi, saritha 2017and others** found state significant difference in their interventions of mastery learning approach.

Inference : Therefore, the research hypothesis mentioned above is dismissed. It can be rephrased that there is no notable significance. The t-value is 1. 201, and the p-value is (. 237), which is greater than the p>0. 05 threshold, indicating statistical significance.

2.ii) Metacognitive skills

Table 12:**Differences in after intervention and Delayed post test Mean scores of Metacognitive skills among Mastery learning approach (E.G).**

Group	Exam	s.s ize	Avera ge	S.D	df	t-worth	p-worth	Hypothes is supported
ML	Post test	40	139.5 2	44.807	39	.979	.334	no
	Delayed Post-test	40	138.5 0	43.514				

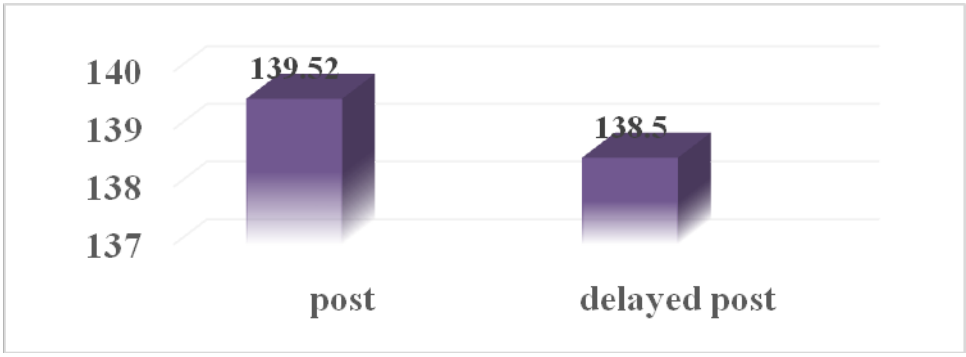


Figure 1.17 :The bar graph represents after intervention and Delayed post test Mean scores of Metacognitive skills among Mastery learning approach (E.G).

The difference between post- and delayed post-BLA-EG2 metacognitive skills test scores is seen in table 12 and figure 1.17 Results shows mean scores prior to and after the test of 139.52 and 138.50, respectively. Statistically significant differences were reported subsequent to Mastery learning interventions.(Bhamini, 2002)**Golnaz ostad 2014,Patel, Shireen 2021 singh Abhai raj 2020 and others** found state significant difference in their interventions of mastery learning approach

Inference: Therefore, the research hypothesis mentioned above is rejected. It can be rephrased that there is no significance. The t-value is. 979 and the p-value is (. 334), which is higher than the p>0. 05 critical value for statistical significance.

Conclusion

The mastery learning method greatly improves academic performance and metacognitive abilities in geography for secondary school learners. It guarantees comprehensive comprehension by permitting students to advance at their own speed, resulting in better retention and problem-solving skills. This technique encourages self-regulation and critical thinking, which are crucial for more profound learning. In general, mastery learning establishes a nurturing atmosphere that enhances both achievement and cognitive awareness in geography instruction.

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