

# An Interaction Effect of Learning Style, Social Competence and School Environment on Academic Achievement of Secondary School Students

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## Abstract

## Original Research Article

Learning is a personalized process influenced by a wide range of factors such as motivation levels, personality traits, educational backgrounds, and prior experiences. Everybody has a different learning style, which is related to how they generally prefer to have knowledge presented. This is because different people think and reason in various ways. People with different learning styles can solve problems, process information, learn it, and retain it in different ways. A detailed analysis examining the impact of varying levels of Learning style (low and high), Social competencies (low and high), and School environment (low and high) on the academic achievement in Social science of students of secondary schools. To assess these effects, a two-way ANOVA with an interaction design and it is commonly referred to as a 2x2 factorial design was utilized. Following this analysis, pair wise comparisons were conducted using Tukey's post-hoc tests.

**Keywords:** Learning Style, Social Competencies, School Environment, Academic Achievement

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## INTRODUCTION

The dynamic process of education includes the transfer of knowledge, the arousal of curiosity and interests, the instillation of positive attitudes and values, and the development of critical skills necessary for independent study. Encouraging kids to become capable and valuable members of society requires this. Life is full of opportunities for learning, but in order to fully understand one's own life, "education" is the most important survival skill. An individual can acquire knowledge by engaging in physical or mental activities. Education allows people to carry on values, knowledge, and skills to future generations.

## Objectives of the Study

1. To study the interaction effect of Students' Learning style and Social competencies on Academic achievement in Social science.
2. To study the interaction effect of Students' Learning Style and School environment on Academic achievement in Social science.

3. To study the interaction effect of Students' Social Competencies and School environment on Academic achievement in Social science.
4. To study the interaction effect of Students' Learning Style, Social Competencies and School environment on Academic achievement in Social science.

## Hypothesis of the Study

1. There is no significant interaction effect of Learning style (low and high) and Social competencies (low and high) on academic achievement in Social Science of students of secondary schools.
2. There is no significant interaction effect of Learning style (low and high) and School environment (low and high) on academic achievement in Social Science of students of secondary schools.
3. There is no significant interaction effect of Social competencies (low and high) and School environment (low and high) on academic achievement in Social Science of students of secondary schools.

## Sampling of the study

A sample of 824 secondary school students was randomly selected from various secondary schools, representing male and female from urban and rural areas, and encompassing government and unaided secondary schools of Kalburagi district.

## Statistical Techniques Used

An independent t-test was conducted to examine differences in demographic characteristics associated with academic achievement in social science, Learning style, Social competencies, and School environment among secondary school students. In addressing objective 2, a two-way Analysis of Variance (ANOVA) with an interaction design was performed, followed by Tukey's multiple post hoc tests. This

approach was used to identify significant interaction effects of Learning style, Social competencies, and School environment on the academic achievement in social science of secondary school students.

### Data Analyses, Results and Interpretations

Data were initially collected through three pre-tested questionnaires featuring a Likert Scale and one pre-tested questionnaires featuring a multiple options. To ensure a thorough statistical evaluation, appropriate weights were assigned to the responses, enabling the calculation of total scores. These scores were subsequently treated as quantitative variables for detailed and in-depth analysis.

**Null Hypothesis 01:** There is no significant interaction effect of Learning style (low and high) and Social competencies (low and high) on academic achievement in Social Science of students of secondary schools.

**Table 01:** Outcome of two-way ANOVA with interaction design of Learning style (low and high) and Social competencies (low and high) on academic achievement in Social Science of students of secondary schools.

Sources of variation	Sum of squares	Degrees of freedom	Mean sum of squares	F-value	p-value
<b>Main effects</b>					
Levels of LS	6367.32	1	6367.32	124.4857	0.0001,S
Levels of SC	4564.55	1	4564.55	89.2403	0.0001,S
<b>2-way interaction effects</b>					
Levels of LS * Levels of SC	2260.68	1	2260.68	44.1979	0.0001,S
Error	41942.20	820	51.15		
Total	55134.76	823			

The analysis examined various sources of variation, including the main effects of Learning style (low vs. high) and Social competencies (low vs. high), as well as the interaction effect between Internet and Social competencies levels on the academic achievement in Social Science of students of secondary schools. The results are displayed in the table above, with detailed descriptions provided below:

A statistically significant main effect of learning style levels (low and high) on academic achievement in Social Science among secondary school students. The F-value was 124.4857, with a corresponding p-value of 0.0001. Since the calculated F-value exceeds the critical F-value of 3.8600 for 1 and 820 degrees of freedom, the null hypothesis is rejected, and the alternative hypothesis is accepted. This indicates that the level of learning style (low vs. high) significantly affects students' academic achievement in Social Science.

A statistically significant main effect of Social

competencies levels (low and high) on academic achievement in Social Science among secondary school students. The F-value was 89.2403, with a corresponding p-value of 0.0001. Since the calculated F-value exceeds the critical F-value of 3.8600 for 1 and 820 degrees of freedom, the null hypothesis is rejected, and the alternative hypothesis is accepted. This indicates that the level of Social competencies (low vs. high) significantly impacts students' academic achievement in Social Science.

A statistically significant interaction effect between Learning style (low and high) and Social competencies (low and high) on academic achievement in Social Science among secondary school students. The F-value was 44.1979, with a p-value of 0.0001. Since the calculated F-value exceeds the critical F-value of 3.8600 for 1 and 820 degrees of freedom, the null hypothesis is rejected, and the alternative hypothesis is accepted. This indicates a significant interaction between

Learning style and Social competencies levels on academic achievement in Social Science, suggesting that secondary school students with varying levels of these factors demonstrate different academic performance in Social Science.

Furthermore, the Tukey's multiple posthoc

procedures were employed to conduct pair wise comparisons of the interaction effects of Learning style (low and high) and Social competencies (low and high) on academic achievement in Social Science. The results of these comparisons are presented in the table below.

**Table 02:** Pair wise comparison of interaction effect of learning style (low and high) and Social competencies (low and high) on academic achievement in Social Science of students of secondary schools by Tukeys multiple posthoc procedures.

Interactions	Low LS with low SC	Low LS with high SC	High LS with low SC	High LS with high SC
Mean	66.47	75.93	76.94	78.58
SD	7.38	7.48	6.43	7.26
Low LS with Low SC	-			
Low LS with High SC	p=0.0001, S	-		
High LS with Low SC	p=0.0001, S	p=0.7522,NS	-	
High LS with High SC	p=0.0001, S	p=0.0233,S	p=0.0680 NS	-

The table presents the pair wise comparisons of interaction effects of Learning style (low and high) and Social competencies (low and high) on academic achievement in Social Science of students of secondary schools. The values in the table represent the pair wise comparisons of these groups. It clearly shows the followings:

A statistically significant difference was found between students of secondary schools with low learning style & low Social competencies and low learning style & high social competencies with respect to academic achievement in Social Science at 5% level of significance. This indicates that students of secondary schools with low learning style & high Social competencies have higher academic achievement in Social Science as compared to students of secondary schools with low learning style & low social competencies.

A statistically significant difference was found between students of secondary schools with low learning style & low social competencies and high learning style & low social competencies with respect to academic achievement in Social Science at 5% level of significance. This indicates that students of secondary schools with high learning style & low Social competencies have lesser academic achievement in social Science as compared to students of secondary schools with low learning style & low Social competencies.

A statistically significant difference was found between students of secondary schools with low learning style & low social competencies and high Learning style & high Social competencies with respect to academic achievement in social Science at 5% level of significance. This indicates that students of secondary schools with high learning style & high Social competencies have lesser academic achievement in social Science as compared to students of secondary schools

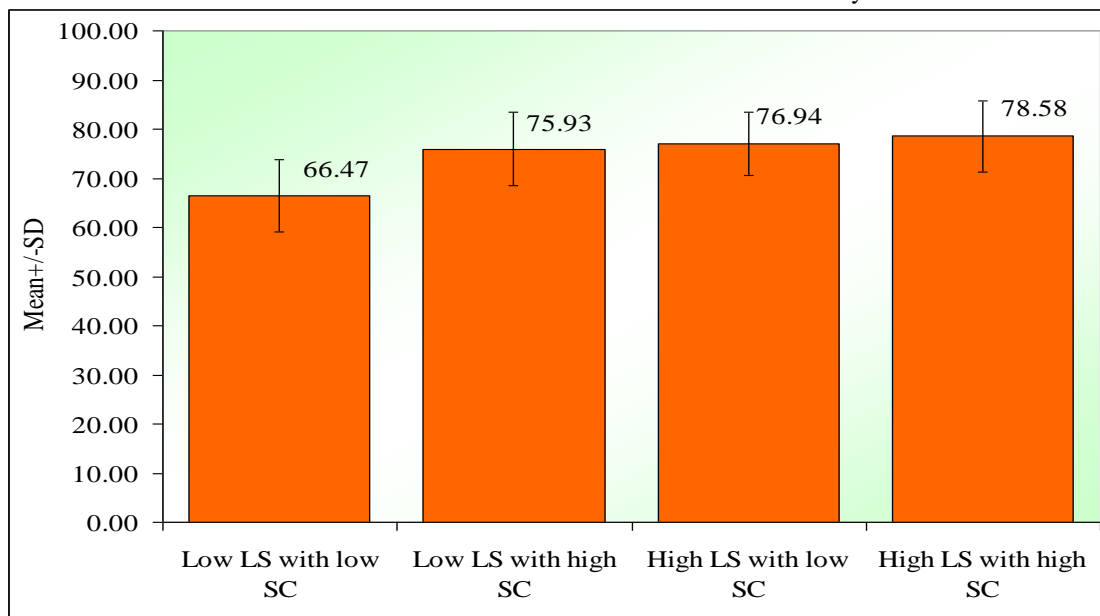
with high learning style & high Social competencies.

No statistically significant difference was found between students of secondary schools with low learning style & high social competencies and high learning style & low social competencies with respect to academic achievement in Social Science at 5% level of significance. This indicates that students of secondary schools with low learning style & high social competencies and high learning style & low social competencies have similar academic achievement in Social Science.

A statistically significant difference was found between students of secondary schools with low learning style & high social competencies and high learning style & low social competencies with respect to academic achievement in Social Science at 5% level of significance. This indicates that students of secondary schools with low learning style & high Social competencies have higher academic achievement in Social Science as compared to students of secondary schools with high learning style & high Social competencies.

No statistically significant difference was found between students of secondary schools with high learning style & low social competencies and high learning style & high social competencies with respect to academic achievement in Social Science at 5% level of significance. This indicates that students of secondary schools high Learning style & low Social competencies and high Learning style & high Social competencies have similar academic achievement in Social Science. The mean and SD of interaction effects of learning style (low and high) and social competencies (low and high) on academic achievement in Social Science of students of secondary schools is also presented in the following figure

**Figure 01:** Comparisons of interaction effects of Learning style (low and high) and Social competencies (low and high) on academic achievement in Social Science of students of secondary schools.



**Null hypothesis 02:** There is no significant interaction effect of Learning style (low and high) and School environment (low and high) on academic achievement in Social Science of students of secondary schools

To evaluate the null hypothesis, a two-way ANOVA with interaction design procedure was conducted, and the results are summarized in the following table.

**Table 03:** Outcome of two-way ANOVA with interaction design of Learning style (low and high) and School environment (low and high) on academic achievement in Social Science of students of secondary schools

Sources of variation	Sum of squares	Degrees of freedom	Mean sum of squares	F-value	p-value
<b>Main effects</b>					
Levels of LS	6718.16	1	6718.16	152.0381	0.0001,S
Levels of SE	10915.41	1	10915.41	247.0258	0.0001,S
<b>2-way interaction effects</b>					
Levels of LS*Levels of SE	300.26	1	300.26	6.7952	0.0093,S
Error	36233.63	820	44.19		
Total	54167.46	823			

In the analysis, several sources of variation were examined, including the main effects of Learning style (low and high) and School environment (low and high) as well as the 2-way intersection effect between Learning style (low and high) and School environment (low and high) on academic achievement in Social Science of students of secondary schools. The results are displayed in the table above, with detailed descriptions provided below:

The analysis of the effect of learning style levels (Low and High) on academic achievement in Social Science among secondary school students revealed a statistically significant result. The F-value was 152.0381, with a corresponding p-value of 0.0001. Since the calculated F-value exceeds the critical F-value of 3.8600 for 1 and 820 degrees of freedom, the null

hypothesis is rejected, and the alternative hypothesis is accepted. This indicates a significant effect of learning style levels (Low and High) on academic achievement in Social Science for secondary school students.

The analysis of the effect of school environment levels (Low and High) on academic achievement in Social Science among secondary school students showed a statistically significant result. The F-value was 247.0258, with a corresponding p-value of 0.0001. Since the calculated F-value exceeds the critical F-value of 3.8600 for 1 and 820 degrees of freedom, the null hypothesis is rejected, and the alternative hypothesis is accepted. This indicates a significant effect of school environment levels (Low and High) on academic achievement in Social Science for secondary school students.

The interaction effect of learning style (Low and High) and school environment (Low and High) on academic achievement in Social Science among secondary school students was found to be statistically significant. The F-value was 6.7952, with a corresponding p-value of 0.0093. Since the calculated F-value exceeds the critical F-value of 3.8600 for 1 and 820 degrees of freedom, the null hypothesis is rejected, and the alternative hypothesis is accepted. This indicates a significant interaction effect of learning style and school environment on academic achievement in Social Science for

secondary school students. In other words, students with different levels of learning style and school environment exhibit varying levels of academic achievement in Social Science.

Furthermore, the Tukey's multiple posthoc procedures were employed to conduct pair wise comparisons of the interaction effects of Learning style (low and high) and School environment (low and high) on academic achievement in Social Science. The results of these comparisons are presented in the table below.

**Table 04:** Pair wise comparison of interaction effect of learning style (low and high) and Social competencies (low and high) on academic achievement in Social Science of students of secondary schools by Tukeys multiple posthoc procedures.

Interactions	Low LS with low SE	Low LS with high SE	High LS with low SE	High LS with high SE
Mean	65.50	74.95	73.21	79.96
SD	7.32	6.71	7.99	5.54
Low LS with low SE	-			
Low LS with high SE	p=0.0001,S	-		
High LS with low SE	p=0.0001,S	p=0.1729,NS	-	
High LS with high SE	p=0.0001,S	p=0.0001,S	p=0.0001,S	-

The table presents the pair wise comparisons of interaction effects of Learning style (low and high) and School environment (low and high) on academic achievement in Social Science of students of secondary schools. The values in the table represent the pair wise comparisons of these groups. It clearly shows the followings:

A statistically significant difference was found between students of secondary schools with low Learning style & low School environment and low Learning style & high School environment with respect to academic achievement in Social Science at 5% level of significance. This indicates that students of secondary schools with low Learning style & high School environment have higher academic achievement in Social Science as compared to students of secondary schools with low Learning style & low School environment.

A statistically significant difference was found between students of secondary schools with low Learning style & low School environment and high Learning style & low School environment with respect to academic achievement in Social Science at 5% level of significance. This indicates that students of secondary schools with high Learning style & low School environment have higher academic achievement in Social Science as compared to students of secondary schools with low Learning style & low School environment.

A statistically significant difference was found between students of secondary schools with low Learning style & low School environment and high Learning style & high School environment with respect to academic achievement in Social Science at 5% level of significance. This indicates that students of secondary schools with high Learning style & high School environment have higher academic achievement in Social Science as compared to students of secondary schools

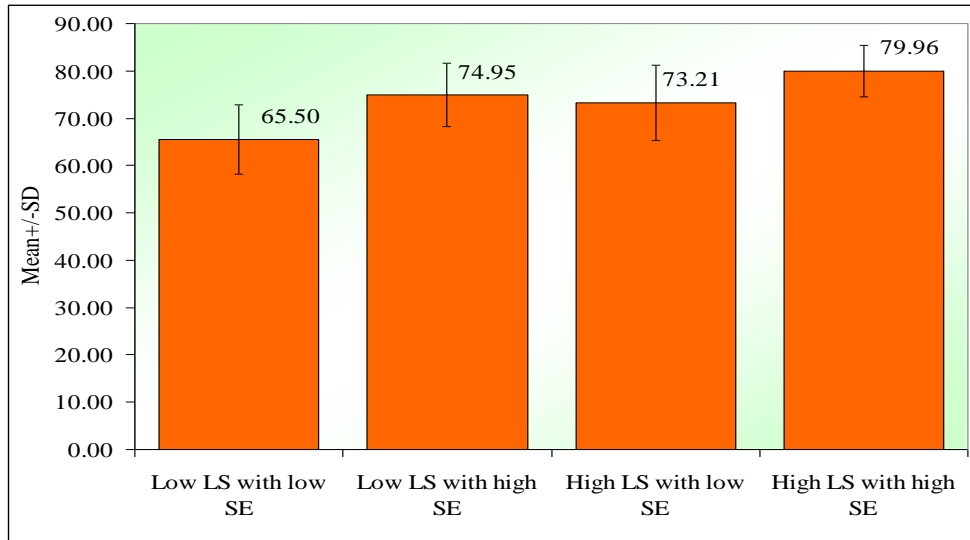
with high Learning style & high School environment.

No statistically significant difference was found between students of secondary schools with low Learning style & high School environment and high Learning style & low School environment with respect to academic achievement in Social Science at 5% level of significance. This indicates that students of secondary schools with low Learning style & high School environment and high Learning style & low School environment have similar academic achievement in Social Science.

A statistically significant difference was found between students of secondary schools with low Learning style & high School environment and high Learning style & low School environment with respect to academic achievement in Social Science at 5% level of significance. This indicates that students of secondary schools with low Learning style & high School environment have lesser academic achievement in Social Science as compared to students of secondary schools with high Learning style & high School environment.

A statistically significant difference was found between students of secondary schools with high Learning style & low School environment and high Learning style & high School environment with respect to academic achievement in Social Science at 5% level of significance. This indicates that students of secondary schools with high Learning style and high School environment have higher academic achievement in Social Science as compared to students of secondary schools with high Learning style & low School environment. The mean and SD of interaction effects of Learning style (low and high) and School environment (low and high) on academic achievement in Social Science of students of secondary schools is also presented in the following figure.

**Figure 02:** Comparisons of interaction effects of Learning style (low and high) and School environment (low and high) on academic achievement in Social Science of students of secondary schools.



**Null hypothesis 03:** There is no significant interaction effect of Social competencies (low and high) and School environment (low and high) on academic achievement in Social Science of students of secondary schools.

To evaluate the null hypothesis, a two-way ANOVA with interaction design procedure was conducted, and the results are summarized in the following table.

**Table 04:** Outcome of two-way ANOVA with interaction design of Social competencies (low and high) and School environment (low and high) on academic achievement in Social Science of students of secondary schools

Sources of variation	Sum of squares	Degrees of freedom	Mean sum of squares	F-value	p-value
<b>Main effects</b>					
Levels of FBU	5135.51	1	5135.51	110.3894	0.0001,S
Levels of YTU	14294.49	1	14294.49	307.2645	0.0001,S
<b>2-way interaction effects</b>					
Levels of FBU*Levels of YTU	393.11	1	393.11	8.4501	0.0037,S
Error	38147.84	820	46.52		
Total	57970.95	823			

In the analysis, several sources of variation were examined, including the main effects of Social competencies (low and high) and School environment (low and high) as well as the 2-way intersection effect between Social competencies (low and high) and School environment (low and high) on academic achievement in Social Science of students of secondary schools. The results are displayed in the table above, with detailed descriptions provided below:

The analysis of the impact of Social Competencies (Low and High) on academic achievement in Social Science among secondary school students revealed a statistically significant effect. The F-value was found to be 110.3894, with a corresponding p-value of 0.0001. Since the calculated F-value exceeds the critical F-value of 3.8600 (with 1 and 820 degrees of freedom), the null hypothesis is rejected, and the alternative hypothesis is accepted. This indicates that the levels of Social

Competencies (Low and High) have a significant effect on students' academic achievement in Social Science.

The analysis of the effect of Social Competencies (Low and High) on academic achievement in Social Science among secondary school students showed a statistically significant result. The F-value was 110.3894, and the corresponding p-value was 0.0001. Since the calculated F-value is greater than the critical F-value of 3.8600 (with 1 and 820 degrees of freedom), the null hypothesis is rejected in favor of the alternative hypothesis. This demonstrates that the levels of Social Competencies (Low and High) significantly influence students' academic performance in Social Science.

The interaction effect of Social Competencies (Low and High) and School Environment (Low and High) on academic achievement in Social Science among secondary school students was found to be statistically significant. The F-

value was 8.4501, with a corresponding p-value of 0.0001. Since the calculated F-value exceeds the critical F-value of 3.8600 (with 1 and 820 degrees of freedom), the null hypothesis is rejected, and the alternative hypothesis is accepted. This indicates a significant interaction effect between Social Competencies (Low and High) and School Environment (Low and High) on students' academic achievement in Social Science. In other words, secondary school students with different levels

of Social Competencies and School Environment exhibit varying levels of academic achievement in Social Science.

Furthermore, the Tukey's multiple posthoc procedures were employed to conduct pair wise comparisons of the interaction effects of Social competencies (low and high) and School environment (low and high) on academic achievement in Social Science. The results of these comparisons are presented in the table below.

**Table 05:** Pair wise comparison of interaction effect of Social competencies (low and high) and School environment (low and high) on academic achievement in Social Science of students of secondary schools by Tukeys multiple posthoc procedures.

Interactions	Low SC with low SE	Low SC with high SE	High SC with low SE	High SC with high SE
Mean	66.33	76.53	73.02	80.32
SD	7.47	6.52	8.58	5.47
Low SC with low SE	-			
Low SC with high SE	P=0.0001,S	-		
High SC with low SE	P=0.0001,S	P=0.0001,S	-	
High SC with high SE	P=0.0001,S	P=0.0001,S	P=0.0001,S	-

The table presents the pair wise comparisons of interaction effects of Social competencies (low and high) and School environment (low and high) on academic achievement in Social Science of students of secondary schools. The values in the table represent the pair wise comparisons of these groups. It clearly shows the followings:

A statistically significant difference was found between students of secondary schools with low Social competencies & low School environment and low Social competencies & high School environment with respect to academic achievement in Social Science at 5% level of significance. This indicates that students of secondary schools with low Social competencies and high School environment have higher academic achievement in Social Science as compared to students of secondary schools with low Social competencies & low School environment.

A statistically significant difference was found between students of secondary schools with low Social competencies & low School environment and high Social competencies & low School environment with respect to academic achievement in Social Science at 5% level of significance. This indicates that students of secondary schools with high Social competencies & low School environment have higher academic achievement in Social Science as compared to students of secondary schools with low Social competencies & low School environment.

A statistically significant difference was found between students of secondary schools with low Social competencies & low School environment and high Social competencies & high School environment with respect to academic achievement in Social Science at 5% level of significance. This indicates that students of secondary schools with high Social competencies & high School environment have higher academic achievement in Social Science as compared to students of secondary schools with high Social

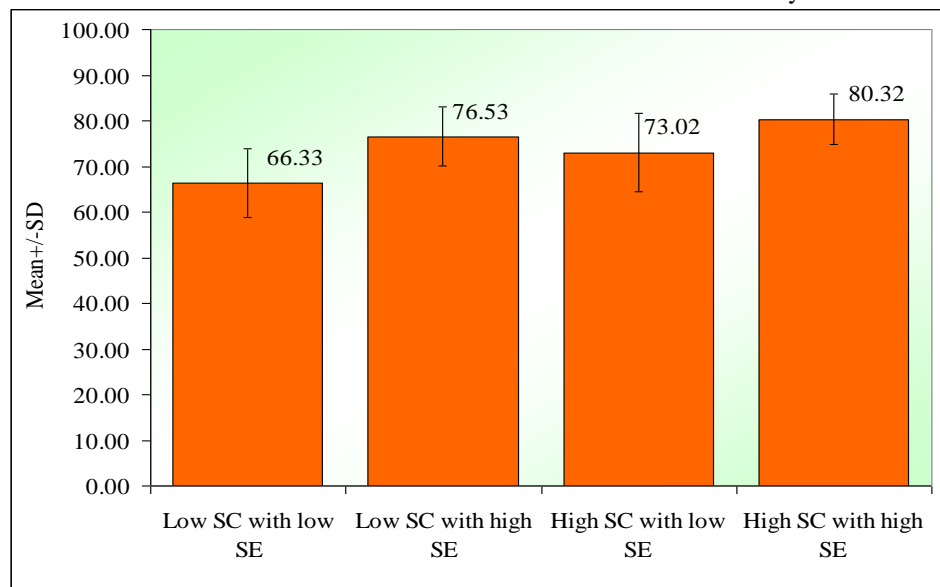
competencies & high School environment.

A statistically significant difference was found between students of secondary schools with low Social competencies & high School environment and high Social competencies & low School environment with respect to academic achievement in Social Science at 5% level of significance. This indicates that students of secondary schools with low Social competencies & high School environment have higher academic achievement in Social Science as compared to students of secondary schools with high Social competencies & low School environment.

A statistically significant difference was found between students of secondary schools with low Social competencies & high School environment and high Social competencies & high School environment with respect to academic achievement in Social Science at 5% level of significance. This indicates that students of secondary schools with high Social competencies & high School environment have higher academic achievement in Social Science as compared to students of secondary schools with low Social competencies & high School environment.

A statistically significant difference was found between students of secondary schools with high Social competencies & low School environment and high Social competencies & high School environment with respect to academic achievement in Social Science at 5% level of significance. This indicates that students of secondary schools with high Social competencies & high School environment have higher academic achievement in Social Science as compared to students of secondary schools with high Social competencies and low School environment. The mean and SD of interaction effects of Social competencies (low and high) and School environment (low and high) on academic achievement in Social Science of students of secondary schools is also presented in the following figure.

**Figure 03:** Comparisons of interaction effects of Social competencies (low and high) and School environment (low and high) on academic achievement in Social Science of students of secondary schools.



### Educational Implications

The study on the impact of learning styles, social competencies, and school environment on academic achievement among secondary school students has several important educational implications. These implications can guide educators, school administrators, and policymakers in improving student performance and fostering a positive and effective learning environment. Some of these implications include:

1. **Differentiated Instruction:** Teachers should adopt teaching methods that cater to different learning styles (visual, auditory, kinaesthetic, etc.) to ensure all students can engage with the content in a way that suits their strengths. This can be done by incorporating varied instructional techniques, such as multimedia presentations, hands-on activities, discussions, and group work.
2. **Promoting Social Competencies:** The development of students' social competencies (such as communication, collaboration, and conflict resolution skills) is crucial for their overall success. Schools should implement programs that focus on improving students' interpersonal skills, such as social-emotional learning (SEL) workshops, peer mentoring, and group activities. Encouraging positive peer relationships can lead to better academic outcomes, as students who collaborate and support one another tend to perform better in school.
3. **Creating a Positive School Environment:** A supportive and inclusive school environment is key to enhancing academic achievement. Schools should promote a safe and nurturing atmosphere where students feel valued and respected, which can enhance motivation and engagement in learning. The physical environment, such as well-equipped classrooms, quiet

study spaces, and recreational areas, can also play a role in academic performance by fostering focus and reducing distractions.

4. **Teacher Training and Professional Development:** Educators should be trained to recognize and accommodate diverse learning styles. Professional development programs that focus on instructional strategies, classroom management, and creating a positive school culture can improve teaching effectiveness. Teachers should be aware of the social and emotional needs of students, as these are closely linked to academic performance. Training teachers to identify and support students' social and emotional well-being can have a direct impact on their academic achievement.

### CONCLUSIONS

Students of secondary schools with low learning style and high Social competencies have higher academic achievement in Social Science as compared to students of secondary schools with low learning style and low social competencies. High learning style and low Social competencies have lesser academic achievement in social Science as compared to students of secondary schools with low learning style and low Social competencies. High learning style and high Social competencies have lesser academic achievement in social Science as compared to students of secondary schools with high learning style and high Social competencies. Low learning style and high social competencies and high learning style and low social competencies have similar academic achievement in Social Science. Low learning style and high Social competencies have higher academic achievement in Social Science as compared to students of secondary schools with high learning style and high Social competencies. High

Learning style and low Social competencies and high Learning style and high Social competencies have similar academic achievement in Social Science. Low Learning style and high School environment have higher academic achievement in Social Science as compared to students of secondary schools with low Learning style and low School environment. High Social competencies and high School environment have higher academic achievement in Social Science as compared to students of secondary schools with high Social competencies and low School environment.

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