



Science Motivation among Secondary School Students with respect to Gender, Caste, Locality and type of School Management

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Abstract: Student motivation stems from their personal experiences, particularly those related to their enthusiasm for participating in lessons and learning activities, as well as their underlying reasons for engagement. The motivation to learn science primarily pertains to the level of students' cognitive involvement in science activities, rather than the physical effort or the amount of time they invest in them (Borphy, 2004 p. 16). This study examined variations in science motivation among secondary school students based on gender, caste, locality, and school management. Using a descriptive survey design, data were collected from 1,160 ninth-grade students through the Science Motivation Questionnaire (SMQ), adapted from Glynn and Koballa (2006). The SMQ consists of 30 items across six subscales, rated on a five-point Likert type scale. Data analysis included descriptive statistics, t-tests, and ANOVA. The findings revealed no significant differences in science motivation by gender. However, urban and private school students showed higher motivation compared to rural students and government school students respectively, and motivation varied significantly among different caste groups. Recommendations were made for educators, parents, and policymakers to implement strategies to enhance students' motivation towards science.

Keywords: Science motivation, secondary school students.

1. Introduction:

Motivation is the driving force of any goal oriented human activity. It is a psychological construct that tries to explain efforts and quality of behaviours enacted in different activities (Watters & Ginns, 2000). Motivation according to Brophy (2004, p. 3) is a theoretical concept that explains the initiation, direction, intensity, persistence, and scope of behaviour. Within the framework of social cognition, motivation is proposed to serve as a facilitative process initiating and sustaining actions leading towards specific goals (Pintrich & Schunk, 2002). Motivation is assessed within the social cognitive context through constructs such as intrinsic motivation, extrinsic motivation, goal orientation, self-determination, self-efficacy, and assessment anxiety (Glynn & Koballa, 2006a). Enhancing the intrinsic and extrinsic motivation of students to participate in science is at the heart of any radical science education reform. Intrinsic motivation is those actions which are taken from an inner interest and pleasure, while extrinsic motivation is those actions which are taken to gain certain external rewards or consequences (Ryan & Deci, 2000). It becomes obvious when learners take active participation in classroom activities in the pursuit of understanding subject matter

and using techniques for achieving that understanding (Lee & Brophy, 1996). Such motivated learners tend to achieve meaningful science learning. Ultimately, these learners become independent learners in the field of science, evolving into self-regulated learners (Anderson & Roth, 1989 cited in Lee & Brophy, 1996).

Scientific literacy is now becoming vital in modern technological societies. It is influenced by a number of factors of both cognitive and affective aspects. Of these, motivation figures as the most salient among the affective factors as it determines success in learning science. Motivation essentially acts as a prime drive that activates and sustains behaviour. For students, to acquire motivation to learn any discipline, they would need to engage in relevant activities perceived as meaningful or worthwhile (Glynn & Koballa, 2006). The motivation for learning science supports both those future scientists like today's young students and those needing scientific literacy such as the ability to enabling them to understand scientific concepts, recognize key scientific questions, draw conclusions based on evidence, and make informed decisions (Bryan, Glynn & Kittleson, 2011). Various researchers have hypothesized that the motivation for science among secondary school students is one of the important predictors of their success in scientific fields (Singh et al., 2002). The process of learning science demands for the improvement of both intrinsic and extrinsic motivation among students (Areepattamannil et al., 2011). College students motivated in science due career opportunities in future and found a strong association with science achievement (Glynn, Taasooobshirazi, & Brickman, 2007). The aim of this study was to explore how science motivation of class nine students differs based on different categorical factors namely gender, caste, locality and type of school management.

2. OBJECTIVES:

To evaluate science motivation of students studying in class IX under WBBSE in relation to gender, caste, locality and type of school management.

3. HYPOTHESES:

- H₀₁: Boys and girls students studying in secondary school do not differ significantly in respect of science motivation.
- H₀₂: Rural and urban students studying in secondary school do not differ significantly in respect of science motivation.
- H₀₃: Government and private school students studying in secondary school do not differ significantly in respect of science motivation.
- H₀₄: General (Gen), Schedule caste (SC), Schedule Tribe (ST) and other backward Class (OBC) students studying in secondary school do not differ significantly in respect of science motivation.

4. METHODOLOGY:

The present research utilizes a survey-based methodology. Altogether, 1,160 individuals participated in the research endeavour. From the sample population, 643 were male students and 517 were female students. All of these participants came from 28 educational institutions located across 10 districts in West Bengal. The participants were selected with stratified random sampling methods targeting ninth-grade students.

Science Motivation Questionnaire (SMQ) was adapted for the present study for collecting survey data. SMQ was constructed by Shawn M. Glynn and Thomas R. Koballa, Jr. in 2006. It was a five-point Likert-type scale ranging from "never" (1) to "always" (5). The researcher translated SMQ from English to Bengali language. The questionnaire was re-standardized and reliability was measured. Internal consistency (Cronbach's alpha) of SMQ was found 0.79.

Several statistical methods were adopted to examine the research hypotheses. Descriptive statistics, Independent samples t-test was used to check whether a difference existed in terms of gender, locality, and type of school management. One-way ANOVA was adopted to check whether any difference exist among the castes. All null hypotheses were tested at a significance level of 0.05. This part of the analysis was done using SPSS version 22.0.

5. RESULT AND DISCUSSION:

Descriptive statistics of science motivation among secondary school students with respect to different categorical variables like gender, locality, type of school management and caste are presented below;

Table 1: Descriptive statistics of science motivation among secondary school students

Categorical Variable		N	Mean	Standard Deviation(SD)
Gender	Boys	643	112.23	14.944
	Girls	517	112.85	14.499
Locality	Rural	605	110.23	13.982
	Urban	555	114.98	15.162
Type of School Management	Government	765	109.72	14.383
	Private	395	117.89	13.937
Caste	General	615	114.13	14.857
	SC	301	110.19	15.02
	ST	30	103.93	13.514
	OBC	214	112.29	13.358
Total		1160	112.51	14.744

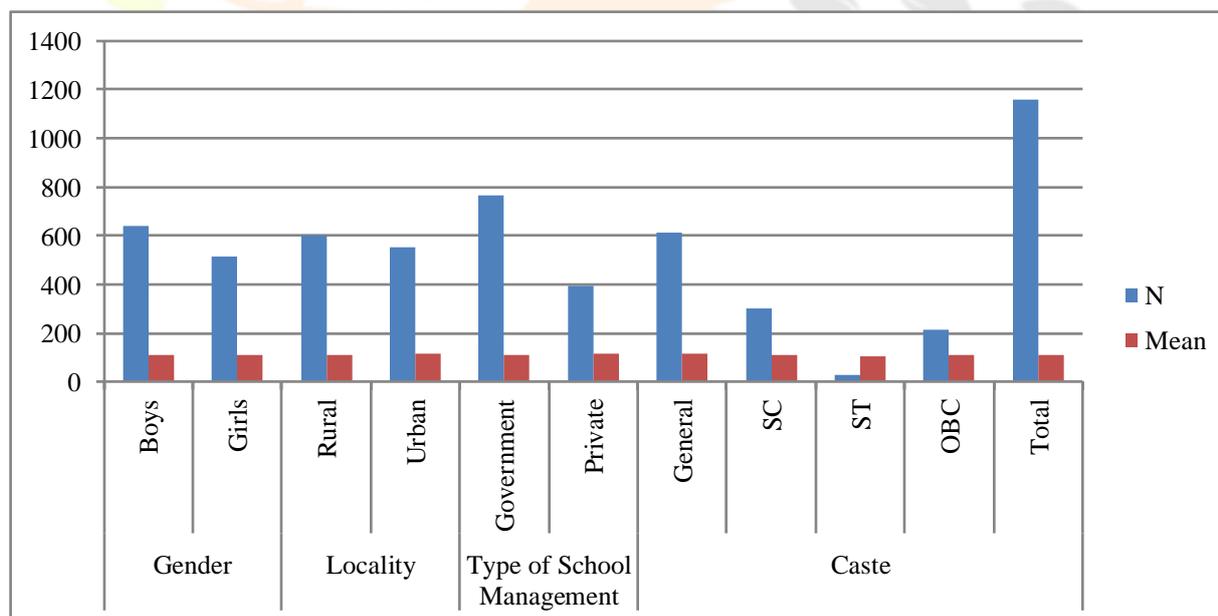


Figure 1: Column of science motivation with different categorical variables of students

Hypothesis 1

The *t*-test was applied to test the hypothesis 1. Results are presented in Table 2.

Table 2: t-test between boys and girls students on science motivation

Variable	Gender	N	M	SD	SED	DF	t	Sig.(2-tailed)
Science Motivation	Boys	643	112.23	14.944	0.871	1158	-0.706	0.480
	Girls	517	112.85	14.499				

From the Table 2 it is observed that for boys $M= 112.23$ & $SD= 14.944$ and girls $M= 112.85$ & $SD= 14.499$ on science motivation. There is a slight difference between the mean values. So, *t*- test was applied. The calculated $t_{(1158)}$ value is 0.706 and *p* value is 0.480 ($p>0.05$). Hence, 't' is not significant at 0.05 level. So, null hypothesis is accepted. Thus, it can be safely concluded that boys and girls have same level of science motivation. So, gender has no impact on secondary students' science motivation. This is due to the fact that recently parents are equally motivating their boys and girls child towards science. This finding is supported by previous literatures by Bryan, Glynn & Kittleson (2011); Kaur (2013) etc. On the other hand Ekici (2010) showed female students have higher biology lesson motivation than male students. Obrentz (2012) found undergraduate male students' higher intrinsic and personal goal motivation towards chemistry lesson.

Hypothesis 2

A *t*-test was applied to test the hypothesis 2. The results are found in Table 3.

Table 3: t-test between rural and urban students on science motivation

Variable	Locality	N	M	SD	SED	DF	t	Sig.(2-tailed)
Science Motivation	Rural	605	110.23	13.982	0.856	1158	-5.548*	0.000
	Urban	555	114.98	15.162				

*Significant at 0.05 level

From the Table-3 it is observed that for rural students $M= 110.23$ & $SD= 13.982$ and urban students $M= 114.98$ & $SD= 15.162$ on science motivation. There is a small difference between the mean values. So, *t*- test was applied. The calculated $t_{(1158)}$ value is 5.548 ($p<0.05$). Hence, 't' is significant at 0.05 level. So, null hypothesis is rejected. Thus, it can be safely concluded that, rural and urban school students differ significantly on science motivation. Result shows urban students have higher science motivation than rural students. The researchers suggest that these findings may stem from the fact that urban students have greater exposure to advanced science knowledge and applications, and their parents tend to be more attentive to their children's science education. Previous literature (Singh & Singh, 2011) is supported this finding.

Hypothesis 3

A *t*-test was applied to test the hypothesis 3. The results are found in Table 4

Table 4: t-test between Government and private school students on science motivation

Variable	Type of Management	N	M	SD	SED	DF	t	Sig.(2-tailed)
Science Motivation	Govt.	765	109.72	14.383	0.882	1158	-9.264*	0.000
	Private	395	117.89	13.937				

*Significant at 0.05 level

From the Table 4 it is observed that for Government school students $M= 109.72$ & $SD= 14.383$ and private school students $M= 117.89$ & $SD= 13.937$ on science motivation. There is a small difference between the mean values. So, *t*- test was applied. The calculated $t_{(1158)}$ value is 9.264 ($p<0.05$). Hence, 't' is

significant at 0.05 level. So, null hypothesis is rejected. Thus, it can be safely concluded that, Government and private school students differ significantly on science motivation. Government students have lower science motivation compared to private students. This is could be due to that in private schools, the use of advanced teaching methods, various science-related activities, and consistent encouragement from teachers contribute to higher science motivation among students. In contrast, government schools often face challenges such as a shortage of science teachers, insufficient physical infrastructure, and a lack of science-related activities, which result in lower science motivation among students. This finding supported by Kavyakishore (2013) but opposed by Dalal & Sharma (2023).

Hypothesis 4

An ANOVA test was applied to test the hypothesis 4. The results are found in Table 5.

Table 5 Descriptive statistics of General (Gen), Schedule caste (SC), Schedule Tribe (ST) and other backward Class (OBC) students on science motivation

Caste	N	Mean	SD
General	615	114.13	14.857
SC	301	110.19	15.02
ST	30	103.93	13.514
OBC	214	112.29	13.358
Total	1160	112.51	14.744

Table 6: ANOVA test between General (Gen), Schedule caste (SC), Schedule Tribe (ST) and other backward Class (OBC) students on science motivation

Variable	SV	SS	DF	MS	F-value	Sig.
Science Motivation	Between Caste	5458.781	3	1819.594	8.533*	0.000
	Within Caste	246501.177	1156	213.236		
	Total	251959.958	1159			

*Significant at 0.05 level

From the Table 6 it is observed that students from different castes (General, SC, ST, and OBC) show significant differences in their science motivation ($F=8.533$, $p<0.05$) at the 0.05 level. Therefore, the null hypothesis (H_04) is rejected. This indicates that secondary students among different castes (General, SC, ST, and OBC) exhibit varying levels of science motivation.

Since the F-test indicates significant differences among different castes students' towards science motivation, a post-hoc test was conducted to pinpoint the specific differences. The results are presented below in Table 7.

Table 7: Post hoc LSD test for different castes students' science motivation

Variable	Caste		Mean Difference (I-J)	Std. Error	Sig.
	I	J			
Motivation in science	Gen	SC	3.944*	1.027	.000
	Gen	ST	10.200*	2.730	.000
	Gen	OBC	1.844	1.159	.112
	SC	ST	6.256*	2.796	.025
	SC	OBC	-2.100	1.306	.108
	ST	OBC	-8.356*	2.847	.003

* The mean difference is Significant at the 0.05 level

From the post-hoc comparison in Table 6, it is evident that among the six possible pairs, the students in the Gen & SC, Gen & ST, SC & ST, and ST & OBC pairs show significant differences in their science motivation ($p<0.05$) at the 0.05 level. There exists no significant difference in the Gen & OBC and SC & OBC pairs.

General (M=114.13), Schedule caste (M=110.19), Schedule Tribe (M=103.93) and other backward Class (M=112.29) students differ significantly on science motivation in secondary school. General students have highest science motivation and Schedule Tribe students have least science motivation. Researchers argued this finding may be the fact that General category students tend to have a clear vision regarding science education and careers, often receiving strong support from their parents. In contrast, students from Scheduled Caste or Scheduled Tribe categories often receive less attention in science learning. Their parents are generally less aware of the importance of science education and future career opportunities for their children, leading to lower science motivation, particularly among Scheduled Tribe students.

6. CONCLUSION:

From above discussion so far the major finding are boys (M=112.23) and girls (112.85) do not differ significantly in their science motivation. Urban students (M= 114.98) have higher science motivation compared to rural students (M=110.23). Government students (M= 109.72) have lower science motivation compared to private students (M=117.89). General (M=114.13), Schedule caste (M=110.19), Schedule Tribe (M=103.93) and other backward Class (M=112.29) students differ significantly on science motivation in secondary school. General students have highest science motivation and Schedule Tribe students have least science motivation.

The findings of the study portray the actual situation of the rural and urban; government and private schools of the West Bengal regarding the science motivation in scientific literacy. The government should take greater initiatives to promote science literacy through various efforts. Organizing events such as science exhibitions and science fairs at the block level can play a significant role. Additionally, schools should host a variety of science-related programs to foster greater science motivation among students. It is hoped that educational institutions will implement more professional development programs for teachers across rural and urban, government and private schools to enhance their ability to inspire and improve students' engagement with science.

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