Interactional effect of gender, locale and type of school on metacognition of school students

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Abstract: The present paper is related to study of interactional effect of Gender, Locale and Type of School on Metacognition of 10+1 students. The sample of the study comprised of 800 students selected randomly from four districts of Haryana (India). Data was collected by using Metacognition inventory by Govil (2003). The findings of the study indicate that the two-way interaction effect between gender - locale and gender - type of school is significant. No significant interactional effect exists between locale -type of school and gender, locale and type of school with respect to metacognition.

Key Words: Metacognition, Gender, Locale, Type of school, 10+1 students, School students.

1. INTRODUCTION:

Education is a never-ending process of inner growth and development. It is very important to humanize an individual as well as society. It is through education that man develops his thinking, reasoning, problem solving etc. i.e., cognitive abilities. Metacognition refers to thoughts about one's own thoughts and cognitions (Flavell, 1979). Understanding the limits of your own memory is also a form of metacognition as it concerns your beliefs and knowledge about memory. Metacognition is not a single concept but it is multifaceted in nature. The three facets of metacognition are metacognitive knowledge, metacognitive monitoring and metacognitive control. Metacognitive knowledge relates to one's declarative knowledge, metacognitive monitoring pertains to evaluating current progress of particular cognitive activity, and metacognitive control refers to regulating an ongoing cognitive activity.

1.1 Operational Definitions
Metacognition

Metacognition refers to awareness and monitoring of one's thoughts and task performance, or more simply, thinking about your thinking. "Metacognitive knowledge is one's stored knowledge or beliefs about oneself and others as cognitive agents, about tasks, about actions or strategies, and about how all these interact to affect the outcomes of any sort of intellectual enterprise. Metacognitive experiences are conscious cognitive or affective experiences that occur during the enterprise and concern any aspect of it - often, how well it is going" (Flavell, 1979). It refers to higher-order mental processes involved in learning such as making plans for learning, using appropriate skills and strategies to solve a problem, making estimates of performance, and calibrating the extent of learning (Dunslosky and Thiede, 1998). "Metacognition refers to higher order thinking that involves active control over the cognitive processes engaged in learning" (Livingston, 2003). Metacognition is comprised of two major components: metacognitive knowledge and metacognitive regulation (Schraw and Moshman, 1995). Metacognitive knowledge refers to knowledge of cognition such as knowledge of skills and strategies that work best for the learner, and how and when to use such skills and strategies. Metacognitive regulation refers to activities that control one's thinking and learning such as planning, monitoring comprehension, and evaluation (Artzand Armour-Thomas, 1992; Baker, 1989; Schraw and Dennison, 1994).

Gender
Gender here means that the student is male or female.
Locale
Locale means locality to which student belongs i.e. rural or urban.
Type of school
The school in which the student is studying is government or private school recognized by Board of School Education Haryana.
10+1 Students
The students who have passed class X and are studying in class XI of schools of Haryana, recognized by Board of School Education Haryana.

2. LITERATURE REVIEW:

Carr & Jessup (1997) conducted a study on Gender differences in first grade mathematics strategy use: Social and metacognitive influences. The children's strategy use was assessed individually, as well as their metacognitive knowledge for mathematics strategies and their rationales for the use of different mathematics strategies. The children solved addition and subtraction problems in groups. Girls were more likely to count on fingers and use overt strategies but boys were more likely to use memory in solving addition and subtraction problems. Metacognition was a significant predictor of strategic use. Shunk & Ertmer (2000) studied 8th grade students and found that they use their metacognitive knowledge and skills in learning. It has positive effect on students learning and school performance. Chatard, Guimond & Selimbegovic (2007) investigated the effect of gender stereotyping on how high school students view their abilities in mathematics and arts and found that students who believed strongly in gender stereotyping would self-evaluate their grades in two domains. The study also indicated that boys viewed themselves as being more able in mathematics than girls, and girls viewed themselves as being more able in arts than boys. Yilmaz - Tuzun & Topcu (2009) studied elementary students' metacognition and epistemological beliefs considering science achievement, gender and socioeconomic status and found that students in urban areas developed less knowledge of cognition skills during their science courses. They found that the girls developed better metacognition in their science courses. Again, the students in urban areas developed less regulation of cognition skills. Liliana & Lavinia (2011) did a study on gender differences in Metacognitive skills of 8th grade students in Romania and found that both boys and girls use their metacognitive skills in learning. The results also indicated significant differences between boys and girls on the perception of performance, the perception regarding teachers' expectations about learning, use of prior knowledge in problem solving, planning and monitoring the learning process. Siswati and Corebima (2017) took the study of the effect of Education level and Gender on students' metacognitive skills in Malang, Indonesia. The results analyze that education level had an effect on students' metacognitive skills but there was not any difference in metacognitive skills between male and female students.

3. OBJECTIVE OF THE STUDY:

To study and compare the interactional effect of Gender, Locale and Type of School on Metacognition of 10+1 students.

4. HYPOTHESES OF THE STUDY:

H1   There exists no significant interactional effect of Gender and Locale on Metacognition of 10+1 students.
H2   There exists no significant interactional effect of Locale and Type of School on Metacognition of 10+1 students.
H3   There exists no significant interactional effect of Gender and Type of School on Metacognition of 10+1 students.
H4   There exists no significant interactional effect of Gender, Locale and Type of School on Metacognition of 10+1 students.

5. RESEARCH METHODOLOGY:

To see the interactional effect of Gender, Locale and Type of School Metacognition a factorial design involving three-way analysis of variance, i.e., (2 X 2 X 2) has been employed in the study. Factorial design is usually employed to study the effect of two or more independent variables operating simultaneously.

5.1 Variables

In the present study Gender, Locale and Type of School are independent variables and Metacognition is the dependent variable.

5.2 Method

Descriptive survey method was used, which is used to study the facts of present situations. In present study the researcher inquired about the metacognition of 10+1 students in relation to their gender, locale and type of school.

5.3 Sample

A sample of 800 students (400 male and 400 female) of 10+1 students of schools of Haryana were taken as sample of study by using multistage and stratified sampling techniques.

5.4 Tools of the Study

Metacognition inventory by Govil (2003) was used in the present study.

5.5 Statistical Techniques

To draw inferences from the obtained results inferential statistics like Analysis of Variance (ANOVA), and t-test were used. Data was analyzed by using SPSS 18.0 version.

6. ANALYSIS AND INTERPRETATION OF THE DATA:

Table 1 shows the interactional effect of Gender (Male-Female), Locale (Rural-Urban) and Type of School (Government-Private) on Metacognition of 10+1 students.

Table 1: Analysis of Variance for metacognition of 10+1 Students (2×2×2 factorial design)

Source of variation	Sum of Squares	df	Mean Squares	F- Ratio
Gender × Locale	2003.445	1	2003.445	14.31**
Gender × Type of School	1300.500	1	1300.500	9.29**
Locale × Type of School	208.080	1	208.080	1.48
Gender × Locale × Type of School	167.445	1	167.445	1.19
Error	110891.760	792	140.015	

F- Ratio at 0.01 level is 6.66 at df 1/792
*** Significant at the 0.01 level of significance*

6.1 Two-way Interactions
Gender and Locale

From Table 1 the result of two-way interaction analysis exhibits that the interaction between Gender and Locale (F=14.31) is significant at 0.05 level of significance. It means that a particular combination of Gender and Locale affects the metacognition of 10+1 students. In order to interpret this further, t-test was applied to find out the difference between mean metacognition scores of different combination groups. The results for the same are given in Table 2.

Table 2: Mean, S.D., SED and t- value of different combination groups (Gender× Locale) of 10+1 students on metacognition

Factor	Group	N	Mean	S.D.	SED	t- ratio
Gender× Locale	Male Rural	200	84.37	12.48	1.21	0.87
	Male Urban	200	85.42	11.62		
	Female Rural	200	89.46	10.89	1.17	4.50**
	Female Urban	200	84.19	12.49		
	Male Rural	200	84.37	12.48	1.17	4.35**
	Female Rural	200	89.46	10.89		
	Male Urban	200	85.42	11.62	1.20	1.02
	Female Urban	200	84.19	12.49		

*** Significant at the 0.01 level of significance*

Table 2 clearly shows that the t-ratio between rural male and urban male students is 0.87 which is less than the tabulated value at 0.05 level of significance, it shows that there exists no significant difference between rural male and urban male students on metacognition. The t-ratio between rural female and urban female students is 4.50 which is significant at 0.01 level of significance. The mean score of rural females 10+1 students is 89.46 which is higher than the mean score (84.19) of urban female 10+1 students on metacognition. This shows that the rural female students have higher metacognition than the urban female students. There exists significant mean difference between rural male and rural female students on metacognition as the t-value 4.35 is significant at 0.01 level of significance. It means rural female students have higher metacognition than the rural female students. There exists no significant mean difference between urban male and urban female students, as the t-ratio 1.02 is not significant at 0.05 level of significance. Data is presented graphically in Fig 1.
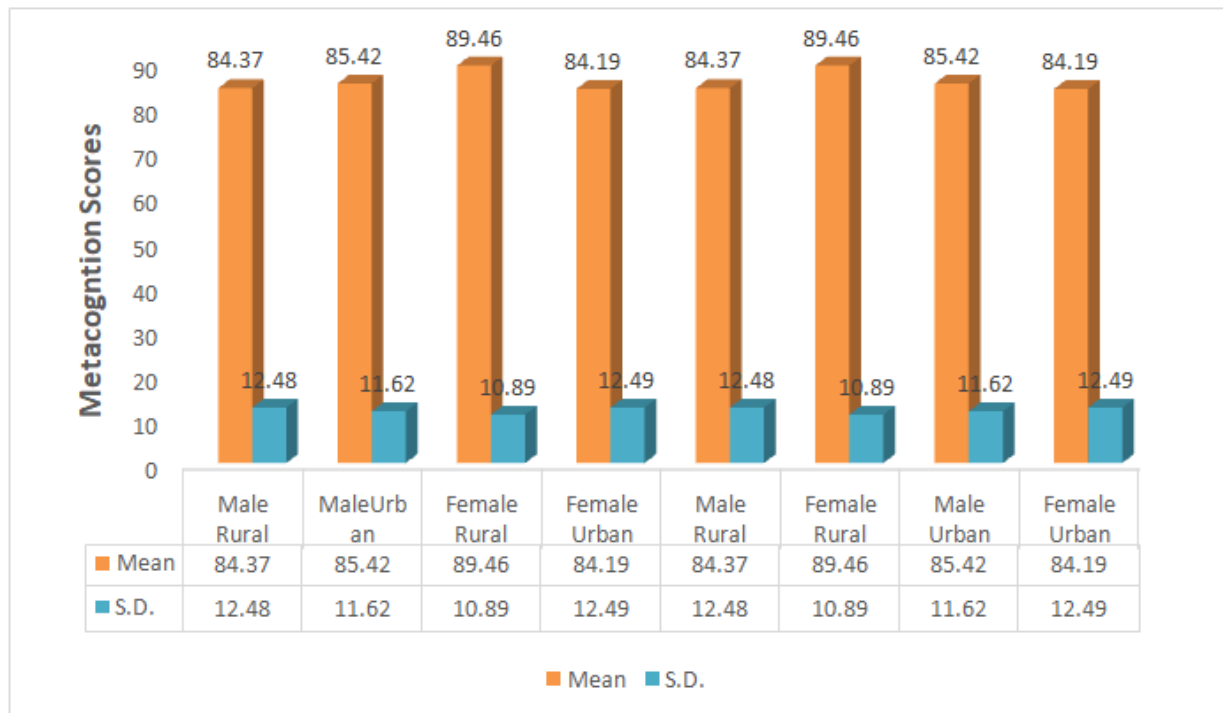
Figure 1: Bar graph showing difference between Mean and S.D. scores of different combinations of (Gender × Locale) groups of 10+1 students on Metacognition

Gender and Type of School

       From Table 1 the result of two-way interaction analysis exhibits that the interaction between Gender and Type of School (F=9.29) is significant at 0.05 level of significance. This shows that when the two factors interact with one another, they create significant influence on the metacognition of 10+1 students. In order to interpret this further, t-test was applied to find out the difference between mean metacognition scores of different combination groups. The results are given in Table 3.

Table 3: Mean, S.D., SED and t- value of different combination groups (Gender× Type of School) of 10+1 students on metacognition

Factor	Group	N	Mean	S.D.	SED	t- ratio
Gender× Type of School	Male Govt.	200	86.01	12.06	1.20	1.85
	Male Private	200	83.78	11.99		
	Female Govt.	200	85.39	13.01	1.19	2.41*
	Female Private	200	88.26	10.73		
	Male Govt.	200	86.01	12.06	1.25	0.49
	Female Govt.	200	85.39	13.01		
	Male Private	200	83.78	11.99	1.14	3.94**
	Female Private	200	88.26	10.73		

** Significant at the 0.01 level of significance

* Significant at the 0.05 level of significance

       Table 3 depicts the t-ratios between mean scores of different combination groups of Gender and Type of School of 10+1 students on Metacognition. The t-ratio between mean scores of male students of government schools and male students of private schools is 1.85 which is not significant. The t-ratio (2.41) between mean scores of female students of government schools and female students of private schools on metacognition is significant at 0.05 level of significance. There exists no significant difference between male students of government schools and female students of government schools. The tratio between male and female students of private schools on metacognition is 3.94 which is significant at 0.01 level of significance. Graphical representation of data is given Fig 2.
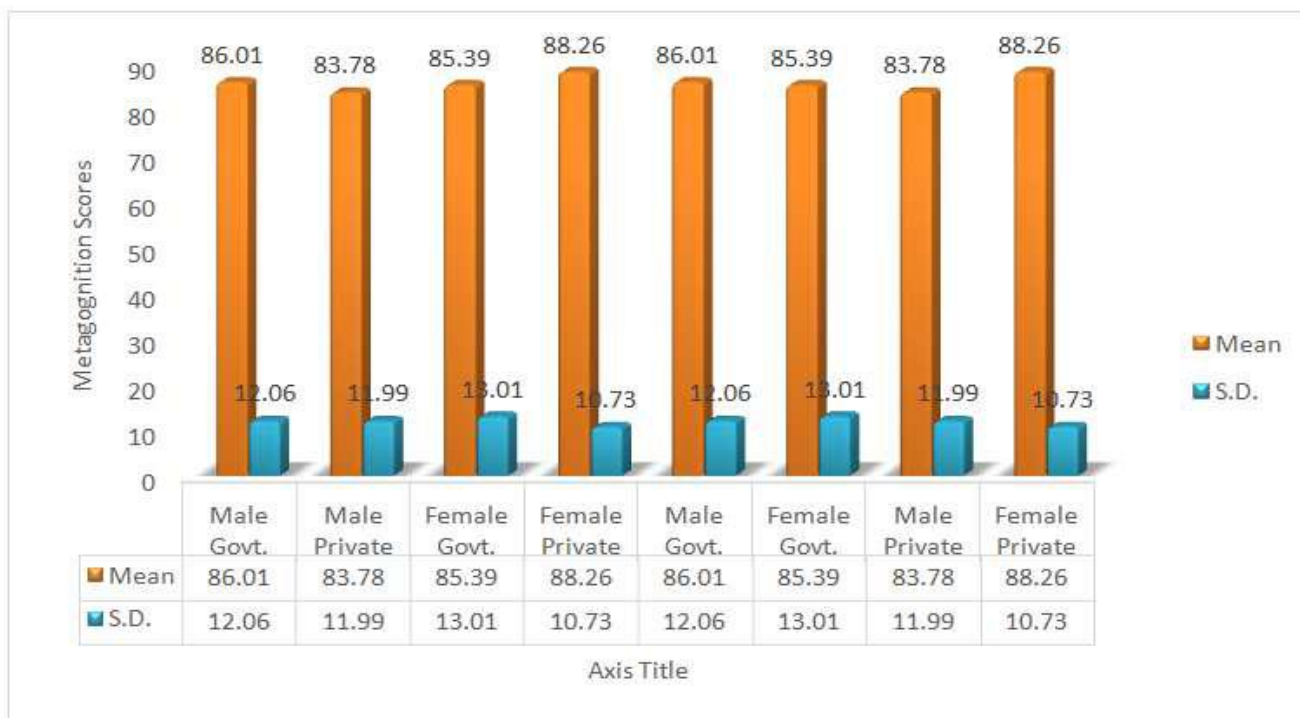
Figure 2: Bar graph showing difference between Mean and S.D. scores of different combinations of (Gender × Type of school) groups of 10+1 students on metacognition

Locale and Type of School

Table 1 reveals that the calculated F- ratio (1.48) for the two-way interaction of Locale and Type of School of 10+1 students is less than the table value at 0.05 level of significance, indicating that the mean metacognition scores with respect to Locale and Type of School is not significant.

6.2 Three-way Interaction

Further Table 1 reveals that the three-way interaction among Gender, Locale and Type of School (F=1.19) is not significant at 0.05 level of significance which shows that in combination these three factors have no influence on metacognition of 10+1 students. Thus, the hypothesis (H4) that "There exists no significant interactional effect of Gender, Locale, and Type of School on Metacognition of 10+1 students" is RETAINED.

7. FINDINGS AND DISCUSSION:

The result of two-way interaction analysis among Gender and Locale on Metacognition shows that a particular combination of Gender and Locale affects the Metacognition of 10+1 students. There exists no significant difference between rural and urban male students and male and female urban students. Both the groups possess average level of metacognition; it shows that they sometimes use thinking and learning strategies. There exists significant difference between rural and urban female students and rural male and female students. Results show that rural female students have higher metacognition than urban female and rural male students. This may be due to the fact that rural female students have more struggling life than those of urban females and rural male students therefore they have more inclination towards thinking strategies. Also, the result of two-way interaction among Gender and Type of School shows significant influence on metacognition of 10+1 students. There is no significant difference between mean scores of male students of government and private schools and male and female students of government schools. All of these possess average level of metacognition. There exists significant mean difference between female students of government and private schools and male and female students of private schools. Female students of private schools possess higher score on metacognition than female students of government schools and male students of private schools. This may be due to the fact that private schools provide more facilities and also female students are more serious in their studies as compared to male students. The combined effect of Locale and Type of School has no influence on metacognition. Also, the three-way interaction analysis among Gender, Locale and Type of School has no influence on metacognition of 10+1 students. This may be due to the reason that demerits of one factor were overcome by the other. Thus, the hypothesis (H4) that there exists no significant interactional effect of Gender, Locale, and Type of School on Metacognition of 10+1 students is RETAINED.

8. CONCLUSION:

By this study we can draw inference that 10+1 students of Haryana have been found to be average in their metacognition. The two-way interaction effect between gender and locale on metacognition is significant. Female rural students have highest mean metacognition and female urban students have the lowest mean metacognition. The two-way interaction effect between gender and type of school on metacognition is significant. Female students studying in private schools have highest mean score on metacognition and male students studying in private schools have the lowest mean score on metacognition. There exists no significant interaction effect between locale and type of school with respect to metacognition. From the factor differences among different variables, we can conclude that female students and rural students perform better in their metacognition but no significant differences were observed between government and private school students on metacognition. No significant three-way interactional effect of gender, locale and type of school was observed with metacognition.

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