Looking for Factors Affecting Testing Pre-concepts in Informal Science Learning Environments

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Abstract

Science education has faced many challenges in the past. One of those challenges is connecting it with the life, especially the life outside the classroom. The strength of the life outside the classroom lies mainly in the form of this being inclined more towards the informal environments. In the present study the teachers have planned their classroom proceedings in a framework that allows for strengths of informal environments to be used in formal classroom settings. The study focuses on preservice teacher's natural dispositions towards "Tested Pre-concepts of the Learners" in terms of Qualification Level of the Teacher, Teacher's Area of Expertise and Classes Taught by the Teacher. In the study related graphs have been drawn and interpreted. Related 'Statistical Descriptives' have also been interpreted. In conclusion, the study did not find any significant difference in pre-service teachers' natural dispositions towards "Tested Pre-concepts of the Learners" in terms of Qualification Level of the Teacher and Teacher's Area of Expertise. Whereas a difference in pre-service teachers' response to "Tested Pre-concepts of the Learners" in terms of Classes Taught by the Teacher has been located. Also, the study finds that the strength of association between Tested Pre-concepts of the Learners and Class Taught by the Teacher is large. Further, the study hints that the teachers teaching at the lower level are testing the pre-concepts of science learners more than their counterparts at higher levels of schooling in the selected schools.

Key Words: Innovative Science Planning, learning strands, Science classrooms, Pre-service teacher education, Qualification Level of the Teacher, Teacher's Area of Expertise, Classes Taught, Informal environments in science, Testing Pre-concepts

Introduction:

Science education has faced many challenges in the past. One of those challenges is connecting it with the life, especially the life outside the classroom. The strength of the life outside the classroom lies mainly in

the form of this being inclined more towards the informal environments. There lies another challenge when we start thinking in terms of informal environments in teaching-learning of science. As soon as plan the teaching-learning processes these become formal in nature. The nature of science is such, that if informal environment is planned it enters in the slippery area of being outside the boundaries of science. Learning strands framework comes to our rescue in this situation. This framework is prepared specially to develop what is expected in authentic teaching-learning of science. But, real classroom planning, including unit planning and lesson planning remained a distance task for many years. One of the researchers from this research team developed a thorough framework of planning units and lessons in formal classrooms using these informal environments.

Applying informal Learning Strands (Bell, Lewenstein, Shouse, & Feder, 2009) in Science Classrooms (Kumar, 2014n; Prabha, Jha, & Kumar, 2012; Prabha, Kumar, & Jha, 2013; Prabha & Kumar, 2014) formally with unit and lesson planning for teaching-learning science had not been an easy task. Years of thought and preparation in science education went in the course of planning the same. During the same process by one of the researchers from this team, there had been attempts to develop theoretical contexts of Alternative Frameworks (Kumar, 2011, 2012c, 2015, 2013k, 2013g, 2013h, 2013n, 2013a, 2013i, 2014m, 2014k) and to undertake Concept specific researches (Kumar, 2013b) on Alternative Framework in Science on Magnets (Kumar, 2014r), Rain (Kumar, 2014q), Soil (Kumar, 2014h), Cells (Kumar, 2014u), Electric Current (Kumar, 2014c), light (Kumar, 2014v), Blood (Kumar, 2014x), Food (Kumar, 2014e), Mirrors and Lenses (Kumar, 2014j), Universe (Kumar, 2014s), Plant Reproduction (Kumar, 2014p), Sources of Energy (Kumar, 2014b), Air (Kumar, 2014o), Force (Kumar, 2014i), Light (Kumar, 2014v) etc. Further, research on understanding Natural Dispositions of the engaged teachers in Classroom Context (Kumar, 2013a) and related Processes (Kumar, 2012b, 2012a, 2014d, 2014g, 2014l, 2014a, 2014f, 2014t, 2014n, 2015, 2013l, 2013e, 2013j, 2013d, 2013f, 2013m, 2013c, 2014w) was also integrated to understand it in the general teaching-learning environments in science classrooms. In these attempts there had been research gaps due to some reasons like the length and breadth of the research that can be managed by one individual. Some of these gaps were related to the factors affecting "Tested Pre-concepts of the Learners".

The current study tries to fill those gaps through the explored research procedures. The contours of the present study are planned based on three identified factors that were not identified and studied earlier.

Research Methodology

Research Questions

Three research questions are framed based on the following three factors viz. Qualification Level of the Teacher, Teacher's Area of Expertise, Class Taught by the Teacher.

1. What graphical representation can we use to depict preservice teacher's natural dispositions towards "Tested Pre-concepts of the Learners" in terms of the three identified factors?

2. How do we interpret 'statistical descriptives' related to preservice teacher's natural dispositions towards "Tested Pre-concepts of the Learners" in terms of the three identified factors?
3. What may be the differences (if any) in preservice teacher's natural dispositions towards "Tested Pre-concepts of the Learners" in terms of the three identified factors?

Research Objectives

The study has focused on the following objectives:

1. To draw and interpret relevant graphs related to preservice teacher's natural dispositions towards "Tested Pre-concepts of the Learners" in terms of the three identified factors.
2. To interpret the 'statistical descriptives' related to preservice teacher's natural dispositions towards "Tested Pre-concepts of the Learners" in terms of the three identified factors.
3. To locate the differences (if any) in preservice teacher's natural dispositions towards "Tested Pre-concepts of the Learners" in terms of the three identified factors.

Methodology, sample and tools:

Methodology:

Based upon experience and review of related literature, one of the researchers from the team developed some thoughts in the area of study related to processes of teaching and learning in science. These also brought about some questions from formal and informal environments in teaching-learning of science that needed further probing. In order to explore these, the researcher developed a wide-ranging tool in the area identified. This tool helped in understanding and evaluating the science classrooms from the sample. The researchers used IBM-SPSS for exploring the data thus collected.

Sample

Total 38 Pre-Service Science teachers, from two B.Ed. colleges, each from University of Delhi and GGSIP University, Delhi was selected. This ensured a sample of total 18 schools in which above Pre-Service teachers were undergoing their School Life Experience Program. These teachers had pursued diverse graduation and post-graduation subjects. First College had 8 participants and second college had 30 participants. Feedback responses from 592 lessons delivered by these 30 pre-service science teachers were analyzed as part of the through study that was undertaken. Out of total 38 Pre-Service teachers, code numbers 1.01 to code number 1.30 were given to 30 Pre-service teachers from First College of Education and 8 Pre-Service teachers from Second College of Education received code numbers 2.01 to code number 2.08. We can see that the sample is not a random sample but a purposive one. No deliberate attempt was made for the sample to be homogeneous or representative, but to some extent it became so in the process. This assertion is evident in the different factors that had been described below. From observations, it became clear that these science teachers belonged to different socio-economic backgrounds. Moreover, the science learners belonged to different sorts of school settings. Therefore, we can say that different socio-

economic backgrounds and diversity in teaching-learning settings has been represented largely in the sample.

The properties of different factors that had been studied in the sample are described below.

Level				
		Value	Count	Percent
Standard Attributes	Label	Qualification Level of the Teacher		
	Type	String		
	Measurement	Nominal		
Valid Values	1	Graduate	25	83.3%
	2	Post Graduate	5	16.7%

Expertise				
		Value	Count	Percent
Standard Attributes	Label	Teacher's Area of Expertise		
	Type	String		
	Measurement	Nominal		
Valid Values	1	Physics	1	3.3%
	2	Bio-Technology	2	6.7%
	3	Life-Sciences	8	26.7%
	4	Mathematics	3	10.0%
	5	Physical Sciences	10	33.3%
	6	Chemistry	4	13.3%
	7	Applied Sciences	1	3.3%
	8	Information Technology	1	3.3%

Class				
		Value	Count	Percent
Standard Attributes	Label	Class Taught by the Teacher		

	Type	String		
	Measurement	Nominal		
Valid Values	6	6th Class	13	43.3%
	7	7th Class	8	26.7%
	8	8th Class	8	26.7%
	9	9th Class	1	3.3%

Tools for data collection

In the present study questionnaire prepared by the researcher was used to collect the data. Observations and unstructured interviews were used to triangulate the data in holistic manner. The questionnaire was designed in the form of self- appraisal consisting of both open ended and close ended questions that can be analyzed quantitatively and qualitatively both. Field experts, and colleagues in the teacher education institutions validated the tool prepared. Some issues related to the vagueness of language formatting style etc. were resolved in the process. This increased the authenticity of the questionnaire.

Analysis of Data

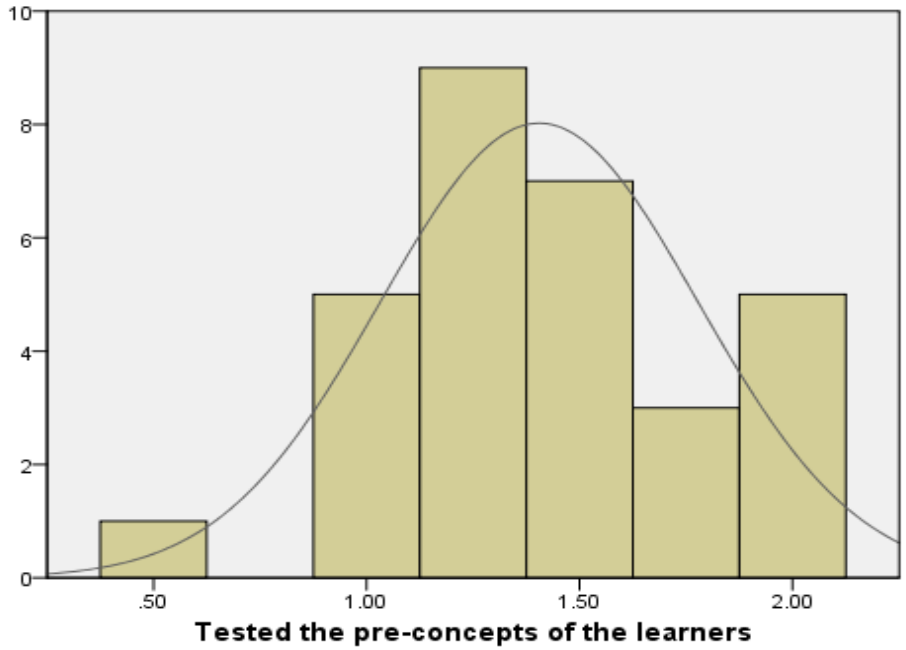
The schedule of self-assessment response, essentially contained 26 items. On this schedule there were choices of answering them in terms of disagree, agree, and strongly agree. These three categories of choices are further given the marks zero, one and two respectively. These responses in the form of marks of zero, one and two were provided as the feedback to the science teachers from the analysis. Also, these responses were then collected on the Microsoft Excel sheet for the duration of overall school time interaction program of all the participating pre-service science teachers. Thus, the average score of one specific teacher was obtained. Further, the average scores of these 30 teachers were entered in separate Excel sheet for additional analysis of their responses on the items in the questionnaire. Graphs and descriptives from this data are being given in “findings” part of the study that follows.

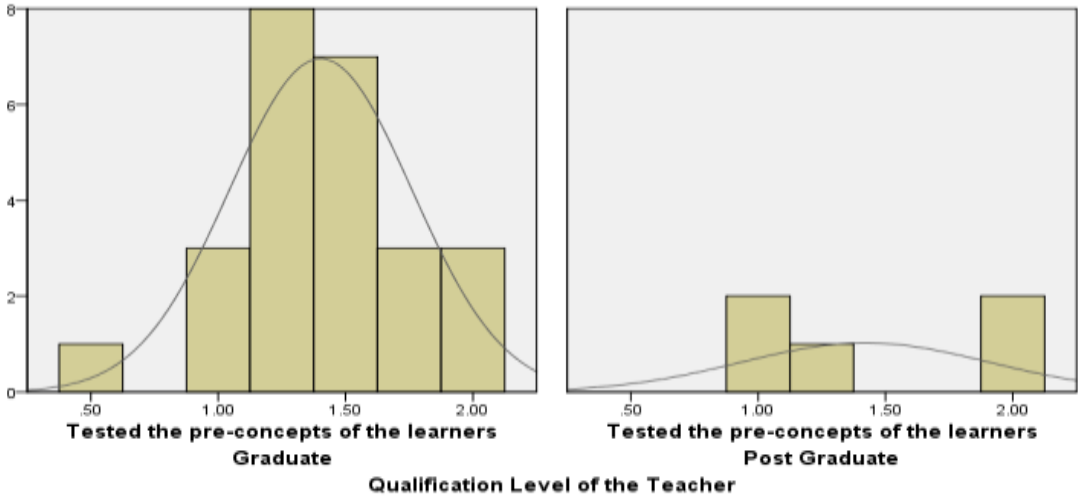
Findings

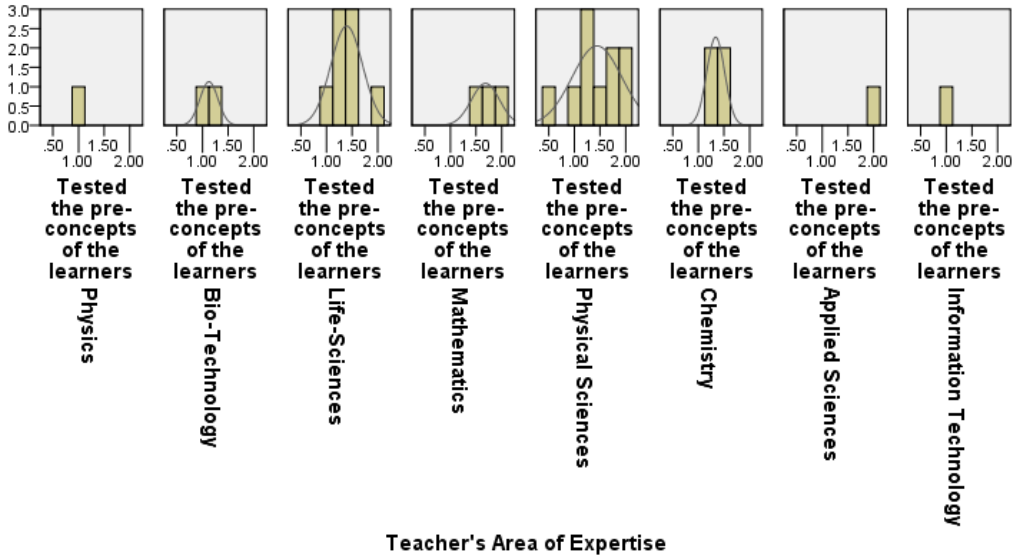
Table 1 shows the average scores of several teachers on the feedback schedule related to the Component “Tested Pre-concepts of the Learners” of the teaching-learning environment in damage of Teachers' Self-Assessment. The evaluation, interpretation and appropriate graphical descriptions had been used in the following discussions using the information from the Table 1.

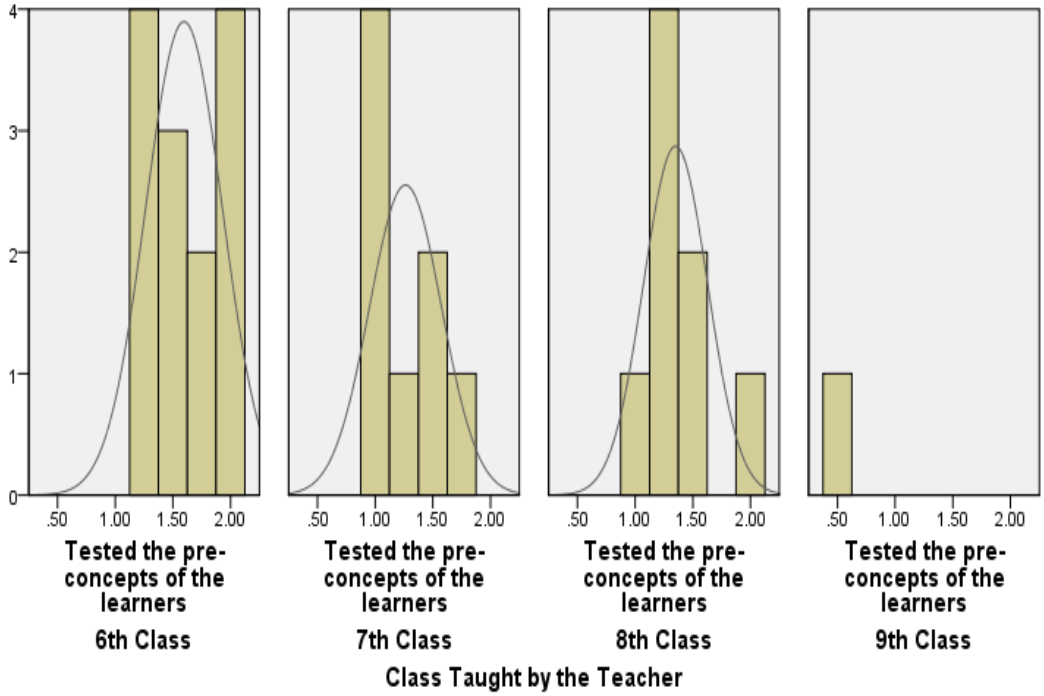
Table 1 - Individual average score of different respondents on the item: Tested Pre-concepts of the Learners

Tch. Cd.	Av. Score
1.03	1.2
1.09	1.4
1.14	1
1.22	2
1.27	1.25
1.28	1.9
2.01	1.15
1.01	1.05
1.02	1
1.04	1.85
1.05	1.5
1.06	1.95
1.07	1.6
1.08	1.8
1.1	1.15
1.11	1.55
1.12	1.25
1.13	1.7
1.17	1
1.18	1.95
1.19	1.55
1.2	1.2
1.21	1.95
1.23	1.6
1.24	1.35
1.25	1.2
1.26	1.4
1.3	1.15
2.02	1
2.03	0.5









Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
Tested the pre-concepts of the learners * Qualification Level of the Teacher	30	100.0%	0	0.0%	30	100.0%

Tested the pre-concepts of the learners * Teacher's Area of Expertise	30	100.0%	0	0.0%	30	100.0%
Tested the pre-concepts of the learners * Class Taught by the Teacher	30	100.0%	0	0.0%	30	100.0%

Tested the pre-concepts of the learners * Qualification Level of the Teacher

Report

Tested the pre-concepts of the learners

Qualification Level of the Teacher	Mean	Median	Minimum	Maximum	Range	Std. Deviation	Skewness	Kurtosis
Graduate	1.4020	1.4000	.50	2.00	1.50	.35838	-.284	.191
Post Graduate	1.4200	1.1500	1.00	1.95	.95	.48683	.554	-3.260
Total	1.4050	1.3750	.50	2.00	1.50	.37286	-.086	-.400

ANOVA Table

			Sum of Squares	df	Mean Square	F	Sig.
Tested the pre-concepts of the learners * Qualification Level of the Teacher	Between Groups	(Combined)	.001	1	.001	.009	.924
	Within Groups		4.030	28	.144		
	Total		4.032	29			

Measures of Association		
	Eta	Eta Squared
Tested the pre-concepts of the learners * Qualification Level of the Teacher	.018	.000

Tested the pre-concepts of the learners * Teacher's Area of Expertise

Report								
Tested the pre-concepts of the learners								
Teacher's Area of Expertise	Mean	Median	Minimum	Maximum	Range	Std. Deviation	Skewness	Kurtosis
Physics	1.0500	1.0500	1.05	1.05	.00	.	.	.
Bio-Technology	1.1250	1.1250	1.00	1.25	.25	.17678	.	.
Life-Sciences	1.3937	1.3500	1.00	1.95	.95	.31103	.607	-.187
Mathematics	1.6833	1.7000	1.40	1.95	.55	.27538	-.271	.
Physical Sciences	1.4400	1.4750	.50	2.00	1.50	.48580	-.638	-.262
Chemistry	1.3375	1.3250	1.15	1.55	.40	.17500	.321	-1.598
Applied Sciences	1.9000	1.9000	1.90	1.90	.00	.	.	.
Information Technology	1.0000	1.0000	1.00	1.00	.00	.	.	.
Total	1.4050	1.3750	.50	2.00	1.50	.37286	-.086	-.400

ANOVA Table

			Sum of Squares	df	Mean Square	F	Sig.
Tested the pre-concepts of the learners * Teacher's Area of Expertise	Between Groups	(Combined)	.956	7	.137	.977	.472
	Within Groups		3.076	22	.140		
	Total		4.032	29			

Measures of Association

	Eta	Eta Squared
Tested the pre-concepts of the learners * Teacher's Area of Expertise	.487	.237

Tested the pre-concepts of the learners * Class Taught by the Teacher

Report

Tested the pre-concepts of the learners

Class Taught by the Teacher	Mean	Median	Minimum	Maximum	Range	Std. Deviation	Skewness	Kurtosis
6th Class	1.5962	1.6000	1.15	2.00	.85	.33258	-.194	-1.700
7th Class	1.2625	1.1250	1.00	1.80	.80	.31254	.801	-.955
8th Class	1.3500	1.3000	1.00	1.90	.90	.27775	1.060	1.456
9th Class	.5000	.5000	.50	.50	.00	.	.	.
Total	1.4050	1.3750	.50	2.00	1.50	.37286	-.086	-.400

ANOVA Table

			Sum of Squares	df	Mean Square	F	Sig.
Tested the pre-concepts of the learners * Class Taught by the Teacher	Between Groups	(Combined)	1.481	3	.494	5.030	.007
	Within Groups		2.551	26	.098		
	Total		4.032	29			

Measures of Association

	Eta	Eta Squared
Tested the pre-concepts of the learners * Class Taught by the Teacher	.606	.367

Analysis and Interpretation:

1) The Mean is 1.405 which means on an average most teachers agree on Tested Pre-concepts of the Learners. The Median is 1.375 which means fifty percent of the cases lie above and below it. The Range for Total teachers taken together is 1.5 for which minimum value is 0.5 and maximum value is 2. This shows high difference between minimum and maximum values. This difference can be interpretated as high divergence in the mean scores on the response towards Tested Pre-concepts of the Learners. Standard deviation is 0.37286. S.D. when interpreted with the calculated means, it implies that most of the teachers scored between 1.03 and 1.77. This means, on an average most of the teachers agree on Tested Pre-concepts of the Learners and some strongly agree with it. Skewness is -0.086. which means that the data is slightly negatively skewed. i.e., the number of low scorers is greater than the high scorers on the question of Tested Pre-concepts of the Learners. This is evident in the graphical representation of the data as well. Kurtosis is -0.4 which shows that the data distribution will be interpreted not outside the range of normality. This is evident in the graphical representation of the data as well.

2(a) The Mean is 1.402 which means on an average most teachers agree on Tested Pre-concepts of the Learners. The Median is 1.4 which means fifty percent of the cases lie above and below it. The Range for Graduate teachers taken together is 1.5 for which minimum value is 0.5 and maximum value is 2. This shows high difference between minimum and maximum values. This difference can be interpretated as high divergence in the mean scores on the response towards Tested Pre-concepts of the Learners. Standard deviation is 0.35838. S.D. when interpreted with the calculated means, it implies that most of the teachers scored between 1.04 and 1.76. This means, on an average most of the teachers agree on Tested Pre-concepts of the Learners and some strongly agree with it. Skewness is -0.284. which means that the data is slightly

negatively skewed. i.e., the number of low scorers is greater than the high scorers on the question of Tested Pre-concepts of the Learners. This is evident in the graphical representation of the data as well. Kurtosis is 0.191 which shows that the data distribution will be interpreted not outside the range of normality. This is evident in the graphical representation of the data as well.

2(b) The Mean is 1.42 which means on an average most teachers agree on Tested Pre-concepts of the Learners. The Median is 1.15 which means fifty percent of the cases lie above and below it. The Range for Post Graduate teachers taken together is 0.95 for which minimum value is 1 and maximum value is 1.95. This shows high difference between minimum and maximum values. This difference can be interpreted as high divergence in the mean scores on the response towards Tested Pre-concepts of the Learners. Standard deviation is 0.48683. S.D. when interpreted with the calculated means, it implies that most of the teachers scored between 0.93 and 1.90. This means, on an average most of the teachers agree on Tested Pre-concepts of the Learners and some strongly agree with it. Skewness is 0.554. which means that the data is moderately positively skewed. i.e., the number of high scorers is greater than the low scorers on the question of Tested Pre-concepts of the Learners. This is evident in the graphical representation of the data as well. Kurtosis is -3.26 which shows that the data distribution will be interpreted outside the range of normality. This is evident in the graphical representation of the data as well.

2(c) We test the null-hypothesis for the relation Tested Pre-concepts of the Learners * Qualification Level of the Teacher the value of the F-ratio comes out to be 0.009 and the p-value comes out to be 0.924 through ANOVA. The interpretation of the p-value reveals that it is more than the alpha level i.e., 0.05 which means that we retain the null hypothesis. The interpretation of the F-ratio reveals that it is less than the critical value 4.196 which means that we retain the null hypothesis. On the basis of this interpretation, we retain the null hypothesis for the relation Tested Pre-concepts of the Learners * Qualification Level of the Teacher as a conclusion of this interpretation. The value of eta-squared is 0 as shown in the table. As we retain the null-hypothesis the strength of association between Tested Pre-concepts of the Learners * Qualification Level of the Teacher is considered insignificant.

3(a) The Mean is 1.05 which means on an average most teachers agree on Tested Pre-concepts of the Learners. The Median is 1.05 which means fifty percent of the cases lie above and below it. The Range for Physics teachers taken together is 0 for which minimum value is 1.05 and maximum value is 1.05. This shows no difference between minimum and maximum values. This difference can be interpretated as no divergence in the mean scores on the response towards Tested Pre-concepts of the Learners. Standard deviation is incalculable. Skewness is incalculable. Kurtosis is incalculable. This is evident in the graphical representation of the data as well.

3(b) The Mean is 1.125 which means on an average most teachers agree on Tested Pre-concepts of the Learners. The Median is 1.125 which means fifty percent of the cases lie above and below it. The Range for Bio-Technology teachers taken together is 0.25 for which minimum value is 1 and maximum value is 1.25. This shows low difference between minimum and maximum values. This difference can be

interpretated as low divergence in the mean scores on the response towards Tested Pre-concepts of the Learners. Standard deviation is 0.17678. S.D. when interpreted with the calculated means, it implies that most of the teachers scored between 0.94 and 1.30. This means, on an average most of the teachers agree on Tested Pre-concepts of the Learners and some strongly agree with it. Skewness is incalculable. Kurtosis is incalculable. This is evident in the graphical representation of the data as well.

3(c) The Mean is 1.3937 which means on an average most teachers agree on Tested Pre-concepts of the Learners. The Median is 1.35 which means fifty percent of the cases lie above and below it. The Range for Life-Sciences teachers taken together is 0.95 for which minimum value is 1 and maximum value is 1.95. This shows high difference between minimum and maximum values. This difference can be interpretated as high divergence in the mean scores on the response towards Tested Pre-concepts of the Learners. Standard deviation is 0.31103. S.D. when interpreted with the calculated means, it implies that most of the teachers scored between 1.08 and 1.70. This means, on an average most of the teachers agree on Tested Pre-concepts of the Learners and some strongly agree with it. Skewness is 0.607. which means that the data is moderately positively skewed. i.e., the number of high scorers is greater than the low scorers on the question of Tested Pre-concepts of the Learners. This is evident in the graphical representation of the data as well. Kurtosis is -0.187 which shows that the data distribution will be interpreted not outside the range of normality. This is evident in the graphical representation of the data as well.

3(d) The Mean is 1.6833 which means on an average most teachers agree on Tested Pre-concepts of the Learners. The Median is 1.7 which means fifty percent of the cases lie above and below it. The Range for Mathematics teachers taken together is 0.55 for which minimum value is 1.4 and maximum value is 1.95. This shows low difference between minimum and maximum values. This difference can be interpretated as low divergence in the mean scores on the response towards Tested Pre-concepts of the Learners. Standard deviation is 0.27538. S.D. when interpreted with the calculated means, it implies that most of the teachers scored between 1.40 and 1.95. This means, on an average most of the teachers agree on Tested Pre-concepts of the Learners and some strongly agree with it. Skewness is -0.271. which means that the data is slightly negatively skewed. i.e., the number of low scorers is greater than the high scorers on the question of Tested Pre-concepts of the Learners. Kurtosis is incalculable. This is evident in the graphical representation of the data as well.

3(e) The Mean is 1.44 which means on an average most teachers agree on Tested Pre-concepts of the Learners. The Median is 1.475 which means fifty percent of the cases lie above and below it. The Range for Physical Sciences teachers taken together is 1.5 for which minimum value is 0.5 and maximum value is 2. This shows high difference between minimum and maximum values. This difference can be interpretated as high divergence in the mean scores on the response towards Tested Pre-concepts of the Learners. Standard deviation is 0.4858. S.D. when interpreted with the calculated means, it implies that most of the teachers scored between 0.95 and 1.92. This means, on an average most of the teachers agree on Tested Pre-concepts of the Learners and some strongly agree with it. Skewness is -0.638. which means that the data is moderately negatively skewed. i.e., the number of low scorers is greater than the high scorers

on the question of Tested Pre-concepts of the Learners. This is evident in the graphical representation of the data as well. Kurtosis is -0.262 which shows that the data distribution will be interpreted not outside the range of normality. This is evident in the graphical representation of the data as well.

3(f) The Mean is 1.3375 which means on an average most teachers agree on Tested Pre-concepts of the Learners. The Median is 1.325 which means fifty percent of the cases lie above and below it. The Range for Chemistry teachers taken together is 0.4 for which minimum value is 1.15 and maximum value is 1.55. This shows low difference between minimum and maximum values. This difference can be interpretated as low divergence in the mean scores on the response towards Tested Pre-concepts of the Learners. Standard deviation is 0.175. S.D. when interpreted with the calculated means, it implies that most of the teachers scored between 1.16 and 1.51. This means, on an average most of the teachers agree on Tested Pre-concepts of the Learners and some strongly agree with it. Skewness is 0.321. which means that the data is slightly positively skewed. i.e., the number of high scorers is greater than the low scorers on the question of Tested Pre-concepts of the Learners. This is evident in the graphical representation of the data as well. Kurtosis is -1.598 which shows that the data distribution will be interpreted outside the range of normality. This is evident in the graphical representation of the data as well.

3(g) The Mean is 1.9 which means on an average most teachers agree on Tested Pre-concepts of the Learners. The Median is 1.9 which means fifty percent of the cases lie above and below it. The Range for Applied Sciences teachers taken together is 0 for which minimum value is 1.9 and maximum value is 1.9. This shows no difference between minimum and maximum values. This difference can be interpretated as no divergence in the mean scores on the response towards Tested Pre-concepts of the Learners. Standard deviation is incalculable. Skewness is incalculable. Kurtosis is incalculable. This is evident in the graphical representation of the data as well.

3(h) The Mean is 1 which means on an average most teachers agree on Tested Pre-concepts of the Learners. The Median is 1 which means fifty percent of the cases lie above and below it. The Range for Information Technology teachers taken together is 0 for which minimum value is 1 and maximum value is 1. This shows no difference between minimum and maximum values. This difference can be interpretated as no divergence in the mean scores on the response towards Tested Pre-concepts of the Learners. Standard deviation is incalculable. Skewness is incalculable. Kurtosis is incalculable. This is evident in the graphical representation of the data as well.

3(i) We test the null-hypothesis for the relation Tested Pre-concepts of the Learners * Teacher's Area of Expertise the value of the F-ratio comes out to be 0.977 and the p-value comes out to be 0.472 through ANOVA. The interpretation of the p-value reveals that it is more than the alpha level i.e., 0.05 which means that we retain the null hypothesis. The interpretation of the F-ratio reveals that it is less than the critical value 2.464 which means that we retain the null hypothesis. On the basis of this interpretation, we retain the null hypothesis for the relation Tested Pre-concepts of the Learners * Teacher's Area of Expertise as a conclusion of this interpretation. The value of eta-squared is 0.237 as shown in the table. As we retain the

null- hypothesis the strength of association between Tested Pre-concepts of the Learners * Teacher's Area of Expertise is considered insignificant.

4(a) The Mean is 1.5962 which means on an average most teachers agree on Tested Pre-concepts of the Learners. The Median is 1.6 which means fifty percent of the cases lie above and below it. The Range for 6th Class teachers taken together is 0.85 for which minimum value is 1.15 and maximum value is 2. This shows high difference between minimum and maximum values. This difference can be interpretated as high divergence in the mean scores on the response towards Tested Pre-concepts of the Learners. Standard deviation is 0.33258. S.D. when interpreted with the calculated means, it implies that most of the teachers scored between 1.26 and 1.92. This means, on an average most of the teachers agree on Tested Pre-concepts of the Learners and some strongly agree with it. Skewness is -0.194. which means that the data is slightly negatively skewed. i.e., the number of low scorers is greater than the high scorers on the question of Tested Pre-concepts of the Learners. This is evident in the graphical representation of the data as well. Kurtosis is -1.7 which shows that the data distribution will be interpreted outside the range of normality. This is evident in the graphical representation of the data as well.

4(b) The Mean is 1.2625 which means on an average most teachers agree on Tested Pre-concepts of the Learners. The Median is 1.125 which means fifty percent of the cases lie above and below it. The Range for 7th Class teachers taken together is 0.8 for which minimum value is 1 and maximum value is 1.8. This shows high difference between minimum and maximum values. This difference can be interpretated as high divergence in the mean scores on the response towards Tested Pre-concepts of the Learners. Standard deviation is 0.31254. S.D. when interpreted with the calculated means, it implies that most of the teachers scored between 0.95 and 1.57. This means, on an average most of the teachers agree on Tested Pre-concepts of the Learners and some strongly agree with it. Skewness is 0.801. which means that the data is moderately positively skewed. i.e., the number of high scorers is greater than the low scorers on the question of Tested Pre-concepts of the Learners. This is evident in the graphical representation of the data as well. Kurtosis is -0.955 which shows that the data distribution will be interpreted not outside the range of normality. This is evident in the graphical representation of the data as well.

4(c) The Mean is 1.35 which means on an average most teachers agree on Tested Pre-concepts of the Learners. The Median is 1.3 which means fifty percent of the cases lie above and below it. The Range for 8th Class teachers taken together is 0.9 for which minimum value is 1 and maximum value is 1.9. This shows high difference between minimum and maximum values. This difference can be interpretated as high divergence in the mean scores on the response towards Tested Pre-concepts of the Learners. Standard deviation is 0.27775. S.D. when interpreted with the calculated means, it implies that most of the teachers scored between 1.07 and 1.62. This means, on an average most of the teachers agree on Tested Pre-concepts of the Learners and some strongly agree with it. Skewness is 1.06. which means that the data is highly positively skewed. i.e., the number of high scorers is greater than the low scorers on the question of Tested Pre-concepts of the Learners. This is evident in the graphical representation of the data as well. Kurtosis is

1.456 which shows that the data distribution will be interpreted outside the range of normality. This is evident in the graphical representation of the data as well.

4(d) The Mean is 0.5 which means on an average most teachers disagree on Tested Pre-concepts of the Learners. The Median is 0.5 which means fifty percent of the cases lie above and below it. The Range for 9th Class teachers taken together is 0 for which minimum value is 0.5 and maximum value is 0.5. This shows no difference between minimum and maximum values. This difference can be interpretated as no divergence in the mean scores on the response towards Tested Pre-concepts of the Learners. Standard deviation is incalculable. Skewness is incalculable. Kurtosis is incalculable. This is evident in the graphical representation of the data as well.

4(e) We test the null-hypothesis for the relation Tested Pre-concepts of the Learners * Class Taught by the Teacher the value of the F-ratio comes out to be 5.03 and the p-value comes out to be 0.007 through ANOVA. The interpretation of the p-value reveals that it is less than the alpha level i.e., 0.05 which means that we reject the null hypothesis. The interpretation of the F-ratio reveals that it is more than the critical value 2.975 which means that we reject the null hypothesis. On the basis of this interpretation, we reject the null hypothesis for the relation Tested Pre-concepts of the Learners * Class Taught by the Teacher as a conclusion of this interpretation. The value of eta-squared is 0.367 as shown. As we reject the null-hypothesis the strength of association between Tested Pre-concepts of the Learners * Class Taught by the Teacher indicates a large effect.

Conclusion:

The study focused on preservice teacher's natural dispositions towards "Tested Pre-concepts of the Learners" in terms of Qualification Level of the Teacher, Teacher's Area of Expertise and Class Taught by the Teacher. In the study relevant graphs related to this focus have been drawn and interpreted. 'Statistical Descriptives' of the same have also been interpreted as part of the study. The study did not find any significant difference in pre-service teachers' response to "Tested Pre-concepts of the Learners" in terms of Qualification Level of the Teacher and Teacher's Area of Expertise. Whereas a difference in pre-service teachers' response to "Tested Pre-concepts of the Learners" in terms of Class Taught by the Teacher has been located. Also, the study finds that the strength of association between Tested Pre-concepts of the Learners and Class Taught by the Teacher is large. Further, the study hints that the teachers teaching at the lower level are testing the pre-concepts of science learners more than their counterparts at higher levels of schooling in the selected schools.

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