Impact of Learning Approaches on Achievement of Pupil Teachers in Relation to their Academic Streams at Different Levels of Intelligence

DR MEENA*

ABSTRACT

The present study was an effort to examine how interaction between Learning Approaches (DA/SA) and Academic Streams (Arts/Science) affected the academic learning outcomes of 200 pupil teachers at their different levels of intelligence i.e., high, average and low. The obtained data was analysed with the help of 2-way ANOVA. The major findings of the study were: (i) Pupil teachers under Arts and Science group yielded significant differences in mean scores at average level of intelligence. (ii) Academic streams (Arts/Science) and Learning Approaches (DA/SA) interacted significantly with regard to mean scores at average and low level of intelligence.

Much literature is now available on the ***learning approaches*** where the crucial juncture is that student follows numerous ways or strategies of learning as per his need or as the situation demands from him. The work done by Marton and Saljo (1976); Marton, Prosser and Trigwell (1991); Biggs (1999) reflected the number of approaches to learning like deep approach, surface approach, achievement approach, strategic approach, vocational approach, etc. However, Marton and Saljo (1976) identified two levels of processing that were considered significant in the domain of students' learning: ***deep*** and ***surface***.

The experiment conducted by the **Marton and Saljo (1976)** established two major categories i.e. *deep* and *surface,* which were used in the present study to describe the ***learning approaches*** of students for specific academic tasks. *Deep Approach* of learning means when the students try to understand the whole picture, and try to comprehend and understand the academic work. *Surface Approach* of learning on the other hand means when students

* *Asistant Professor* of Economics, Government College of Education, Chandigarh

try to remember facts without considering its in-depth knowledge and understanding.

Students definitely follow a particular learning approach that further led to differences in their scholastic proficiencies or academic achievement. Generally, it is assumed that those students who have indepth knowledge of the subject exhibit commendable performances in their discipline. Different subjects, disciplines, streams or learning tasks also force students to select or follow a particular strategy or approach for learning the content matter. Whatever be the domains of cognitive, affective and psychomotor objectives of the academic stream, it influences directly or indirectly the students' learning approach in a great deal. Students are segregated and the best (read those securing higher percentage) walk away with the honour and privilege of studying exalted science subjects (Singh, 2009).

The role, which different academic streams play with the students' learning approaches and their achievement, cannot be overruled. The present study comprises academic streams of Arts and Science. The reason behind choosing arts vs. science was the prevalent norm that assumes science stream requires more efforts from students while arts stream requires less hardwork. In the present study, B.Ed. pupil teachers who obtained their academic degrees i.e. M.A. (Master of Arts); B.A. (Bachelor of Arts) were considered under the ***Arts Group*** while the others who obtained their academic degrees i.e. M.Sc. (Master of Science); B.Sc. (Bachelor of Science) were considered under the ***Science Group***.

Another variable undertaken in the study was ***intelligence***. In general, intelligence is the ability to learn from experiences to deal with new situations. The performance of any task systematically and without any interruptions is considered as a symbol of intelligence. Empirical and scientific investigations also tend to support the widely held view that intellectual capacity of an individual plays an important role in determining the limits of his academic achievement (Hollingworth and Cobb, 1923; Freeman, 1992; Crawford and Burnham, 1946; Gowan, 1955; Vernon, 1970).

Entwistle and Entwistle (1970), Entwistle and Brennan (1971), Pask (1976) and Ramsden and Entwistle (1981) espoused the viewpoint that one of the explanations of discrepant academic achievement lies in learning styles of the students. Cultivating poor style of learning inhibits learning and therefore, may be detrimental to scholastic attainment.

The teacher by identifying the learning style and intelligence level of each student can use this information in grouping the students; motivating the students; selecting appropriate teaching methods; designing curriculum; finding the difficulty level of the discipline and so on so that each of his or her students may get education according to his or her unique style.

Theoretical Perspective

While the description of the two approaches to learning were formulated through research based on finding meaning in text, it is useful to observe how this phenomena helped other researchers. Ramsden and Entwistle's (1981) investigation resulted that positive attitude to study combined with high scores lead to deep approach and with low scores, it lead to surface approach. Van Rossum and Schenk (1984) found that students who used a surface approach to learning held reproductive conception of learning (increasing one's knowledge, memorising and reproducing and applying), whereas those who used a deep approach held a constructive conception (understanding and seeing something in a different way).

The purpose of the study conducted by Avery, R.E. (1986) concluded that matching learning styles with teachers' styles did not improve academic achievement and that teachers could not guess the dominant styles of their students. Thummarpon, A. (1988) indicated that learning style variable labeled expectation for success was the best predictor of academic success as measured by GPA (Grade Point Average). Steven, J.(1989). Reported significant differences in learning style preferences between gifted and non-gifted students regardless of grade level (elementary vs. junior high), type of giftedness (academically talented vs. intellectually gifted) and geographic locale (urban vs. sub urban). Kember et al (1999) observed that there was wide spread support for a deep approach by lecturers and teachers and this was frequently noted as a goal of education.

The findings of the study by Siliauskas - Waker, were that learners characterised as *deep* may be able to assimilate different deep strategies without ill effect, while learners categorised as *surface* may require other interventions if they are to develop understanding. A study done by Lindsey and Faulkner (1996) highlighted a significant association between combinations of learning goals, the types of strategies students use and the levels of school achievement. Salim Kumar, C.'s (1999) study concluded

that there is no impact of approaches to studying and achievement motivation on achievement in Biology for high, low or average intelligence group.

Wannasilapa, U. (2003) in her study led to a conclusion that learning approaches do not seem to affect differently the attainments of students. Hall, Ramsay and Raven (2004) in their research paper indicated that students' of accounting exhibited a small but statistically significant increase in their deep learning approach, and a small but statistically significant reduction in their surface learning approach. Meena (2006) in her study concluded that students with deep and surface learning approaches do not have any significant differences for skill of acquiring knowledge, skill of decision-making and communication skill, but for the skill of critical thinking the results were significant.

Yuan, Rong's (2006) maintained that the surface and apathetic approach was a significant predictor for both learners' measured language proficiency and their self – perception of academic performance. The strategic approach was a positive predictor for learner's attitude towards Technology Enhanced Language Learning (TELL); whereas, surface and apathetic approach was a negative predictor for learners' language proficiency or their attitude towards TELL. Singh, B. (2008) in his study reported that pupil teachers under Arts and Science group with deep and surface learning approaches do not have significant results at high, average and low level of intelligence.

Rationale of the Study

The present study emphasised the delicate balance needed by the pupil teachers' to make the qualitative differences in students' learning along with the quantitative improvement in learning outcomes. While reviewing the related literature on learning approaches and intelligence, it has been found that the students of high intelligence generally follow the learning task very deeply, which is somewhat related to *deep approach of learning*. On the contrary, the students who are less intelligent follow the superficial approach towards the learning tasks. Besides this, the present study also assumed that somehow the different academic streams or courses adopted by the students also reflect their hidden choice towards learning task. Therefore, there is a linkage factor between *learning approaches*, which the students adopt, *intelligence level*, which they possess, and *academic streams/courses*, which they opt.

Students' learning approach – deep or surface does not represent their level of intelligence or the reason why they have chosen a particular academic stream. However, it represents a relationship between the student and what he or she is trying to grasp with the natural endowments he has been provided and the course of education he has opted.

Objectives of the Study

- To compare the achievement scores of pupil teachers of Arts and Science group at different levels of intelligence.
- To study the Learning Approaches of pupil teachers at different levels of intelligence.
- To study the interaction effect of Learning Approaches (DA/SA) and Academic Streams (Arts/Science) of pupil teachers at different levels of intelligence.

Hypotheses

- Arts and Science group will yield equal level of mean scores of achievement at different levels of intelligence, viz. high, average and low.
- Two learning approaches: Deep and Surface (DA/SA) will result in equal levels of means at different levels of intelligence**,** viz. high, average and low.
- Academic Streams (Arts/Science) and Learning Approaches (DA/SA) do not interact with each other to yield significantly different mean scores at different levels of intelligence, viz. high, average and low.

Delimitations of the study

The present study has been delimited as:

- The study was confined to the pupil teachers of Government College of Education, Chandigarh.
- The investigator for the present study chose only pupil teachers of Arts and Science groups.

Tools used

The following tools were used for collecting the data:

- Revised Two-Factor Study Process Questionnaire (R-SPQ-2F) by Biggs, J. B. et al (2001). The questionnaire has two main scales: Deep Approach (DA) and Surface Approach (SA) with four subscales: - Deep Motive (DM), Deep Strategy (DS), Surface Motive (SM) and Surface Strategy (SS). Each of the main scale

consists of 10 items. The questionnaire used a 5-point Likert scale. The Cronbach values of the questionnaire are 0.73 for DA and 0.64 for SA, which are considered as acceptable.

- General Group Mental Ability Test prepared by Jalota (1976) consists of 100 questions and is meant for the age group of 20-52. The total score can be interpreted on 11-point C-scale or a 7-point Intelligence Grading. A useful I. Q. Reckoner is also provided for the range of 60 to 140. The reliability of the test ranges from 0.75 to 0.85 (Singh, 2008).
- Based on the obtained scores of intelligence test the pupil teachers in the Arts and Science group were classified at the three levels of intelligence viz. high, average and low. The different levels of intelligence as per Kelly's (1939) method were formed as follows:
- All the pupil teachers scoring sheets were arranged in the descending order based on total scores obtained.
- The first 27 per cent cases formed the group of Intelligence at High Level (IH) and the last 27 per cent cases formed the lower group, that is, Intelligence at Low Level (IL).
- The remaining 46 per cent cases comprised the group of Intelligence at Average Level (IA).

Sample

The stratified sampling employed to select the pupil teachers from the Arts and Science groups. The structure of the final sample for Arts and Science groups of pupil teachers comprised of N=200 based on Deep and Surface learning approach has been given in Table 1.

Table 1

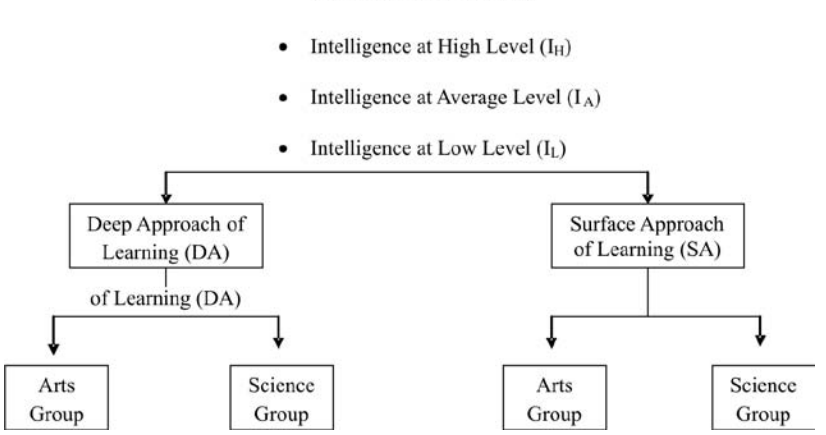
Categorisation of the Final Sample according to Deep and Surface Approach to Learning at Different Levels of Intelligence

S. No.	Groups	High level of Intelligence		Average level of Intelligence		Low level of Intelligence		Total
		DA	SA	DA	SA	DA	SA	
1.	Arts	15	22	28	14	9	19	107
2.	Science	15	14	21	27	9	7	93
	Total	30	36	49	41	18	26	200

Design of the study

The present study employed a 2x2 factorial design where Learning Approaches (DA/SA) and Academic Streams (Arts/Science) of pupil

teachers were independent variables, whereas the achievement scores at the different levels of intelligence was dependent variable. The schematic layout of the design has been given in Figure 1.



Procedure of the Study

The first tool, the questionnaire of Revised Two Factor Study Process was administrated to identify pupil teachers of Deep and Surface Learning Approach. Scores of Jalota's intelligence test was found out and on this basis, the level of intelligence i.e., high, average and low were determined. The final achievement scores of all the students were obtained from the results of the final examination of B.Ed. conducted by Panjab University, Chandigarh in year 2008. Finally, these pupil teachers were divided into two groups (Arts/Science) as per their academic stream. All the tools were scored according to their prescribed scoring keys and the data thus obtained was subjected to statistical analyses.

Statistical Techniques

The following statistical techniques were used to test the various hypotheses based on the objectives of the study:

- Mean and standard deviations were used
- Two-way ANOVA on achievement scores of the students at different levels of intelligence i.e. high, average and low

Analysis and Description of Data

The means and SD's of different groups at different levels of intelligence have been shown in Table 2 and Table 7 (detailed version).

Table 2
Means and SD's of Achievement Scores of Arts and Science Group at Different Levels of Intelligence

Levels of Intelligence	Arts Group	Science Group
I_H	Mean = 792.97 S.D.= 43.48 N=37	Mean = 781.62 S.D.= 29.39 N=29
I_A	Mean = 777.94 S.D.= 32.92 N=42	Mean = 763.2 S.D.= 22.97 N=48
I_L	Mean = 755.17 S.D.= 34.49 N=28	Mean = 776.81 S.D.= 38.77 N=16

The present study employed a 2x2 factorial design so that two independent variables can be evaluated along with the dependent variable. The data was analysed according to the specifications of Winer (1971) and Broota (1989) on ANOVA. The obtained achievement scores of pupil teachers of both Arts and Science groups were tabulated and subjected to two-way analysis of variance. The nomenclature of formulae and procedure used for 2 x 2 ANOVA on achievement scores at high, average and low level of intelligence has been given in the Table 3, 4 and 5 respectively.

Table 3
Nomenclature procedure and formulae for 2x2 ANOVA on Achievement Scores at High Level of Intelligence

	Deep Approach	Surface Approach	Total
Arts Group	$T_1=11725$ $N_1=15$ $\frac{T_1^2}{N_1}=9165041.66$ $Xij^2=9200389$	$T_2=17615$ $N_2=22$ $\frac{T_2^2}{N_2}=14104010.22$ $Xij^2=14135393$	$T_e=29340$ $N_e=37$ $\frac{T_e^2}{N_e}=23265827.027$ $Xij^2=23335782$
Science Group	$T_3=11919$ $N_3=15$ $\frac{T_3^2}{N_3}=9470837.4$ $Xij^2=9484719$	$T_4=11198$ $N_4=14$ $\frac{T_4^2}{N_4}=8956800.28$ $Xij^2=8960790$	$T_c=23117$ $N_c=29$ $\frac{T_c^2}{N_c}=18427437.55$ $Xij^2=18445509$
Total	$T_1+T_3=23644$ $N_1+N_2=30$ $\frac{(T_1+T_3)^2}{N_1+N_3}=18634624.53$ $Xij^2=18685108$	$T_2+T_4=28813$ $N_2+N_4=36$ $\frac{(T_2+T_4)^2}{N_2+N_4}=23060804.69$ $Xij^2=23096183$	$T_T=52457$ $N_T=66$ $\frac{T_T^2}{N_T}=41692982.56$ $Xij^2_{(1)+(2)+(3)+(4)}=41781291$

TABLE 4

Nomenclature Procedure and Formulae for 2x2 ANOVA on Achievement Scores at Average Level of Intelligence

	Deep Approach (DA)	Surface Approach (SA)	Total
Arts Group	$T_1=21551$ $N_1=28$ $\frac{T_1^2}{N_1}=16587342.89$ $Xij^2=16617699$	$T_2=11123$ $N_2=14$ $\frac{T_2^2}{N_2}=8837223.5$ $Xij^2=8850665$	$T_e=32674$ $N_e=42$ $\frac{T_e^2}{N_e}=25418816.09$ $Xij^2=25468364$
Science Group	$T_3=16024$ $N_3=21$ $\frac{T_3^2}{N_3}=12227075.04$ $Xij^2=12239558$	$T_4=20610$ $N_4=27$ $\frac{T_4^2}{N_4}=15732300$ $Xij^2=15763500$	$T_c=36634$ $N_c=48$ $\frac{T_c^2}{N_c}=27959374.08$ $Xij^2=28003058$
Total	$T_1+T_3=37575$ $N_1+N_2=49$ $\frac{(T_1+T_3)^2}{N_1+N_3}=28813890.3$ $Xij^2=28857257$	$T_2+T_4=31733$ $N_2+N_4=41$ $\frac{(T_2+T_4)^2}{N_2+N_4}=24560568.02$ $Xij^2=24614165$	$T_T=69308$ $N_T=90$ $\frac{T_T^2}{N_T}=53373320.71$ $Xij^2_{(1)+(2)+(3)+(4)}=53471422$

Table 5

Nomenclature Procedure and Formulae for 2x2 ANOVA on Achievement Scores at Low Level of Intelligence

	Deep Approach (DA)	Surface Approach (SA)	Total
Arts Group	$T_1=6874$ $N_1=9$ $\frac{T_1^2}{N_1}=5250208.44$ $Xij^2=5251470$	$T_2=14271$ $N_2=19$ $\frac{T_2^2}{N_2}=10719023.2$ $Xij^2=10750097$	$T_e=21145$ $N_e=28$ $\frac{T_e^2}{N_e}=15968250.89$ $Xij^2=16001567$
Science Group	$T_3=6819$ $N_3=9$ $\frac{T_3^2}{N_3}=5166529$ $Xij^2=5169575$	$T_4=5610$ $N_4=7$ $\frac{T_4^2}{N_4}=4496014.28$ $Xij^2=4509490$	$T_c=12429$ $N_c=16$ $\frac{T_c^2}{N_c}=9655002.56$ $Xij^2=9679065$
Total	$T_1+T_3=13693$ $N_1+N_2=18$ $\frac{(T_1+T_3)^2}{N_1+N_3}=10416569.38$ $Xij^2=10421045$	$T_2+T_4=19881$ $N_2+N_4=26$ $\frac{(T_2+T_4)^2}{N_2+N_4}=15202083.11$ $Xij^2=15259587$	$T_T=33574$ $N_T=44$ $\frac{T_T^2}{N_T}=25618488.09$ $Xij^2_{(1)+(2)+(3)+(4)}=25680632$

F- ratios were calculated to know whether the difference in the two groups were significant or not. The sum of squares, mean sum of squares, error term and F-ratios for main effects and interaction effect of the two variables at different levels of intelligence has been presented in the Table 6.

TABLE 6

Summary of Two-way Analysis of Variance on Mean Scores at Different Levels of Intelligence

Sources of Variation	Different Levels of Intelligence	Sum of Squares	df	Mean Sum of Squares	F-ratio
Main Effects: A Arts/Science	I_H I_A I_L	282.017 4869.46 4765.36	1 1 1	282.017 4869.46 4765.36	0.21 **4.78*** 3.90
Learning Approaches: B DA/SA	I_H I_A I_L	2446.66 1137.61 164.4	1 1 1	2446.66 1137.61 164.4	1.79 0.11 0.13
Interaction Effect (AxB)	I_H I_A I_L	978.323 4613.65 8357.07	1 1 1	978.323 4613.65 8357.07	0.72 **4.54*** **6.84***
Error Term	I_H I_A I_L	84601.44 87480.57 48857.08	62 86 40	1364.54 1017.21 1221.427	------ ------- ------
TOTAL	I_H I_A I_L	88308.44 98101.29 62143.91	65 89 43	----- ------ ------	------ ------ ------

** Significant at 0.05 level of significance*

MAIN EFFECT: A

Academic Streams (Arts and Science Group): F-ratio (Table No.6) for the differences in mean scores of two groups viz. Arts and Science was not found to be significant even at the 0.05 level of confidence at ***high*** and ***low*** level of intelligence. This suggests that the two groups opting two different academic streams yielded equal level of mean scores at ***high*** and ***low*** level of intelligence. However, at ***average*** level of intelligence, the difference in mean scores of two groups was found to be significant at 0.05 level of confidence.

MAIN EFFECT: B

Learning Approaches: **Deep and Surface Approach (DA/SA):** F-ratio (Table No.6) for the difference in mean scores of the groups

with Deep and Surface Approach (DA/SA) of learning was not found to be significant even at the 0.05 level of confidence. It concluded that the students with Deep and Surface learning approaches scored equal level of mean scores at ***high, average*** and ***low*** level of intelligence.

TWO ORDER INTERACTION EFFECT (A x B)

Academic Streams (A) and Learning Approaches (B): F-ratio (Table No.6) for the difference in mean scores at ***high*** level of intelligence for the interaction effect between instructional streams (Arts and Science) and Learning Approaches (DA and SA) was not found to be significant even at the 0.05 level of confidence. It concluded that the Instructional Streams and Learning Approaches operated independent of each other with regard to scores at ***high*** level of Intelligence. However, at ***average*** and ***low*** level of intelligence for the interaction effect between Academic Streams (Arts and Science) and Learning Approaches (DA and SA) found to be significant at 0.05 level of confidence. This indicates that differences were not due to chance factors. It concluded that the Academic Streams and Learning Approaches of pupil teachers were dependent on each other with regard to mean scores at average and low level of intelligence.

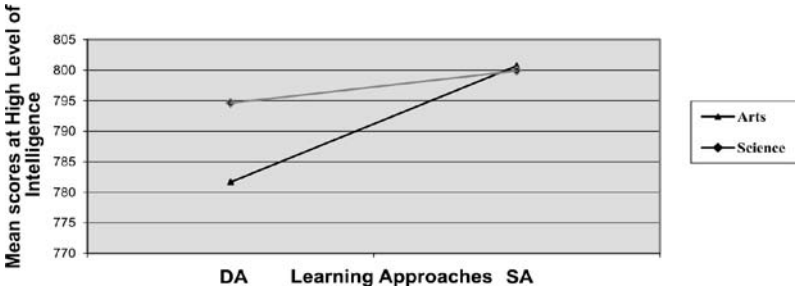


Fig. 2: *Interaction graph between academic stream (Arts/Science) and learning approaches (DA/SA) at high level of intelligence*

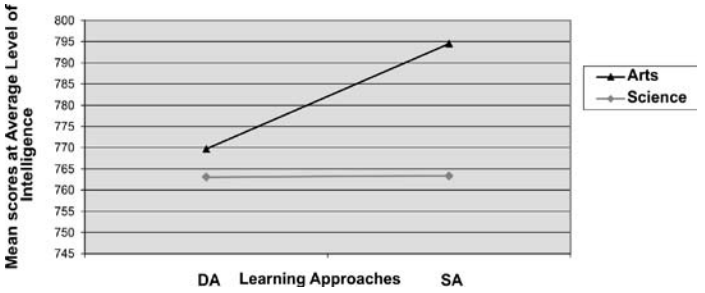


Fig. 3: *Interaction graph between academic streams (Arts/Science) and learning appraches (DA/SA) at average level of intelligence*

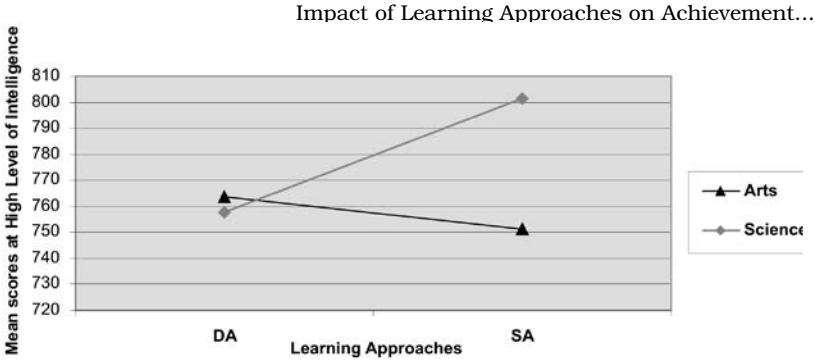


Fig. 4: Interaction graph between academic streams (Arts/Science) and learning appraches (DA/SA) at low level of intelligence

The line diagrams drawn to depict interaction effect (Fig. 2, 3 and 4) at different levels of intelligence led to decision to follow up, F-ratio for interaction effect, by the t-test to probe deeply into the observed results. The differences in the mean scores of students with the two learning approaches (DA and SA) for Arts and Science group were investigated separately with the help of t-ratios. The Mean, S.D.'s and t-ratios for the differences in means scores at different levels of intelligence recorded in Table 7.

TABLE 7

Different Combination Groups of Academic Streams and Learning Approaches at Different Levels of Intelligence

Different Levels of Intelligence	Interaction between Combination Groups	Means		S.D.		t-value
I_H	Arts/DA and Arts/SA	781.67	800.68	48.54	37.77	1.28
	Sci/DA and Sci/SA	794.6	799.86	30.42	16.88	0.58
	Arts/DA and Sci/DA	781.67	794.6	48.54	30.42	0.87
	Arts/SA and Sci/SA	800.68	799.86	37.77	16.88	0.08
	Arts/DA and Sci/SA	781.67	799.86	48.54	16.88	1.36
	Arts/SA and Sci/DA	800.68	794.6	37.77	30.42	0.54
I_A	Arts/DA and Arts/SA	769.67	794.5	36.71	12.01	**3.25***
	Sci/DA and Sci/SA	763.04	763.33	24.48	21.74	0.04
	Arts/DA and Sci/DA	769.67	763.04	36.71	24.48	0.75
	Arts/SA and Sci/SA	794.5	763.33	12.01	21.74	**5.91***
	Arts/DA and Sci/SA	769.67	763.33	36.71	21.74	**8.10***
	Arts/SA and Sci/DA	794.5	763.04	12.01	24.48	**5.04***
I_L	Arts/DA and Arts/SA	763.77	751.10	11.83	40.44	1.26
	Sci/DA and Sci/SA	757.66	801.42	18.39	43.87	**2.48***
	Arts/DA and Sci/DA	763.77	757.66	11.83	18.39	0.84
	Arts/SA and Sci/SA	751.10	801.42	40.44	43.87	**2.65***
	Arts/DA and Sci/SA	763.77	801.42	11.83	43.87	**2.21***
	Arts/SA and Sci/DA	751.10	757.66	40.44	18.39	0.59

** Significant at 0.05 level of significance*

Section I: At High Level of Intelligence

The following conclusions were drawn from the analyses of Table No. 7:

- Pupil teachers with Deep Approach of learning and those with Surface Approach of learning under Arts group failed to yield significant differences in mean scores at high level of intelligence (t = 1.28,not significant).
- Pupil teachers with Deep Approach of learning and those with Surface Approach of learning under Science group failed to yield significant differences in mean scores at high level of intelligence (t=0.58,not significant).
- With Deep Approach, Arts and Science group scored equal levels of mean scores at high level of intelligence (t = 0.87, not significant).
- With Surface Approach also, Arts and Science group scored equal levels of means at high level of intelligence (t = 0.08, not significant).
- For Deep Approach, pupil teachers of Arts group and Science group pupil teachers with Surface Approach scored equal levels of mean scores at high level of intelligence (t = 1.36,not significant).
- For Surface Approach also, pupil teachers of Arts group and Science group pupil teachers with Deep Approach scored equal levels of mean scores at high level of intelligence (t = 0.54, not significant).

Section II: At Average Level of Intelligence

The following conclusions were drawn from the analyses of Table No. 7:

- Pupil teachers with Deep Approach of learning and those with Surface Approach of learning under Arts group yielded significant differences in mean scores at average level of intelligence (t = 3.25, significant).
- Pupil teachers with Deep Approach of learning and those with Surface Approach of learning under Science group failed to yield significant differences in mean scores at average level of intelligence (t = 0.04, not significant).
- With Deep Approach, Arts and Science group scored equal levels of mean scores at average level of intelligence (t = 0.75, not significant).

- Pupil teachers following Surface Approach of learning scored higher means at average level of intelligence under Arts group as compared to those with SA under Science group (t = 5.91, significant).
- For Deep Approach, the mean scores of pupil teachers of Arts group were higher as compared to that of Science group pupil teachers with Surface Approach of learning at average level of intelligence (t= 8.10, significant).
- Pupil teachers with Surface Approach and studying under Arts group achieved higher means at average level of intelligence as compared to pupil teachers with Deep Approach of Science group (t= 5.04, significant).

Section III: At Low Level of Intelligence

The following conclusions were drawn from the analyses of Table No. 7:

- Pupil teachers with Deep Approach of learning and those with Surface Approach of learning under Arts group failed to yield significant differences in mean scores at low level of intelligence (t = 1.26, not significant).
- Pupil teachers with Deep Approach of learning and those with Surface Approach of learning under Science group yielded significant differences in mean scores at low level of intelligence (t = 2.48, significant).
- With Deep Approach, Arts and Science group scored equal levels of mean scores at low level of intelligence (t = 0.84, not significant).
- Pupil teachers following Surface Approach of learning scored higher means at low level of intelligence under Science group as compared to those with SA under Arts group (t = 2.65, significant).
- For Deep Approach, the mean scores of pupil teachers of Arts group were lower as compared to that of Science group pupil teachers with Surface Approach of learning at low level of intelligence (t= 2.21, significant).
- Pupil teachers with Surface Approach and studying under Arts group with and those with Deep Approach and studying under Science group scored equal levels of means at low level of intelligence (t= 0.59, not significant).

Discussion of the Results

Hypothesis 1: The analysis of data of the present study led to the acceptance of first hypothesis that Arts and Science group will yield equal levels of mean scores at ***high*** and ***low*** level of intelligence. Singh, B. (2008) supported this finding that pupil teachers under Arts and Science group failed to prove that the two groups distinguish with each other. However, at ***average*** level of intelligence the result contradicted this null hypothesis. Singh, N. (2009) article affirmed that the academic results of Arts and Science students differ due to the specific demands of these streams.

Hypothesis 2: The results concluded from Table 6 led to the acceptance of hypothesis that two learning approaches: Deep and Surface (DA/SA) will result in equal levels of means at ***high, average*** and ***low*** level of intelligence. Wannasilapa (2003), Meena (2006) and Singh, B. (2008) also reflected that both deep and surface learning approaches failed to yield any significant differences in their studies.

Hypothesis 3: The results based on the third hypothesis that Academic Streams (Arts/Science) and Learning Approaches (DA/SA) do not interact with each other to yield significantly different mean scores led to its rejection at ***average*** and ***low*** level of intelligence. But, the contrary result appeared at high level of intelligence.

The interaction effect found further on the basis of t-ratio's (Table 7) concluded that:

i. Different combination groups of academic streams and learning approaches at high level of intelligence (Section I) along with the following combination groups at average level of intelligence (Section II)
   - Science/DA and Science/SA
   - Arts/DA and Science/DA

   and for combination groups at low level of intelligence (Section III)
   - Arts/DA and Arts/SA
   - Arts/DA and Science/DA
   - Arts/SA and Science/DA, all failed to have significant results.

ii. Results for the following combination groups at ***average*** level of intelligence (Section II) i.e.,
   - Arts/DA and Arts/SA
   - Arts/SA and Science/SA
   - Arts/SA and Science/DA

and at ***low*** level of intelligence (Section III) :

- Science/DA and Science/SA
- Arts/SA and Science/SA
- Arts/DA and Science/SA

were significant and consistent with the findings of some researches conducted by Avery (1986); Miller et al (1990); Britton (1999); Salim Kumar (1999); Evans (2001); Struyven (2005) and Yuan (2006) which reflected that either the results tending to adopt more SA to learning or following other Strategic learning approaches irrespective of the fact that Deep Approach yields permanent retention of learning material.

iii. Only the following combination group at ***average*** level of intelligence (Section III) i.e.

- Arts/DA and Science/SA was significant.

The result clearly stated that this group considered deep learning approach best. This result is supported by number of studies where it has been observed that learning approaches do support the dependent variables like motivation, academic or independent creative study (Aggarwal, 1981); personality types and mathematics anxiety (Hinkle, 1987); students' grade point average, programme area (Thummarpon, 1988); gifted and non-gifted students (Steven, 1989); academic learning of students (Lindsay and Faulkner, 1996; Humphreys, 1998; Lucas 2001).

Educational Implications

- It is important to check out which academic stream is popular among students, as it will be beneficial for academicians, researchers, teachers, administrators to explore its hidden aspects, in terms of
  - Developing and framing the Curriculum
  - Methodology of teaching
  - Level of difficulty to be built in the curriculum
  - Caliber of students i.e. their attitude, aptitude, intelligence while opting any discipline or course etc.
  - Introducing the new courses/streams
  - Job opportunities available in the market
- Deep learning approach is proven to be a boon for enhancing the students learning as it helps
  - To generate interest in the subject or learning task
  - To discourage those learning approaches, which provide superfluous knowledge

- For better retention of the learning material
- Removes anxiety among students
- Provides feedback to the students
- Gives practical application to the learning task
- Maximum retention of the students in their opted streams

This being the case, there is a need to understand the difference between the ways students should be taught and the ways the students are currently being taught in different academic streams (as each academic stream requires different types of learning techniques to master the learning content matter or skill etc.). It is imperative then that educators involved in the teacher preparation process must be familiar with the types of support that suits best at different levels of students' intelligence to overcome the challenges toward learning process in different academic streams. This is important for two reasons. First, this support will help pupil teachers to be the most effective teachers in the future and second, this will encourage pupil teachers to remain in their teaching profession.

Other factors like intelligence, personality traits, attitude, aptitude, interest, motivation, etc. do play an important role in predicting learners' proficiency or their academic outcomes. Nonetheless, deep learning approach is an enjoyable learning process where the objectives like knowledge, understanding, application, skill formation, attitude formation and interest can be achieved at higher rate for attaining maximum learning outcomes.

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