PREDICTION OF ACADEMIC ACHIEVEMENT BY INTRINSIC MOTIVATION ACROSS STYLES OF LEARNING OF ELEVENTH GRADE STUDENTS

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ABSTRACT

Prediction of academic achievement by intrinsic motivation of eleventh grade students across styles of learning is the aim of this study. The simple random sampling technique has been used. Data have been collected by the standardized instruments and are statistically treated in order to verify the research hypotheses. Findings indicate the prediction of academic achievement by intrinsic motivation across styles of learning of eleventh grade students.

Keywords: *Intrinsic Motivation, Academic Achievement, Learning Style*

1. INTRODUCTION:

The tradition in the school setting has always been a teacher-centered approach, where the students are just passive receivers of knowledge. The underlying concept of the prevalent teacher-centered approach to school learning is based on the traditional pedagogy wherein knowledge is passed from teacher to children (Katsuko, 1995). However, the trend in schools now is to move away from that teacher-centered approach and to adopt a new approach called the learner-centered approach, which is also mentioned in the Eleventh National Plan of India, and also continues to the next plan (2012-17). This has also been strongly articulated in the National Curriculum Framework (2005) and urged for a paradigm shift in school learning. Moreover, the twelfth five year plan considers over very seriously curriculum renewal and continuous teacher development to face the new challenges. The new approach claims that students are more actively involved with the subject matter, they are more motivated as learners and they learn more skills, especially discipline, communication and collaboration skills (Johnson, 2000). The diversity in the students' needs have grown too large to a teacher-centered approach to address (Laboard & Brown, 2003) smartly. Therefore, the teachers have to know about how the students learn i.e. student learning style. Knowing students' learning style is not the all but there are several factors in the classroom that influence the students' achievement. It is found from the several literatures that academic achievement is predicted by intrinsic motivation in positive way. However, studies on predicting the factors of intrinsic motivation in relation to academic achievement under different learning styles have not been found on defining which particular factors of intrinsic motivation under which learning style be most predicted towards achievement of students. Therefore, the said problem and complexities can be analyzed by taking cues from two areas of thoughts and data developed and produced by Felder and Silverman [(1988, 2002) (learning style)] and Deci and Ryan and their teams [(1985a) (intrinsic motivation)].

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Intrinsic motivation is defined as an individual's ability to demonstrate competence (Deci, Eghrari, Patrick, & Leone, 1994), a readiness to engage in an activity because of his or her own internal interests and curiosity (Lepper, Henderlong, & Gingras, 2000) and a desire to master the environment (Brophy, 1983). Intrinsic motivation appears within the individual and is connected to the sense of well-being and individual's identity. When learning is the ultimate goal then the students are motivated intrinsically. They find intrinsically motivating tasks interesting and challenging; Moreover, Vallerand and Ratelle (2002) classified intrinsic motivation (IM) into three types i.e. IM-Knowledge, IM-Accomplishment, and IM-Stimulation. According to their view point, IM-knowledge implies "engaging in activities because of the pleasure and satisfaction derived from learning, exploring and understanding new things". IM-Accomplishment refers to "engaging in activities because of the pleasure and satisfaction derived from trying to surpass oneself, creating, or accomplishing something". Finally, IM-Stimulation is related to the positive sensations stimulated by performing an activity in learning.

Intrinsic motivation has seven dimensions (Deci and Ryan 1985b) i.e. - Interest/Enjoyment, Perceived Competence, Effort, Value/Usefulness, Pressure and Tension, Perceived Choice, and Relatedness. Interest/Enjoyment is defined as measuring the self-report of intrinsic motivation. Perceived Choice and Perceived Competence concepts are defined as positive predictors and measuring both self-report and behavioral of intrinsic motivation. Value/Usefulness sub-scale is used in internalization studies (Deci et al., 1994), the idea being that people internalize and become self-regulating with respect to activities that they experience as useful or valuable for themselves. Pressure/Tension is defined as negative predictor of intrinsic motivation. Relatedness, a sub-scale is used for maintaining friendship formation, interpersonal interactions, and so on.

Learning style is "A model classifies students according to where they fit on a number of scales pertaining to the ways they receive and process information," (Felder and Silverman, 1988). It has four bi-polar dimensions i.e. – Activity-Reflectivity, Sensory-Intuitive, Visual-Verbal, and Sequential-Global. Active learners are the learners who always try to learn by doing something actively and always sharing their experience with others. They like to work in a group. On the other hand, reflective learners like to think introspectively for manipulating and examining the information quickly. They like to work alone. Sensing learners like to learn the learning facts. They engage to observe, gather the data through their senses. But, the intuitive learners like to discover the relationships and possibilities. They tend to involve for indirect perception through their subconscious— speculating, accessing memory, imagining. Visual learners are the learners who remember best what they see like diagrams, pictures, films, flow charts, time lines, and demonstrations. They prefer visual presentation of information i.e. diagrams, pictures, flow charts, films, time lines, and demonstrations. On the other hand, the verbal learners prefer the information in words i.e. spoken and written explanations. Sequential learners prefer to learn each step by understanding the information in linear steps by following logically to the earlier one. But, the global learners prefer to learn the information in large jumps, taking the material in a random way without observing any connections, and understand in large holistic leaps.

2. ABOUT THE STUDY:

2.1 Objectives:

The objectives of the present study with respect to eleventh grade students are-

1. to explore the factors of intrinsic motivation.

2. to find out the relations of the factors of intrinsic motivation with academic achievement of students under different learning styles.
3. to predict academic achievement of students by the factors of intrinsic motivation as predictors under different learning styles.

2.2 Hypotheses:

Major hypotheses for the present study are-

$^{H}O_1$: There is no significant relationship between principal component factors of intrinsic motivation and academic achievement (AAch) of students across styles of learning (activity, reflectivity, sensory, intuitive, visual, verbal, sequential, and global).

$^{H}O_2$: Significant principal component factors of intrinsic motivation will not significantly predict the criterion Academic Achievement of students across styles of learning (activity, reflectivity, sensory, intuitive, visual, verbal, sequential, and global).

3. METHODOLOGY:

3.1 Method:

The investigator adopts descriptive research design to describe what relations exist with respect to the variables under consideration. Hence, the investigator has selected survey method for his study.

3.2 Sample and Sampling Design:

The sample consists of four hundred (400) eleventh grade students, taken from nine Bengali-medium secondary schools (seven co-education, one boys and one girls) approved by the West Bengal Council of Higher Secondary Education situated in different areas of the District of Purba Medinipur, West Bengal. The investigator has employed simple random sampling technique for selecting these nine schools for his study.

3.3 Instruments:

i) Learning Style:

This investigator has used a Bengali translated version of the Index of Learning Style (ILS) which has been adopted and standardized by Roy (2008) constructed by Felder and Soloman (2001). The ILS consists of four scales. The four scales are coined as: Sensing – intuitive (S-N), Visual – Verbal (Vs-Vb), Active – Reflective (A-R), and Sequential – Global (Sq-G). Each learning style dimension has associated with eleven (11) forced-choice items, each with option, either 'a' or 'b', corresponding to one or other category / pole of the dimension (e.g. visual or verbal). The high percentage of conformity (72% to 88%) confirms the stability of learning styles items.

ii) Academic Achievement:

The investigator has collected the total marks covering all the subjects obtained by the subjects in eleventh grade examination conducted by the West Bengal Council of Higher Secondary Education for the measure of academic achievement.

iii) Intrinsic Motivation

This investigator has used a Bengali translated version of the Intrinsic Motivation Inventory

(IMI) which has been translated and standardized by Roy (2008) constructed by Deci and Ryan (1985b). Deci and Ryan of Rochester University, USA and his team have developed and standardized the original IMI. This tool is underpinned by the theory of intrinsic motivation of Deci and Ryan (1985). This is a multidimensional flexible tool consisting of 52 items with 7 sub-scales that determines subjects' level of intrinsic motivation with the help of interest/enjoyment (10 items), perceived competence (7 items), effort (10 items), value/ usefulness (3 items), felt pressure and tension (8 items), and perceived choice (8 items) while performing a given activity, thus yielding six subscale scores. Recently, a seventh subscale has been added i.e. experiences of relatedness (6 items) (Deci et al. 1994; and Ryan, 1982). The Bengali version of the IMI is a 3 point Likert- type tool with 52-items and three response alternatives. The response alternatives are labeled as 'Agree', 'Undecided', and 'Disagree' and the assigned weights are '3', '2', and '1' respectively.

The investigator used this scale after factor analysing for determining the relationship of intrinsic motivation and academic achievement across learning styles. For this, Principal Component Factor Analysis and varimax rotation of reference axes were also made to have meaningful/interpretable principal component factors. For doing this 52 × 52 correlation matrix and each item of the Intrinsic Motivation Inventory (IMI) was used as a test. The S. P. S. S. (version – 10.0.1) Computer Programme was used for extraction of Principal Components Factors Analysis and it was noticed that only first eighteen (18) principal component factors had eigen value greater than one accounted for nearly 60 % of variance of tests, hence eighteen factor solution was accepted for this purpose. For interpretation of common factors of 'Intrinsic Motivation' loadings more than equal to 0.30 were used, as proposed by Child (1990).

These 18 principal component factors are: 1) Value/Usefulness (V/U) [Using in internalization studies, the idea being that pupil internalize and become self-regulating with respect to their studies that they experience as useful or valuable for themselves]. 2) Effort / Importance (E/I) [Relating to some work (motivational work)]. 3) Relatedness (Rel.) [Relating to study to do with interpersonal interaction, friendship formation.]. 4) Perceived Choice in Course (PCC) [Preferring the course due to learning some useful skills]. 5) Initiativeness (Ini) [Putting effort in regular study]. 6) Perceived Competence (PC) [Relating to understand the course material very well]. 7) Perceived Competence in Future Career (PCFC) [Seeking to gather more knowledge for future benefit]. 8) Value for Empowerment (VE) [Seeking for empowerment of knowledge for using the information in new situation]. 9) Valuing Class Lecture (VCL) [Seeking for pleasing class lecture.]. 10) Striving for Academic Success (SAS) [Desiring to fulfill the mission of life]. 11) Enjoying Inclusiveness (EI) [Desire to include both students and teacher]. 12) Perceived Confidence in Course Work (PCCW) [Relating to exam. preparation communication skill and acquiring good grade]. 13) Interest and Enjoyment in School (IES) [Seeking enjoyment in school by engaging in studying the course]. 14) Autonomy in Learning (AL) [Seeking autonomy in their choice of learning]. 15) Perceived Choice in Learning (PCL) [Desire to have choice in learning]. 16) Enjoyment in Studying (ES) [Seeking enjoyment in studying the course]. 17) Pressure and Tension (PT) [Feeling pressure and tension while doing home work]. 18) Interest in Course – Curriculum (ICC) [Preferring to join the course].

3.4 Statistical Technique Used:

Simple product moment correlation (a parametric test) was applied as the data were measured data and the distribution were nearly normal for finding out the relations of intrinsic motivation with Academic Achievement of students under different learning styles. Further, linear multiple regression is used to find the predictor variables of academic achievement under different learning styles.

4. RESULTS AND INTERPRETATION:

Relationship of Academic Achievement and Factors of Intrinsic Motivation:

The concern major null hypothesis is given below.

4.1 Major null hypothesis:

$^{H}o_{1}$: There is no significant relationship between principal component factors of intrinsic motivaton and academic achievement across styles of learning (activity, reflectivity, sensory, intuitive, visual, verbal, sequential, and global).

As per design of the study, the major null hypothesis is portioned into eight null hypotheses as there are eight poles of learning styles. The portioned out eight sub-null hypotheses have been designed as $^{H}o_{1.1}$, $^{H}o_{1.2}$, $^{H}o_{1.3}$, $^{H}o_{1.4}$, $^{H}o_{1.5}$, $^{H}o_{1.6}$, $^{H}o_{1.7}$, and $^{H}o_{1.8}$ each relating to the variables principal component factors of intrinsic motivation and eight sets of learning styles namely - activity, reflectivity, sensory, intuitive, visual, verbal, sequential, and global respectively.

For example $^{H}o_{1.1}$ stands as-

$^{H}o_{1.1}$: There is no significant relationship between principal component factors of intrinsic motivation and academic achievement under activity learning style.

4.2 Results:

The obtained results have been presented in **Table 1.**

Table 2: Summary of Results of Linear Multiple Regression of Academic Achievement with Significant Factors of Intrinsic Motivation under different Learning Styles

P.C. Factors of Intrinsic Motivation	"r" for							
	Act. (N=257)	Ref. (N=143)	Sen. (N=346)	Int. (N=54)	Vis (N=340)	Ver. (N=60)	Seq. (N=272)	Glo. (N=128)
V/U	0.101	-0.024	0.054	0.051	0.067	0.003	0.096	-0.052
E/I	0.166*	0.173*	0.144*	0.299*	0.184*	0.113	0.275*	-0.085
Rel	0.131*	0.093	0.092	0.229	0.128*	0.092	0.170*	-0.046
PCC	0.144*	0.132	0.157*	0.068	0.151*	0.084	0.193*	0.003
Ini	0.048	0.014	0.010	0.235	0.012	0.191	0.080	-0.047
PC	0.284*	0.124	0.234*	0.198	0.238*	0.136	0.266*	0.128
PCFC	0.115	0.074	0.085	0.202	0.116*	0.062	0.116	0.052

P.C. Factors of Intrinsic Motivation	"r" for							
	Act. (N=257)	Ref. (N=143)	Sen. (N=346)	Int. (N=54)	Vis (N=340)	Ver. (N=60)	Seq. (N=272)	Glo. (N=128)
VE	0.137*	-0.036	0.080	0.045	0.072	0.108	0.044	0.115
VCL	-0.020	-0.083	-0.092	0.259	-0.038	-0.052	-0.009	-0.122
SAS	0.176*	0.100	0.139*	0.236	0.157*	0.102	0.217*	-0.018
EI	0.037	0.044	0.026	0.234	0.027	0.122	0.040	0.086
PCCW	0.288*	0.118	0.255*	0.089	0.223*	0.222	0.267*	0.169
IES	0.066	0.012	0.084	-0.143	0.063	0.037	0.074	0.035
AL	0.110	0.213*	0.132*	0.192	0.131*	0.137	0.151*	0.071
PCL	0.025	0.048	0.049	-0.067	0.057	-0.178	0.097	-0.124
ES	-0.032	-0.110	-0.074	0.027	-0.063	-0.061	-0.042	-0.056
PT	0.197*	0.210*	0.189*	0.357*	0.203*	0.309*	0.252*	0.040
ICC	0.015	0.043	-0.024	0.282*	0.013	0.091	-0.002	0.038

** Significant at 0.05 level*
N.B. Act. = Activity, Ref. = Reflectivity, Sen. = Sensory, Int. = Intuitive, Vis. = Visual, Ver. = Verbal, Seq. = Sequential, and Glo. = Global

4.3 Testing of null hypothesis:

It is found from the table 1 that some of the values of principal component factors except V/U, Ini, VCL, EI, IES, PCL, and ES of intrinsic motivation are significant at 0.05 level of significance with academic achievement (AAch) under different learning styles except global learning style.

Therefore, the parts of null hypotheses ${}^{H}o_{1.1}$, ${}^{H}o_{1..2}$, ${}^{H}o_{1.3}$, ${}^{H}o_{1.4}$, ${}^{H}o_{1.5}$, ${}^{H}o_{1.6}$, and ${}^{H}o_{1.7}$ indicating correlation between academic achievement and principal component factors of intrinsic motivation relating to E/I, Rel, PCC, PC, VE, SAS, PCCW, and PT under Activity learning style; E/I, AL, and PT under Reflectivity learning style; E/I, PCC, PC, SAS, PCCW, AL, and PT under Sensory learning style; E/I, PT, and ICC under Intuitive learning style; E/I, Rel, PCC, PC, PCFC, SAS, PCCW, AL, and PT under Visual learning style; PT under Verbal learning style; and E/I, Rel, PCC, PC, SAS, PCCW, AL, and PT under Sequential learning style could be rejected but the null hypothesis (${}^{H}o_{1.8}$) under global learning style could not be rejected as no significant correlation is found between principal component factors of intrinsic motivation and academic achievement of students at 0.05 level of significance. Thus, it may be concluded that ${}^{H}o_{1}$ is partially rejected.

Thus it appears that principal component factors of intrinsic motivation are related to academic achievement in a limited way and its relationship depends, to some extent, on different learning styles.

This portion of study has only concentrated on relationships of academic achievement with principal component factors of intrinsic motivation under different learning styles but in order to have a more in-depth study regarding prediction of academic achievement from all of these independent factors of intrinsic motivation under different learning styles except global learning style. An attempt has been made by instituting Multiple Regression Models, and by finding out multiple R's. The summary of results has been presented in **Table 2**.

Table 2: Summary of Results of Linear Multiple Regression of Academic Achievement with Significant Factors of Intrinsic Motivation under different Learning Styles

Descriptions		Act.	Ref.	Sen.	Int.	Vis.	Ver.	Seq.
F-value		5.798	6.380	7.471	3.779	7.506	6.137	7.119
Sig.		.000	.000	.000	.003	.000	.016	.000
R		.501	.469	.461	.604	.494	.309	.514
R^2		.25	.22	.21	.37	.24	.10	.26
Adj. R		.208	.185	.184	.269	.212	.080	.227
E/I	β	-.008	.046	-.006	.038	.028		.057
	t-value	-.124	.553	-.101	.271	.497		.868
	Sig.	.901	.581	.920	.788	.620		.386
Rel	β	-.024				-.024		-.042
	t-value	-.373				-.426		-.663
	Sig.	.709				.671		.508
PCC	β	.038		.060		.054		.081
	t-value	.617		1.175		1.068		1.427
	Sig.	.537		.241		.287		.155
PC	β	.140		.131		.122		.071
	t-value	2.146		2.454		2.306		1.143
	Sig.	.033		.015		.022		.254
PCFC	β					.045		
	t-value					.880		
	Sig.					.380		
VE	β	.004						
	t-value	.063						
	Sig.	.950						
SAS	β	.062		.035		.029		.097
	t-value	.921		.642		.522		1.545
	Sig.	.358		.521		.602		.124
PCCW	β	.180		.154		.111		.131
	t-value	2.898		2.826		2.096		2.157
	Sig.	.004		.005		.037		.032

Descriptions		Act.	Ref.	Sen.	Int.	Vis.	Ver.	Seq.
AL	β		.104	.018		.026		.024
	t-value		1.317	.350		.524		.425
	Sig.		.190	.727		.601		.671
PT	β	.019	.064	.036	.163	.040	.309	.052
	t-value	.292	.749	.648	1.168	.724	2.477	.835
	Sig.	.771	.455	.518	.249	.470	.016	.405
ICC	β				.208			
	t-value				1.613			
	Sig.				.114			

It is observed from Table 2 that-

1. The F-value is found significant under activity, reflectivity, sensory, intuitive, visual, verbal, and sequential learning styles.
2. All these predictor variables put together can explain 25%, 22%, 21%, 37%, 24%, 10%, and 26% of the variance on the criterion (academic achievement) of the students under activity, reflectivity, sensory, intuitive, visual, verbal, and sequential learning styles.
3. The t-values for PC and PCCW under activity, sensory, and visual; PT under verbal; and PCCW under sequential learning style are found significant and their concerning β values are 0.140 and 0.180 under activity; 0.131 and 0.154 under sensory; 0.122 and 0.111 under visual; 0.309 under verbal; and 0.131 under sequential learning style which signify that these predictor variables contribute positively, independently and significantly to the criterion (Academic achievement) of students.

Therefore, the null hypotheses (as per design of the study) $^{H}o_{2.1}$, $^{H}o_{2.3,}$ $^{H}o_{2.5,}$ $^{H}o_{2.6,}$ and $^{H}o_{2.7}$ except $^{H}o_{2.2}$ and $^{H}o_{2.4}$ are rejected and the alternative hypotheses [principal component factors of intrinsic motivation taken together will significantly predict the criterion academic achievement of students under activity, sensory, visual, verbal, and sequential learning styles.

4.4 Discussion:

From the above results it can be explained that:

I. Perceived Competence (PC) contributes significantly (β =.140, .131 and .122, p<.05 in Table 2) to the academic achievement under Activity, Sensory, and Visual learning styles respectively. It signifies that understanding the course materials very well promotes student' academic achievement.

II. Perceived Confidence in Course Work (PCCW) is a significant predictor of the academic achievement of students (β = .180, .154, .111 and .131, p<.05 in Table 2) under the first pole of each of the four learning style dimensions (Activity, Sensory, Visual, and Sequential) of Felder-Silverman model respectively. It represents that confidence while doing examination preparation for getting good grade increases student's academic achievement.

III. Pressure / Tension (PT) is a significant predictor of academic achievement of students (β =.309, $p<.05$ in Table 2) under Verbal learning style. It suggests that presumably, verbal learner do not feel pressurized while completing daily assignment daily and do not feel tensed while doing best in studying which reflects in their academic achievement.

5. CONCLUSION:

From the above discussions, it may be concluded that:

I. Factors of intrinsic motivation are related to academic achievement of students under different learning style paradigm.
II. All the three predictors of intrinsic motivation (PC, PCCW, and PT) positively predict the academic achievement of students across styles of learning.

Implication:

The results of the study suggest that the factors of intrinsic motivation are related to academic achievement of students under different learning style conditions except global learning style. Therefore, a balance be looked forward so that learning style dimensions of the learners are becoming exercisable in relation to several factors of intrinsic motivation which are generally thought of as correlates of academic achievement.

The results of the study definitely predict that in case of learning styles (activity, sensory, visual, and sequential) the factor perceived confidence in course work (PCCW) is found to contribute positively to the academic achievement of the learners. It implies that if learners are encouraged to organize their study material competently, there is possibility of getting good grade. In this case teacher has to perform additional job while presenting the subject matter and developing the study material. They must be concern with the structure of the knowledge and how to present it meaningfully to the learner.

Finally it is apparent that the factor understanding the material very well is found to contribute positively to academic achievement of the learners who are under activity, sensory, and visual category. This finding simply implies that delivery of school learning should be so designed and executed so that it becomes meaningful and understandable. This is the main slogan of today's constructivist curriculum transaction where the learner is not only a knowledge builder but also a meaning maker.

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