

## Curiosity, Self-regulation and Academic Achievement among Undergraduate Students

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The purpose of this research was to find relationship of curiosity, self-regulation and academic achievement. It was hypothesized that there would be a significant relationship among curiosity, self-regulation and academic achievement. Secondly, it was hypothesized that there would be a significant mean difference among achievement levels with respect to students' curiosity and self-regulation. The current study has been conducted in four phases. In phase I and II semantic analysis and translation of tools were done respectively while in the phase III and IV psychometric properties, validity of instruments and the main findings were examined. For the current study sample was  $N = 150$  (51 male and 99 female students). The participants were students of BS (Hons) belonging to different fields like arts, science and business. Curiosity and Exploration Inventory-II (Kashdan et al., 2009), Self-regulation Questionnaire (Ryan & Deci, 2000; adapted version) were used to collect data. Purposive sampling technique was used. Data were interpreted by using descriptive statistics, Pearson correlation, independent t-test, analysis of variance and factor analysis. The findings suggest that academic achievement is positively correlated with students' embracing and autonomous regulation. The current study has important implications in educational settings.

*Keywords:* Curiosity, self-regulation, academic achievement, undergraduates

Curiosity is an important factor in human dynamic tasks. It plays a vital role in learning, wellbeing and motivation (Kashdan et al., 2009). The research on curiosity started from two approaches: Motivational research and observation of children behavior. The observations of children behavior provided the concepts such as question asking, interest in new things and desire for new knowledge (Voss & Keller, 1983). Curiosity in the classic times was considered as a part of motivation. Later on, curiosity was conceptualized as distinct feature of human personality (Goldberg et al., 2006; Kashdan et al., 2009; Peterson & Seligman, 2004). The major controversy in the classic literature on curiosity was found in its definition and the number of dimensions and it is still a point of controversy to some extent. However, the empirical investigation was spare on curiosity till 1950s. Even afterwards the literature on curiosity was limited to the four basic questions. These questions were about the definition of curiosity, its dimensionality, underlying factors and situational determinants (Loewenstein, 1994).

The curiosity model was based on Berlyne's specific and diversive curiosity concepts (Kashdan, Rose, & Fincham, 2004). Later on, Kashdan et al. (2009) modified the two factor curiosity and exploration model. Kashdan, Rose, and Fincham (2004) found that curiosity is significantly associated with big five personality traits (openness to experience, conscientiousness, and extraversion; positive direction with weak to moderate coefficients). Voss and Keller (1983) describe that the child-rearing process affects the exploratory behavior and this is also evident from the innate role of gender. In contrast, Draper (2010) found that there is no gender difference in overall curiosity level. It is also evident from the literature that motivation and curiosity concepts are linked to learning outcome (Guay, Ratelle, Roy, & Litalien, 2010; Kashdan et al., 2009; Ratelle, Guay, Vallerand, Larose, & Senecal, 2007; Vansteenkiste et al., 2010).

The need to address the academic achievement is important because students' personal and social development is allied with academic achievement (Barna & Brott, 2011), and if achievement is not productive and satisfying it may create problems for teachers, parents and individuals. The research findings suggested that poor academic achievement produce problems such as low self-esteem, poor self-concept or depression (Athanimath, 2009; Baumeister, Campbell, Krueger, & Vohs, 2003; Canadian Council on Learning, 2009).

Occupational and educational success demands optimal performance, and are connected to social and personal development (Barna & Brott, 2011). In this connection academic achievement is important factor to examine various perspectives, because it is not a topic of limited interest, but it is a broad topic of interest now. Students' academic performance is related to their personal and social satisfaction (Barna & Brott, 2011).

In summary, curiosity, self-regulation and academic achievement provided the insight that there could be a link between curiosity, self-regulation and academic performance (see Voss & Keller, 1983). Self-regulation was examined in various contexts in educational, clinical and organizational settings (Brydges & Butler, 2012). The literature also suggests that gender, socio economic status and age factor has already sufficient empirical findings with respect to academic achievement (Gibb, Fergusson, & Horwood, 2008). Therefore, academic achievement model needs to be explored with indigenous perspective.

### Objectives of the Study

- To examine the Urdu translated version of the curiosity and exploration inventory-II and self-regulation questionnaire (adapted version).
- To examine the validity and psychometric properties of curiosity and self-regulation measure.
- To find the relationship between academic achievement, curiosity and self-regulation
- To find the difference of high, average and low achievers' performance with respect to curiosity and self-regulation.

- To find the gender differences with respect to students' cumulative grade point average, curiosity and self-regulation.

### Hypotheses

- There would be a significant relationship among cumulative grade point average (academic achievement), curiosity and self-regulation.
- There would be a significant difference in achievement levels (low, average and high achievers) with respect to curiosity and self-regulation.
- There would be significant gender differences with respect to academic achievement, curiosity and self-regulation.

### Method

The present research investigated curiosity, self-regulation with academic achievement. In initial phases of the study instrument's translation, validation and psychometric properties was done while in later phases relationships and differences of curiosity, self-regulation and academic achievement were explored.

### Research Design

In the current study translation of the tools and validity with psychometric properties has been examined in different phases. Correlational research design has been used in the present study.

### Sample

The target population selected for the present study was BS (Hons) students from different institutes or departments. Total sample size was  $N = 150$  (female students = 99 and male students = 51). Participants' age range was nineteen to twenty four years; while male students' mean age was 21.29 years and female students' mean age was 20.90 years. The sample consisted of arts, science and business students from different institutes of the Lahore district. The demographic questionnaire consists of information about participants' age, gender, cumulative grade point average, and family system.

### Instruments

*Curiosity and exploration inventory-II.* This questionnaire was developed by Kashdan et al. (2009). It has total 10 items with five-point rating scale, which ranges from 1 to 5 (completely disagree = 1 to completely agree = 5). It has two sub scales named as stretching (5 items: 1,3,5,7 and 9) and embracing (5 items: 2, 4, 6, 8 and 10). The scoring procedure is simple as taking the sum scores on each of the sub scales. Low score on this scale reflects low curiosity and high score reflects high curiosity. There is no reverse scoring for any of the items in the scale.

*Self-regulation questionnaire (SRQ).* This questionnaire was first developed by Ryan and Connell (1989), and later on adapted by Black and Deci (2000). It measures two types of self-regulation named as autonomous and controlled regulation. The present study adapted the questionnaire for the academic purpose and translated it into Urdu language. The adapted version has total 8 items with five

point rating scale which ranges from 1 to 5 (completely disagree = 1 to completely agree = 5). It provides three reasons for academic self-regulation (a) active participation in college course (b) follow instructors' suggestions (c) study reasons. The items related to each sub scales are: 1, 4, 8 and 9 (autonomous regulation), and for control regulation items are 2, 5, 6, and 12. The high score on each of the sub scales reflects high regulation and low score reflects the low regulation.

*Academic achievement.* It was assessed by the cumulative grade point average. Rust (2008) guide lines suggest that students' academic achievement could be assessed by the evaluation of their general subjects (scores obtained in annual or semester system). Student's final scores indicate achievement level in educational settings. Statistical based cut points were used to differentiate the low, average and high achievers with respect to the cumulative grade point average. For the categories sample mean was used (take plus minus one standard deviation from average to avoid diffusion of categories for the academic achievement levels (Hanif, 2004).

### Phase I: Pilot Study

*Semantic analysis.* The semantic analysis has been used in the first phase of the study to find overall sentences (items) understanding level for the target sample. The purposed semantic analysis process is adapted from Landauer (1999) model of latent semantic analysis (LSA). It has been carried out in four steps (a) identification of the problematic words (b) conceptual meaning of the identified words (c) identification of favorable and non-favorable responses (d) calculation of % of favorable and non-favorable responses.

### Phase II: Translation and Adaptation of Research Measures

In the initial phase of the study an important concern was the translation of the instruments. The semantic analysis was utilized to check the target population understanding level about the items in each instrument, and it has been found that there is a need to translate the instruments (see Table 1 and 2). It was also noted that the primary language of target population is Urdu and it could affect the conceptualizing of the items. Usually, translation is needed when the target and the source language differ in conceptual meanings of words or cultural context (Harkness, Vijver, & Mohler, 2003). The current translation process was adapted from Squires et al. (2012) guide lines. Self-regulation questionnaire was adapted and translated, while curiosity measure was only translated into target language. The major objective of translation is to cover the conceptual meaning of the words and to remove the culturally biased and inappropriate words from the item (Cohen, Gafni, & Hanani, 2007).

*Forward translation.* For forward translation, three independent bilinguals were contacted to translate the instruments into Urdu. Their minimum education was masters. The one bilingual was MPhil in Urdu, and other two were masters in English literature. The bilingual experts were instructed to translate the items on the basis of conceptual equivalence rather than literal meanings.

*Backward translation.* For the backward translation, the same procedure was also adopted as in the forward translation process. Three independent bilinguals were asked to translate the Urdu version of the instruments into English. It was also assured that they had no knowledge of the original instruments.

*Committee review.* After forward-backward translation three independent Urdu and English versions were presented to the Department committee, which consisted of the five members, including the researcher. All three forward and backward translations were compared on the basis of three criteria (a) cultural context (b) conceptual translation (c) removing any surplus or misfit words from the items. The test version was formed after the experts' review. Discrepancies of conceptual meaning were minimized at that stage of the translation. The newly formed version of the instruments was tested among the target population. The discussion was also done with the students and any identified problems in the item were noticed and again consulted with the Department review committee. The results from semantic analysis, committee revisions and students discussion combined, formed the final test version.

#### Phase III and IV: Validity of the Tools and Psychometric Properties

The first priority was given to the instrument validity. Exploratory factor analysis (EFA) was used to demonstrate the instruments' construct validity. First the assumptions were checked for the EFA process (see Field, 2009). Corrected Item-total correlation was also used to demonstrate content validity of the items (see Table 4 and 5). For psychometric properties mean, standard deviation, skewness and reliabilities were computed.

#### Procedure

Before approaching the participant, criteria of the participant were confirmed and consent form was given. The pilot study sample was taken from the GC University Lahore and total  $n = 23$  participants were selected. The instructions were carefully delivered by the researcher to the participants for the semantic analysis. The forms were administered in a group and the whole process took 30 min. The letters were presented to the principals of the different institutes. The questionnaires were first explained to the participant and were given to them. All questionnaires were filled in a group in the presence of the researcher. The nature and purpose of the study was explained to the participants and the queries from the participants were answered. The participants were assured of the anonymity and the confidentiality of their information and identity. At the end of administration, forms were collected and no indemnity or credits were given to the participants.

#### Results

The data was analyzed using SPSS 20 version. Both descriptive and inferential statistics were used for the demonstration and finding out the results of study in both phase I and phase II.

Table 1  
*Semantic Analysis for Curiosity and Exploration Inventory-II (N = 23)*

Item no.	Original indicator	Top two meanings	% favor	% other
1	Actively	پرجوش، ہچستی سے	39%	61%
2	a. Type of person	اس قسم کا انسان، قسم کا بندہ	57%	43%
	b. Uncertainty	غیر یقینی	61%	39%
3	a. Complex	پیچیدہ، مشکل	74%	26%
	b. Challenging	مشکل، محرک	57%	43%
4	Out looking	تلاش، ڈھونڈنا	39%	61%
5	Opportunity to grow	آگے بڑھنے کا موقع، ترقی کرنے کا موقع	52%	48%
6	Frightening	ڈرانے والا، خوفزدہ کرنے والا	74%	26%
7	a. Challenge	مشکل کام، لٹکارنا	30%	70%
	b. My self	میں، بذات خود	74%	26%
8	Excitingly unpredictable	پرجوش طور پر ناقابل بیان یا غیر یقینی	30%	70%
9	Grow as a person	شخصی بہتری، بہتر انسان	30%	70%
10	a. Embraces	ملنا، قبول کرنا	44%	56%
	b. Unfamiliar	اجنبی، انجان لوگ	48%	52%
	c. Event	مواقع، جگہ	39%	61%

Note. % other = No response and not significant meanings.

Table 2  
*Semantic Analysis for Self-Regulation Questionnaire (N = 23)*

Item no.	Original indicator	Top two meanings	% favor	% other
A	Course	مضمون، نصاب	78%	22%
1	Understanding of the material	مواد کی سمجھ	70%	30%
2	Others	دوسرے لوگ اور معاشرہ	100%	-
4	a. Solid understanding	پختہ سمجھ، مکمل معلومات	52%	48%
	b. Intellectual growth	ذہنی بہتری، دماغی نشوونما	35%	65%
B	Suggestions	مشورہ، رائے	70%	30%
1	Bad grades	برے نمبر، برا نتیجہ	83%	17%
2	Worried	پریشان	87%	13%
3	My own study strategies	میرے پڑھنے کے طریقے	70%	30%
4	a. Insight	علم ہونا، خود آگاہی	44%	56%
	b. The material	مواد، کورس کا کام	65%	35%
C	To expand my knowledge	علم یا معلومات کو بڑھانا	87%	13%
1	Nature	فطرت، قسم	48%	52%
2	The content	مواد، فہرست	44%	56%
3	Look positive	اچھا تاثر، مثبت تاثر	39%	61%
4	Intelligent	ذہین، سمجھدار	78%	22%

Note. % other = it represents no response and non-significant meanings.

Table 3  
*Exploratory Factor Analysis for Curiosity and Exploration Inventory-II (N = 150)*

Items key content	<i>r</i>	Stretching	Embracing
1. Actively seeks information	.59	<b>.75</b>	.29
3. Try best for complex and challenging task	.56	<b>.78</b>	.16
5. Challenging situations	.74	<b>.85</b>	.45
7. Think about world and me	.62	<b>.70</b>	.51
9. Grow as a person	.61	<b>.69</b>	.52
2. Enjoys uncertain life	.46	.39	<b>.72</b>
4. Seeks new things and experiences	.71	.47	<b>.50</b>
6. Frightening tasks	.53	.44	<b>.75</b>
8. Excitingly unpredictable tasks	.34	.22	<b>.75</b>
10. Embrace unfamiliar people, places and events	.48	.40	<b>.32</b>
Eigen value		4.49	1.21
% Variance		44.94	12.07

Note. *r* = item-total correlation (corrected).

Table 4  
*Exploratory Factor Analysis for Self-Regulation Questionnaire (N = 150)*

Items key content	<i>r</i>	<u>Autonomous regulation</u>	<u>Controlled regulation</u>
1. Better way to understand the college material	.29	<b>.73</b>	-.03
4. My intellectual growth	.42	<b>.74</b>	.16
8. Teacher's insight	.28	<b>.71</b>	-.03
9. Nature of classes	.35	<b>.72</b>	.07
2. Think bad of me	.20	-.03	<b>.66</b>
5. Bad grades	.26	.16	<b>.58</b>
6. Unable to show better performance	.20	.03	<b>.61</b>
12. Intelligent	.15	-.01	<b>.55</b>
Eigen value		2.19	1.42
% Variance		27.34	17.68

Note. *r* = item-total correlation (corrected).

Table 5  
*Psychometric Properties of the Study Variables (N = 150)*

Scale	<i>k</i>	<i>M(SD)</i>	<i>α</i>	Potential	<u>Range</u>		Skew
					Actual		
Curiosity							
Stretch	5	19.69(4.47)	.83	1-5	1.0-5.0		-1.0
Embrace	5	16.89(4.15)	.70	1-5	1.4-5.0		-.38
Self-regulation							
Autonomous	4	16.62(2.78)	.69	1-5	1.5-5.0		-1.0
Controlled	4	14.07(3.10)	.42	1-5	1.0-5.0		-.62

Note. *k* = no. of items.

Table 2 shows the semantic analysis for the self-regulation questionnaire. Items having percentage favor less than 55 were in section A and B (both item 4), C (item 1, 2 and 3). Total 5 items were found below the cut-off value.

Table 3 shows the exploratory factor analysis to identify the underlying latent variables for the Urdu version of curiosity and exploration instrument. The Oblique rotation with promax method was used. The Kaiser Meyer Olkin (KMO) measure of sample adequacy value was .87 which is suitable for structure detection, and Bartlett's test of sphericity was significant  $\chi^2 (45, N = 150) = 546.12, p < .001$ . Total 57% variation was explained by these factors.

Table 4 shows the factor structure for self-regulation questionnaire (SRQ). The Orthogonal rotation with varimax method was used. The Kaiser Meyer Olkin (KMO) measure of sample adequacy value was .64 which was suitable for structure detection, and Bartlett's test of sphericity was significant  $\chi^2 (28, N = 150) = 141.77, p < .001$ . Total 45% variation explained by these factors.

Table 5 shows mean, standard deviation, Cronbach's alpha value, potential and actual response range with skewness values. However, subscales with less than ten items did not accurately determine the internal consistency or might produce low alpha coefficient. In such case computation of average inter-item correlation is suitable (Briggs & Cheek, 1986). The computed average inter-item correlation was satisfactory for all subscales i.e.  $\geq .2$  (Clark & Watson, 1995). Further to check the normally distributed scores skewness values were computed. For normal

distributed scores criterion was skewness score with  $\pm 1$  range (Tariq, 2011).

Pearson product moment correlation was carried out to find the relationship among curiosity, self-regulation (sub scales) and academic achievement. Results suggested that academic achievement significantly correlated with embrace and autonomous regulation (positive direction with low correlation coefficients). Stretching and embracing factor moderately correlated with each other, moreover, stretching factor significantly correlated with autonomous regulation (see Table 6).

Table 7 shows the significant mean difference for academic achievement levels (low, average and high achievers) with respect to sub scales of self-regulation and curiosity among undergraduate students. Result indicated that significant mean difference found on curiosity total. Eta square suggested small effect size for the significant variables. Post hoc indicated that there is a relative difference among the achievement groups. The overall differences between low and high achiever was quite distinct as compared to average and high achievers.

Table 8 shows the mean difference between male and female students with respect to sub scales of curiosity and self-regulation. The results indicated that there is a significant mean difference between male and female students with respect to academic achievement (CGPA). Female students' academic achievement is better than male students mean females higher in academic achievement than male students. The Cohen's *d* value suggested high effect size for gender with respect to academic achievement.

Table 6

*Inter-correlations among Academic Achievement, Curiosity and Self-regulation (N = 150)*

Variable	2	3	4	5	M (SD)
1. Academic achievement	.13	.16*	.19*	.04	3.38 (.40)
2. Stretching	-	.66**	.23**	-.02	19.69 (4.47)
3. Embracing		-	.05	-.04	16.89 (4.15)
4. Autonomous regulation			-	.11	16.62 (2.28)
5. Controlled regulation				-	14.07 (3.10)

Note. \* $p < .05$ , \*\* $p < .01$ . Cumulative grade point average as academic achievement.

Table 7

*Analysis of Variance for Academic Achievement Levels with Curiosity and Self-regulation*

Source	df	MS	F	p	$\eta^2$
Curiosity total	2	183.51	3.06	.05	.04
Autonomous	2	15.24	2.00	.14	.02
Controlled	2	9.80	1.02	.36	.01
Error	147				

Note.  $\eta^2$  = effect size.

Table 8

*Independent Sample t-test for Gender with Curiosity and Self-regulation Sub Scales*

Variable	Men		Women		t(148)	p	95 % CI		Cohen's d
	M	SD	M	SD			LL	UL	
CGPA	3.17	.43	3.48	.32	-5.06	<.00	-.43	-.19	.83
Stretch	19.80	4.94	19.64	4.23	.22	.83	-1.36	1.70	.04
Embrace	16.63	4.49	17.02	3.97	-.55	.58	-1.81	1.02	.09
AR	16.43	3.15	16.72	2.58	-.59	.55	-1.23	.66	.10
CR	13.92	3.70	14.14	2.76	-.41	.68	-1.28	.84	.07

Note. CI = confidence interval. LL = lower limit. UL = upper limit. AR = autonomous regulation. CR = controlled regulation. CGPA = cumulative grade point average, taken as academic achievement.

## Discussion

The present research aims to find relationship of curiosity, self-regulation and academic achievement among undergraduate students. Firstly, it was hypothesized that there would be a significant relationship among curiosity, self-regulation and academic achievement. In the present study, it has been found that curiosity is positively correlated with academic achievement and the literature also supports this finding (Association for Psychological Science, 2011; Stumm, Hell, & Chamorro-Premuzic, 2011). It has been also found a weak positive relationship between academic achievement, embrace and autonomous regulation. These findings are consistent with previous literature (Guay, Ratelle, Roy, & Litalien, 2010; Ratelle, Guay, Vallerand, Larose, & Senecal, 2007) Autonomous regulation is associated with academic achievement instead of controlled regulation is also found consistent with literature with respect to academic settings (Ryan & Connell, 1989; Tariq, 2011; Vansteenkiste et al., 2010).

Secondly, it was hypothesized that there would be a significant mean difference among achievement levels with respect to students' curiosity and self-regulation, and it has been found that significant differences exist among type of achievers (low, average and high) with respect to the curiosity and self-regulation. The findings suggested that high achievers significantly differ in term of total curiosity. However, the difference is noticeable between low and high achievers. Self-determination theory argues that autonomous,

control or a motivation regulation predicts experience and learning based performance outcome (Ryan, 2009). Self-determination theory's point is valid as Vansteenkiste et al. (2010) suggest that there is a significantly positive correlation between autonomous and controlled regulations for learning outcome. Some recent findings have suggested that autonomous regulation is more effective in predicting performance and wellbeing outcomes as compared to control regulation (Chirkov, Ryan, Kim, & Kaplan, 2003; Tariq, 2011).

Thirdly, it was hypothesized that there would be significant gender differences with respect to academic achievement, curiosity and self-regulation. It has been found that female students are better in academic achievement as compared to the male students and it is supported by the literature (Ahmad, 2009; Dayioglu & Turut-Asik, 2004). The reason behind female student's better performance on academic achievement is due to factors such as class room behaviors and academic competence difference as compared to male students (Fergusson & Horwood, 1997; Gibb, Fergusson, & Horwood, 2008). It is also supported from present literature that there is no cultural variation regarding female students' better academic performance in general (Information Network on Education in Europe, 2010). In the present study no significant mean differences have been found for the gender regarding curiosity and self-regulation. The findings regarding non-significant gender difference and self-regulation is consistent with literature (Draper, 2010; Yukselturk & Bulut, 2009).

### Limitations and Suggestions

The generalization of findings could be limited to the selected population characteristics as BS (Hons) students. The data were only collected from the departments or institutions of Lahore district so findings could not be generalized to the whole student population. Another limitation was the difficulty in data collection from male students, and it was because in higher education departments male students are lesser in number. In the beginning of the research it was estimated to have equal sample size for both gender but due to the mentioned reason and stipulated time it was not possible.

It is therefore suggested that to generalize findings in broader sense, the data could be collected from various districts of the Punjab and different age group comparisons of students should be added to the relevant studies. In order to understand the depth of academic achievement process, qualitative studies could also help i.e. triangulation method. There is no single perfect model to check the students' academic achievement but a combination of internal and external factors with respect to the academic achievement could be more helpful to build a sound theoretical model.

### Conclusion

The findings suggested that student's autonomous regulation and curiosity (embrace) are significantly correlated with academic achievement. Furthermore, it has been found that significant positive correlation exists between stretch and autonomous regulation. The high achievers are better in curiosity level, autonomous regulation (intrinsic type of motivation) as compared to low achievers. The present findings confirmed that female student's academic achievement is better than male students.

### Implications of the Study

The current study could help to identify the curiosity level and type of self-regulation in students. The identified students with extreme low scores with respect to the suggested curiosity level and type of self-regulation could be promoted to enhance these potential factors to improve the academic achievement. The major implication is to facilitate students regarding the academic self-regulation and curiosity. The role of parents, counselors and educational psychologist would be helpful regarding improvement in motivation level and learning process.

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