FACTOR ANALYSIS OF ATTITUDE OF STUDENTS TOWARDS THE HIGHER EDUCATION SYSTEM

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Abstract *- This study aims to find out the factors affecting the attitude of students towards the higher education system in India. For this purpose, the study employs Factor Analysis. The study is based on a survey. The sample consisted of undergraduate students from various colleges of the University of Delhi. The findings of the study show that there are four major factors which impact the attitude of students, together explaining 42.86% of the variation in the data. These factors are: (1) Class participation and Practical approach; (2) Extra-curricular and Infrastructural facilities; (3) New Undergraduate structure; and (4) Curriculum and Evaluation.*

Keywords- Attitude, Education System, Factor Analysis, Varimax Rotation.

I. INTRODUCTION

"The important and decisive factor in life is not what happens to us, but the attitude we take toward what happens."- Hilary HintonZig Ziglar.

A positive attitude is regarded as the most important key to success. Such an attitude and commitment towards quality education has, in large part, enabled Asian countries like China, Korea and Singapore to gradually transform themselves from developing nations to advanced economies. India, the world's oldest civilization, is also similarly, on its road to success, and owes a substantial part of its rapid progress to its educated youth. The country's pioneering reforms in university education over the past twenty years have yielded positive results. In the last few years, reforms in the higher education sector have virtually taken centre-stage in economic planning which has helped India to remarkably transform its higher education landscape.

In the higher education sector, the attitudes that students hold towards the education sector are a crucial determinant of the quality and quantum of education imparted. Students should have a positive attitude towards higher education because research suggests that positive attitudes are linked with higher academic achievement. In other words, students' attitudes have a great impact on how well the education is imbibed by the students. A study of student's attitudes would also suggest improvements in the system that may be needed to so that the education system meets the students' requirements.

In view of the above, it is felt appropriate to examine the attitude of students towards the university education, particularly at undergraduate level, since there have been several initiatives by the government to improve university education in the country. The rationale for this study arises from the need to assess the present attitude of the students towards the education system to identify corrective steps required for steering it in the positive direction. Also, there is dearth of such studies based in India.

This study aims to determine the factors affecting students' attitude towards the higher education system through factor analysis of data collected through a survey method based on a questionnaire devised for studying the attitude of students. Factor Analysis is a statistical procedure used to reduce the number of variables in a study and detect relationships between the variables. It allows various correlated variables to be condensed into fewer dimensions, called factors. In the context of this research, variables are the statements of the questionnaire, and factor analysis will help to identify the underlying factors that affect the attitude of students and make suggestions for improvement in the system.

II. LITERATURE REVIEW

Fishbein and Ajzen (1975) defined *'attitude'* as a learned predisposition to respond in a consistently favorable or unfavorable manner with respect to a given object. It can be formed from a person's past and present experiences. It is measurable and changeable, and is capable of influencing a person's behaviour in the future. For this reason, perception and attitudinal studies in education have been used to unravel crucial aspects about a particular issue, concept or an idea.

Başer (2013) explored the relationship among students' attitudes towards computer programming, their gender and their academic achievement in programming. The sample composed of 179

sophomore students (85 females, 94 males) of an introductory programming course in a university in Turkey in 2012. Their responses were collected through a survey. Exploratory Factor Analysis (Principal Component Analysis) was done for validation of the programming attitude scale. The Scree Plot yielded 4 factors. Items that did not load enough on any factor or load significantly on more than one factor were removed from the survey. Finally, there were 35 items left in four factors which accounted for 65% of the variance in attitudes toward computer programming. Factors were named as "Confidence in learning computer programming", "Usefulness of computer programming", "Attitudes toward success in computer programming" and "Effective motivation in computer programming". The study found that the students had a positive attitude toward computer programming. Further, using Pearson Correlation, it was found that there was a significant positive correlation between students' attitudes and their achievements in programming. T-test results showed that male students had a more positive attitude toward programming than female students.

Ugulu et al. (2013) developed a valid and reliable instrument for measuring high school students' attitudes toward environment and its applications. Data gathered from 350 high school students provided evidence for the validity and reliability of the new instrument which consisted of 35 attitude items on a four point Likert-type scale. Results of the factor analysis with varimax rotation showed items constituting Environmental Attitude Scale (EAS) was grouped under four subscales: (1) Environmental awareness; (2) Attitudes towards recovery; (3) Attitudes towards recycling; and (4) Environmental consciousness and behaviour. Each environmental attitude item had a factor loading of at least 0.40 with its own scale. The Cronbach's alpha reliability coefficient for the subscales ranged from 0.70 to 0.84. According to these findings, the EAS is a valid and reliable instrument that can be used in the field of environmental and science education.

Liu, Lee & Chen (2013) developed a new computer game attitude scale for Taiwanese early adolescents (elementary school students). They believed that attitude of students towards a subject matter is an important variable in predicting performance. Therefore, before integrating computer games into classrooms, they investigated how the students viewed them. Earlier, Chappell and Taylor (1997) had developed an instrument called the Computer Game Attitude Scale (CGAS) to evaluate the attitudes of students toward educational computer games. Liu et al. (2013) developed a New CGAS (NCGAS) for sixth and seventh graders, and also devised a questionnaire that contained three subscales and five factors, with the cumulative explained-variance exceeding 50%. The three subscales were cognition (learning and confidence), affection (liking), and behavior (participation and leisure). The five factors were learning, confidence, liking, participation and leisure. Among the five factors, students scored highest on the Leisure, followed by the Liking and Learning, with Confidence and Participation scoring the lowest. Among the three subscales, students scored highest on the Affection subscale, followed by Cognition and Behavior. These results implied that students learnt from the computer game, liked using the computer game, and played the computer game in their leisure time. Further, male students demonstrated greater enthusiasm for computer games than their female counterparts and so did the students with more experience of using the internet.

Georgina and Yemisi (2014) constructed and validated a Mathematics attitude scale using factor analysis. The sample for their study consisted of 1500 students using multistage sampling technique. A total of 115 test items were generated and subjected to preliminary analysis and factor analysis. Subsequently, factor analysis was done using 56 items selected after data screening. Oblique rotation was undertaken. 13 items did not load on any of the factors, 2 overlapped while 1 was not directly-related. Thus, there were 40 items which loaded on 10 factors. Convergent validity was ascertained using inter-factor correlation. Cronbach's Alpha was used as the measure of reliability coefficient for the entire scale and was found to be 0.925. It was concluded that the scale was valid and reliable for measuring students attitude toward Mathematics and, hence, it was recommended that teachers may utilize the scale to measure the attitude of their students as a precursor to facilitate positive attitude towards Mathematics.

OBJECTIVE

The objective of this study is to determine the factors affecting the attitude of students of towards the university education system at undergraduate level.

III. RESEARCH METHODOLOGY

This is a quantitative research conducted using the survey method. A questionnaire consisting of 33 items related to the higher education system was constructed and administered to undergraduate students of the University of Delhi.

PRE-TESTING
Initially, the questionnaire was pre-tested on a sample of 10 respondents who were chosen through judgment sampling, in order to assess the relevance/accuracy of the contents of questionnaire. The questionnaire was modified taking into account the feedback from the pilot run, particularly students' difficulties in filling the questionnaire and suggestions from experts. The number of items in the questionnaire was reduced. Multiple response questions (where students could tick more than one of the given item options) that students had found ambiguous were modified. Wherever the wording of a question was found to be unclear, it was simplified and made clear.

PARTICIPANTS
The research was conducted at various colleges of the University of Delhi. The undergraduate students of the University were chosen as the respondents. Convenience sampling technique was used for collecting data from respondents based on accessibility and availability. The questionnaire was administered to 310 respondents, out of which 112 students responded. However, 21 responses were incomplete and were deleted. Hence, the sample of the study consisted of 91 students attending 17 different colleges with differing socio-demographic backgrounds.

DATA COLLECTION
The study employed the survey method to study the factors affecting students' attitudes towards the university education system at the undergraduate level. For this study, the data was collected through a questionnaire consisting of 33 statements related to university education. The questionnaire comprised of both negatively-worded and positively-worded items, with a 5-point Likert-type scale where a higher score represented a more favourable attitude. Thus, the students' responses to the scale items were assigned scores ranging from 5 (highest) to 1(lowest). Reverse scoring was done for negative statements.

The data set was screened and examined for incorrect data entries, missing values, normality and outliers. Factors were extracted through the factor analysis technique which was done using the Statistical Package for the Social Sciences (SPSS) 19.0 software program package. The steps involved in factor analysis are: testing assumptions, selecting type of analysis; extraction of factors; rotation; determining the number of factors; identifying which items of the questionnaire belong to each factor; checking the extent of variance explained by the factors; and finally naming and defining the factors.

IV. RESULTS

RELIABILITY ANALYSIS
The internal consistency (reliability) of the questionnaire's construct is tested by calculating Cronbach's Alpha coefficient. Since the questionnaire measures the attitude on two scales - 'agreement' and 'satisfaction'- different coefficients are calculated for analysing the reliability of the two scales. The reliability coefficient is found to be 0.724 for measuring 'agreement' and 0.778 for measuring 'satisfaction'. Since the coefficients are higher than 0.7, it is concluded that the constructs in the study are reliable.

DESCRIPTIVE STATISTICS
The respondents' attitudes are measured by adding his/her score against each item in the questionnaire. As can be seen in Table 1, the highest score is $\Sigma X = 126$ and the lowest is $\Sigma X = 66$. The mean of the score is $\bar{X}$=98.67.

TABLE 1: DESCRIPTIVE ANALYSIS OF ATTITUDE SCORES

Descriptive	Statistic
Mean	98.67
Median	99
Variance	146.668
Standard Deviation	12.111
Minimum	66
Maximum	126
Skewness	-0.475
Kurtosis	0.502

TESTING FACTORABILITY
It is important to test whether the data is suitable for factor analysis. For this purpose Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett's test is used. The KMO index ranges from 0 to 1, with 0.50 considered suitable for factor analysis. Table 2 shows that KMO index for this sample is 0.593 which indicates that the sample is adequate and suitable for factor analysis.

Bartlett's test is used to test whether correlation matrix is an identity matrix i.e. all diagonal terms are 1 and all off-diagonal terms are 0 (correlation among variable is zero). The Bartlett's Test of Sphericity should be significant ($p<0.05$) for factor analysis to be suitable. Table 2 shows that for Bartlett's Test, the p – value is 0.000 which is less than 0.05. Therefore,

it is concluded that the null hypothesis that "correlation matrix is an identity" is rejected and data set is suitable for factor analysis.

TABLE 2: KMO AND BARTLETT'S TEST

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.593
Bartlett's Test of Sphericity	Approx. Chi-Square	1316.053
	df	528
	Sig.	.000

EXTRACTION OF FACTORS

Principal Component Analysis is used to extract the factors. Before extraction, there are 33 linear components in the data set. Table 3 lists the eigenvalues associated with each factor before extraction and after rotation. The eigenvalues associated with each factor represent the variance explained by that particular linear component. The table also shows the eigenvalues in terms of the percentage of variance explained. Factor 1 explains 19.066% of total variance; Factor 2 explains 10.405% of total variance before rotation and so on. The first few factors explain relatively large amounts of variance (especially factor 1) whereas subsequent factors explain only small amounts of variance.

The criterion of Eigenvalue more than 1 is used for determining the number of the factors. After extraction of factors, 11 factors are identified with Eigenvalues above 1. These 11 factors together explain 71.747% of the total variance. Rotation optimizes the factor structure. As a result, the variance explained by the factors equalises. Before rotation, factor 1 accounts for considerably more variance than the second and third components (19.06% compared to 10.405% and 8.446%). However, after rotation, it accounts for only 10.784% of total variance (compared to 9.491% and 9.041% by the second and third components).

TABLE 3: VARIANCE EXPLAINED BY 11 FACTORS EXTRACTED THROUGH PRINCIPAL COMPONENT ANALYSIS

Total Variance Explained						
Component	**Initial Eigenvalues**			**Rotation Sums of Squared Loadings**		
	Total	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**
1	6.292	19.066	19.066	3.559	10.784	10.784
2	3.433	10.405	29.47	3.132	9.491	20.276
3	2.787	8.446	37.916	2.984	9.041	29.317
4	1.964	5.95	43.866	2.091	6.338	35.655
5	1.691	5.125	48.991	1.916	5.807	41.462
6	1.532	4.642	53.633	1.885	5.713	47.175
7	1.442	4.37	58.002	1.814	5.496	52.67
8	1.297	3.93	61.932	1.652	5.006	57.676
9	1.194	3.618	65.55	1.611	4.882	62.558
10	1.043	3.159	68.709	1.52	4.606	67.164
11	1.002	3.038	71.747	1.513	4.583	71.747
12	0.914	2.769	74.516			
13	0.823	2.494	77.01			
14	0.717	2.172	79.183			
15	0.701	2.123	81.306			
16	0.652	1.976	83.282			
17	0.63	1.91	85.191			
18	0.595	1.805	86.996			
19	0.546	1.654	88.65			
20	0.516	1.563	90.212			
21	0.439	1.331	91.543			
22	0.389	1.179	92.722			
23	0.364	1.103	93.825			
24	0.329	0.996	94.821			
25	0.299	0.908	95.729			

26	0.284	0.861	96.59			
27	0.253	0.767	97.357			
28	0.227	0.687	98.044			
29	0.213	0.645	98.689			
30	0.151	0.459	99.148			
31	0.104	0.315	99.463			
32	0.092	0.279	99.742			
33	0.085	0.258	100			
Extraction Method: Principal Component Analysis.						

The number of factors to be taken up is also examined through the Scree Plot. Figure 1 shows the Scree Plot of components plotted against their Eigenvalues. It confirmed presence of 11 factors having an Eigen value more than 1. However, as may be seen in Figure 1, a sudden flattening of the curve was observed after the 5th factor. Therefore, the number of factors to be considered was specified as 5 in the Principal Component Analysis.

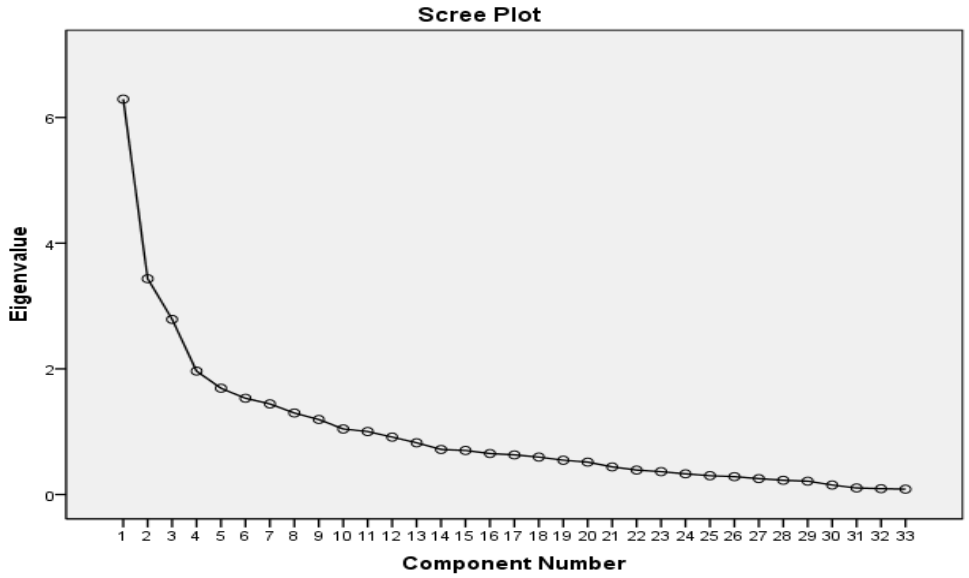

FIG. 1: THE SCREE PLOT OF THE SCALE OF ATTITUDE TOWARDS HIGHER EDUCATION SYSTEM.

Since the Scree Plot showed a sharp change in the slope after the fifth component, the Principal Component Analysis was repeated after specifying the number of factors as 5. After rotation, these 5 factors were seen as accounting for almost 50% (48.99%) of the total variance (as given in Table 4).

TABLE 4: VARIANCE EXPLAINED BY 5 FACTORS BY PRINCIPAL COMPONENT ANALYSIS

Total Variance Explained						
	Initial Eigenvalues			**Rotation Sums of Squared Loadings**		
Component	**Total**	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**
1	6.292	19.066	19.066	3.916	11.868	11.868
2	3.433	10.405	29.47	3.713	11.251	23.118
3	2.787	8.446	37.916	3.662	11.096	34.215
4	1.964	5.95	43.866	2.853	8.646	42.861
5	1.691	5.125	48.991	2.023	6.13	48.991
6	1.532	4.642	53.633			
7	1.442	4.37	58.002			

8	1.297	3.93	61.932			
9	1.194	3.618	65.55			
10	1.043	3.159	68.709			
11	1.002	3.038	71.747			
12	0.914	2.769	74.516			
13	0.823	2.494	77.01			
14	0.717	2.172	79.183			
15	0.701	2.123	81.306			
16	0.652	1.976	83.282			
17	0.63	1.91	85.191			
18	0.595	1.805	86.996			
19	0.546	1.654	88.65			
20	0.516	1.563	90.212			
21	0.439	1.331	91.543			
22	0.389	1.179	92.722			
23	0.364	1.103	93.825			
24	0.329	0.996	94.821			
25	0.299	0.908	95.729			
26	0.284	0.861	96.59			
27	0.253	0.767	97.357			
28	0.227	0.687	98.044			
29	0.213	0.645	98.689			
30	0.151	0.459	99.148			
31	0.104	0.315	99.463			
32	0.092	0.279	99.742			
33	0.085	0.258	100			
Extraction Method: Principal Component Analysis.						

FACTOR ROTATION

Table 5 shows the rotated factor matrix for the questionnaire. After performing the Varimax Rotation Method with Kaiser Normalization, Factor 1 comprises of six items with factor loadings ranging from 0.53 to 0.74. The items in Factor 1 are 1, 3, 4, 5, 6 and 12. Factor 2 comprises of seven items with factor loadings ranging from 0.46 to 0.71. The items in Factor 2 are 26, 27, 28, 29, 30, 31 and 33. Factor 3 comprises of seven items with factor loadings ranging from 0.44 to 0.79. The items in Factor 3 are 2, 14, 15, 17, 18, 19 and 20. Factor 4 comprises of six items with factor loadings ranging from 0.51 to 0.71. The items in Factor 4 are 8, 10, 11, 21, 23 and 24. Factor 5 comprises of only three items which are not related with each other. Therefore, it is not considered as a factor in this study. The items factor loadings of less than 0.4 were not considered for inclusion in the factor. As a result, four items did not load on any factor.

TABLE 5: ROTATED FACTOR MATRIX WITH FACTOR LOADINGS

Rotated Component Matrix*						
Item No.	Item Description	Component				
		1	2	3	4	5
1	My teachers encourage us to participate in class discussion.	**0.534**	0.315	0.319	0.071	-0.012
2	I get an equal opportunity to interact in the class.	0.268	0.388	**0.44**	0.117	-0.092
3	Teachers solve my academic problems outside the class also.	**0.688**	0.183	-0.048	0.043	-0.06
4	I get ample opportunity to explore and innovate in my projects.	**0.616**	0.248	0.207	0.129	-0.004
5	Our teachers indulge us in role-play situations.	**0.744**	0.109	0.124	0.072	0.086
6	We have ample of self learning experience.	**0.658**	0.103	0.274	-0.015	0.078
7	Curriculum should be made with student's participation.	-0.405	0.012	-0.032	0.116	0.021
8	I find the existing curriculum is an overburdening.	-0.037	-0.061	-0.044	**0.563**	-0.123
9	The curriculum I am studying should be interdisciplinary.	0.277	0.149	0.352	-0.378	0.151
10	To me university degree is a requirement than an academic pursuit.	-0.05	-0.129	-0.269	**0.511**	0.46

11	The curriculum doesn't provide me useful practical experience.	0.283	0.092	-0.141	**0.577**	0.053
12	The curriculum adequately trains me for employment.	**0.679**	0.059	0.244	-0.113	-0.356
13	I feel that all the Indian institutions should have uniform curriculum.	-0.286	-0.176	0.127	0.226	**0.428**
14	To me FYUP (4-Yr UG Prog.) in Delhi University is a creative step.	0.249	0.043	**0.793**	-0.06	-0.039
15	Providing laptops has made learning easy.	-0.15	-0.149	**0.581**	-0.015	-0.029
16	Foundation courses are repetition of my school curriculum.	-0.078	0.378	0.266	0.379	0.012
17	Teachers teaching us Foundation course are well equipped.	0.397	-0.047	**0.552**	0.007	0.369
18	The new structure introduces a healthy interdisciplinary education.	0.315	0.064	**0.704**	-0.039	0.136
19	Exit after second and third year sounds flexible to me.	0.048	0.067	**0.634**	-0.145	-0.079
20	Evaluation system assesses me on my overall development.	0.373	-0.071	**0.604**	-0.074	-0.237
21	Internal assessment (I.A.) should not be done by a single teacher.	0.022	-0.065	-0.152	**0.63**	0.018
22	The I.A. aims to reduce the workload on students.	0.34	-0.208	0.383	-0.193	-0.313
23	The system doesn't evaluate me on my creativeness optimally.	0.038	0.145	0.047	**0.713**	-0.086
24	Final examinations are not a sufficient measure of evaluation.	-0.18	-0.201	0.062	**0.621**	0.154
25	I want my teacher to evaluate my final exam sheets.	-0.088	-0.062	-0.043	-0.169	**0.721**
26	Library	-0.013	**0.696**	0.175	-0.205	0.031
27	Sports facilities	0.04	**0.699**	-0.081	-0.162	-0.026
28	Canteen	0.222	**0.466**	-0.05	0.154	0.033
29	Internet	0.112	**0.509**	0.236	-0.124	-0.274
30	Medical facility	0.225	**0.688**	-0.238	-0.132	0.022
31	Problem hearing and solving	0.179	**0.711**	-0.032	0.104	-0.119
32	Drinking water, washroom, sanitation	0.242	0.298	-0.032	-0.083	**0.613**
33	Safe campus	0.028	**0.668**	0.01	0.069	0.311
	Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. *Rotation converged in 6 iterations.					

A study of the factor loadings of each variable brought up 4 major factors, with no clear 5th factor. Table 6 shows the names of these 4 factors and the percentage of variance explained by each of the factors. The first factor named "*Class participation and practical approach"* explains the highest percentage (11.868%) of variance in the data; followed by *"Extra-curricular and infrastructure facilities"* which explains 11.251% of variance; *"New undergraduate structure"* explains 11.096% and *"Curriculum and Evaluation"* explains 8.646% of the variance.

TABLE 6: NAME OF THE FACTORS WITH PERCENTAGE OF VARIANCE EXPLAINED

Factor Name	Percentage of Variance Explained
Class participation and practical approach	11.868
Extra-curricular and Infrastructure facilities	11.251
New Under-graduate structure	11.096
Curriculum and Evaluation	8.646

V. DISCUSSION

The findings suggest that *class participation and practical approach* is an important factor which affects the attitude of students of University of Delhi towards the higher education system. Therefore, greater class participation and practical experience should be emphasized. Such steps will help to increase the students' involvement and facilitate them in learning and assimilating education better.

The results also show that students consider *extra-curricular activities and infrastructural facilities* important aspects of the education system. Thus, improvements in extra-curricular and infrastructural facilities such as library, canteen, internet and sports facilities, is essential. Hence, infrastructural improvements are essential for ensuring a positive attitude among students towards the university education. Such a step could also avoid a majority of students flocking to certain selected colleges during admission time every year due to issues such as better teaching aids and infrastructure.

The *new undergraduate structure* in the university system emerged as one of the four determining factors in this study. The new structure has introduced a healthy inter-disciplinary education and exit option after second and third years is viewed favorably by the students.

The findings of the study also show that reform in the *curriculum and evaluation system* is another factor which is valued by the students. Therefore, it is important to update the teaching methodology and the curriculum in tune with current times, to ensure continued interest of students and avoid repetition. Also, making the curriculum uniform across institutions may help to spread the students uniformly across them. Further, adopting fair evaluation methods could go a long way in improving students' attitudes towards the system. In this context, the evaluation process at college level, particularly internal assessment, could be broad-based by including more than one teacher in the process, as compared to only one teacher involved at present. In addition to academic performance, creative aspects of the students could also be incorporated into the evaluation, for broad-basing the evaluation process.

Although no clear fifth factor emerged from the study, it was also observed that basic facilities like availability of drinking water, clean washroom and sanitation facilities have a significant impact on students' attitude. This is because these are basic necessities in an educational campus.

VI. CONCLUSION

The results show that the attitude of undergraduate students of the University of Delhi towards the education system is generally based on four factors identified above (Table 6). It is important to focus upon these factors so as to improve the attitude of the students towards the university education system which could go a long way in helping the students to imbibe the education more easily. By incorporating improvements suggested by surveys such as this, the education system in the country could be steered towards becoming globally competitive and valued by all.

LIMITATIONS AND SCOPE FOR FUTURE RESEARCH

The present study is limited to the undergraduate programme at the University of Delhi. In order to assess the education system in the country, it is necessary to cover other prominent universities and other levels of higher education as well. Also, more items could be included in the questionnaire to study other factors such as student exchange between universities and shift from one course to another, which may also impact the attitude of students. Further, although the undergraduate structure has been revised recently, the present study has found that the option for exit after the 2nd and 3rd years which had been offered was viewed favourably by the students. Hence, this structure could be examined further. A wider and more comprehensive study along these lines could suggest additional improvements that may be required in the university education system.

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