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COMPARATIVE ANALYSIS OF LEARNING STYLES OF STUDENTS OF USA AND BANGLADESH

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ABSTRACT

A study was conducted to compare and evaluate the different learning styles of students in Bangladesh and the United States. The objective was to identify the similarities and differences among individual student learning styles using the Fielder-Silverman model and an index of learning styles, which was compiled using student response data from two universities in Bangladesh and one American university. Statistical analysis was performed to identify the factors affecting learning style, such as the number of years spent in school, cultural background, and academic major. Altogether, eight dimensions were used to study the students' differences in learning preference. The analysis concluded there was no difference between the learning styles of American and Bangladeshi engineering students. However, the results showed a difference between first year (freshmen) and final year (senior) engineering students on the sensing/intuitive dimension. Differences in learning style were also observed between students from different academic majors on the sensing/intuitive and visual/verbal dimensions.

Keywords: Learning style, Motivation, Quality of education, Engineering education, Bangladesh.

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1. INTRODUCTION

Although pedagogical research in the area of learning styles has revealed interesting information about how students learn in different disciplines, there are still concerns about how to use the information to improve the learning process. Concerns include whether to consider information processing as a study method, due to the inadequacy of the instruments and models used in previous studies. However, it has been suggested that these instruments and models should be carefully used considering the level of validity of these models. Positive results were obtained from experiments involving cognitive/learning styles and how students' level of learning may be influenced by individual behavior.

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A number of different models and instruments are reported in the literature with variable effectiveness claimed for each model. Although these models differ in some aspects, they all concur that everyone should not be taught in the same manner, and thus academicians and administrators in higher education institutions should carefully consider learning style differences among students. The literature is abundant with studies exhibiting differences in the learning styles of students based on urban/rural background, age (freshman/senior), gender, culture, academic majors, and other factors. The current study used forty-four questions developed by Felder and Solomon based on Felder–Silverman model to assess the preference of students on each of the four dimensions of the model.

The abovementioned model used responses obtained from forty-three students from the University of Michigan-Flint (UM-F), twenty-five students from Khulna University, and ninety students from Eastern University, Bangladesh. Data was collected on each student's demographic background, academic major, and level of education (freshman, senior, etc.) in order to evaluate whether any differences existed in the learning style dimensions of the students.

2. LITERATURE SURVEY

Glauco de Vita used the index of learning styles to study the learning styles in an international business management class. The results showed large variations in learning preferences in multi-cultural classrooms since international students preferred to learn differently than the typical methods of instruction in an American school(Glauco, 2001). Monika and Edward Lumsdaine used the four quadrants of the Herrmann Brain Dominance Instrument (HBID) to evaluate the thinking preferences of students. They reported that the students' thinking preferences underwent an enormous change as they advanced from freshmen to seniors(Lumsdaine, 1995). In addition, most of the students cloned the thinking preferences of faculty. A male-female difference also existed with females scoring significantly higher on the C quadrant of the HBID instrument. While studying female student's poor academic performance in Chemical Engineering, Felder identified that one of the causes of such performance may be the misalignment between the learning styles of the female students and the characteristic instructional styles of the engineering professors(Richard *et al.*, 1995). Another study by the same author showed that students from urban and suburban backgrounds outperformed students from rural and small town backgrounds. Rosati reported that seniors were more inclined toward group studies (active learning preference) compared to first year students, and first year students were more sequential(Rosati, 1996). Felder and Spurlin reported validity of the ILS (Index of Learning Styles) instruments using results from engineering students' style preferences(Felder and Spurlin, 2005). The current study uses ILS due to its higher reliability and relevance to the group of students used in this study. A search of literature did not reveal any previous study comparing the learning styles of students from different academic majors.

3. STATISTICAL ANALYSIS

The Chi Square test is one of the most common methods to determine correlation between two or more categorical variables. When hypothesis testing involves categorical variables, the Chi Square test can evaluate the significance of the results. The Chi Square distribution is a continuous theoretical probability distribution that is widely used in significance testing because many test statistics follow this distribution when the null hypothesis is true(Paul and Sarah, 2008). The Chi Square test of equality of proportions was used as the data was collected from multiple independent populations and the hypothesis to be tested was that the distribution of some variable is the same in all populations.

Students were categorized into the dimensions of active/reflective, sensing/intuitive, visual/verbal, and sequential/global. Therefore, a 2x2 contingency table Chi Square test was preferred since it would provide meaningful results for the current data set. Statistical analysis was performed for each dimension of learning style to test the following three hypotheses:

1. Students from the University of Michigan-Flint (UM-F) and Khulna University, Bangladesh have different learning styles due to their cultural backgrounds.
2. The learning styles of first year students are different from those of final year students regardless of their cultural background.
3. The learning styles of students majoring in business are different from those majoring in engineering.

The above hypotheses were tested to determine whether the distribution of some variable in one particular learning style dimension was similar. The Chi Square test and p-value were used to determine whether there is a significant preference for the active learning style or the reflective learning style. If both groups showed a preference for active over reflective, the null hypothesis cannot be rejected, concluding that there is no significant difference in the active/ reflective dimension. The Chi Square test of independence was not used since there was no concern with the dependency of variables. In addition, the Chi Square test of goodness of fit was not considered appropriate since there was no concern about whether the categorical variable follows a specific pattern. Pearson's Chi Square tests were used since the current data was collected in independent observations with categories that are mutually exclusive and exhaustive. A small number of the data sets contained sparse data (with expected value less than one and with more than 20% of the cells having an expected value < five) that was analyzed using Fisher's exact test(Paul and Sarah, 2008).

4. ANALYSIS OF LEARNING STYLES

A number of previous studies showed that engineering students from different geographical backgrounds exhibit similar learning styles(Constant, 1997) although culture plays an important role. The first hypothesis test involves engineering students from significantly different cultural backgrounds. A total of sixty-eight students, of which twenty-five were from the University of Michigan-Flint (UM-F) and forty-three were from Khulna University, Bangladesh, were used in the analysis. To compare students within the discipline, the null hypothesis was tested for each

learning style dimension to determine whether there is a significant difference in learning styles between these two groups. From the Chi Square and p-values reported in row 1-6 of Table 1, no significant difference in learning style preference exists between these two groups in any dimension. The null hypothesis cannot be rejected, stating that both groups prefer active to reflective, sensing to intuitive, and sequential to global leaning styles. An analysis was also performed to explore the learning preference differences of freshman engineering students and senior engineering students. Since the influence of culture on learning styles was eliminated in the previous analysis, the Bangladeshi and American engineering students were considered to be a homogenous group in this section of the study. Therefore, this section of the study included twenty-two freshman students and twenty senior students from both universities.

Table-1. Comparison of Learning Style Preferences of Students

	UMF	Khulna		UMF	Khulna		UMF	Khulna		UMF	Khulna
ACT	29	19	SEN	29	22	VIS	39	23	SEQ	24	15
REF	14	6	INT	14	3	VER	4	2	GLO	19	10
Total	43	25	Total	43	25	Total	43	25	Total	43	25
Chi- Square: 0.558			Chi-Square: 3.563			Chi sq.: 0.033			Chi-Square: 0.113		
P-Value: 0.455			P- Value: 0.059			P- Value: 0.855			P-Value: 0.736		
	First Year	Fourth Year		First Year	Fourth Year		First Year	Fourth Year		First Year	Fourth Year
ACT	17	10	SEN	19	11	VIS	20	18	SEQ	13	9
REF	5	10	INT	3	9	VER	2	2	GLO	9	11
Total	22	20	Total	22	20	Total	22	20	Total	22	20
Chi- Square:3.394			Chi- Square:5.05			Chi- Square:0.01			Chi- Square:0.834		
P-Value: 0.065			P-Value: 0.025			P-Value: 0.92			P-Value: 0.361		
	Eng	Bus		Eng	Bus.		Eng	Bus		Eng	Bus
ACT	48	57	SEN	51	49	VIS	62	69	SEQ	39	60
REF	20	33	INT	17	41	VER	6	21	GLO	29	30
Total	68	90	Total	68	90	Total	68	90	Total	68	90
Chi- Square:0.915			Chi- Square:7.044			Chi- Square:5.756			Chi- Square:1.436		
P-Value: 0.339			P-Value: 0.008			P-Value: 0.016			P-Value: 0.231		

The second hypothesis test involved students from the same discipline but with different years of college experience. This analysis involved forty-two students, of which twenty-two were freshman and twenty were seniors from UM-F and Khulna University. The null hypothesis was tested for each of the four dimensions of learning style to determine whether there is a significant difference in the learning preferences of freshman compared to that of seniors. From the Chi Square and p-values in rows 7-12 of Table 1, there is not sufficient evidence to show a significant difference in the learning style preference (active/reflective) of freshman compared to that of seniors. Therefore, the null hypothesis cannot be rejected since both groups preferred active to reflective. Similarly, p-values also showed that both groups preferred visual to verbal and sequential to global learning styles. However, the p-value for the sensing/intuition dimension

showed the preference to be different for the two groups. The third and final hypothesis was tested to determine the learning style preferences of students with different majors. This analysis involved sixty-eight engineering students from both the University of Michigan-Flint and Khulna University and ninety business students from Eastern University, Bangladesh. The null hypothesis was tested for each dimension of learning style to determine if there is a significant difference in the learning preferences of engineering and business students. From the Chi Square and p-values in rows 13-18 of Table 1, there is not sufficient evidence to show a significant difference in the learning style preference of engineering students compared to that of business students. Therefore, the null hypothesis cannot be rejected since both groups prefer active to reflective and sequential to global learning styles.The p-values for sensing/intuitive and visual/verbal showed both groups to have different learning styles preferences.

Figure- 1. Distribution of Learning Style Preferences of UM-F and Khulna University Students

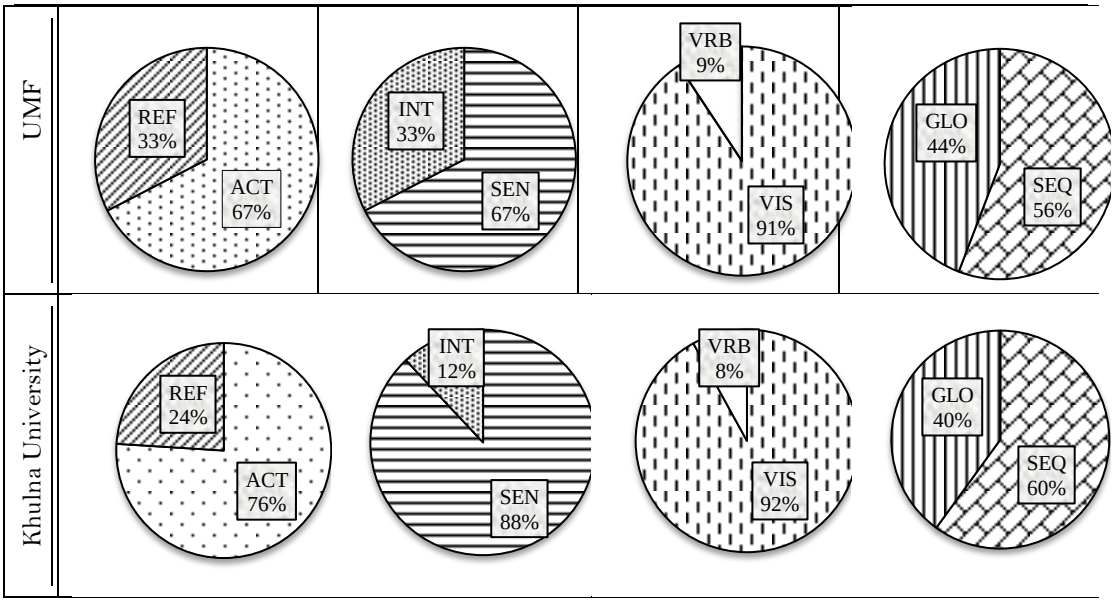
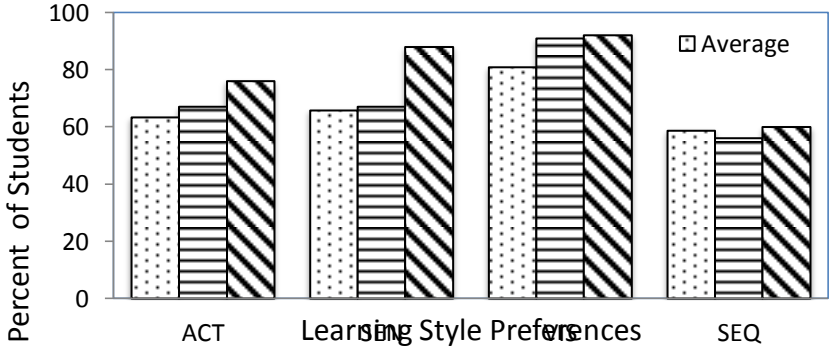


Figure- 2. Comparison of Learning Style Preferences of Engineering Students



The distribution of the four dimensions of learning style preferences of the students from the University of Michigan-Flint and Khulna University is presented in Figures 1 and 2 below. It appears that engineering students from both groups prefer active, sensing, visual, and sequential learning styles. The statistical analysis presented in Table 1 confirmed that despite cultural differences both groups exhibit similar learning preferences due to similar academic disciplines. The distribution of the four dimensions of learning style preferences of freshman students and senior students from the three universities is presented in Figure 3. This confirms senior students prefer intuitive learning. In contrast, freshman students prefer sensing learning by a large margin. Both groups reported that they do not prefer the verbal learning style, which poses a challenge to the traditional lecture-based engineering courses.

Figure- 3. Distribution of Learning Style Preferences of Freshmen and Senior Students

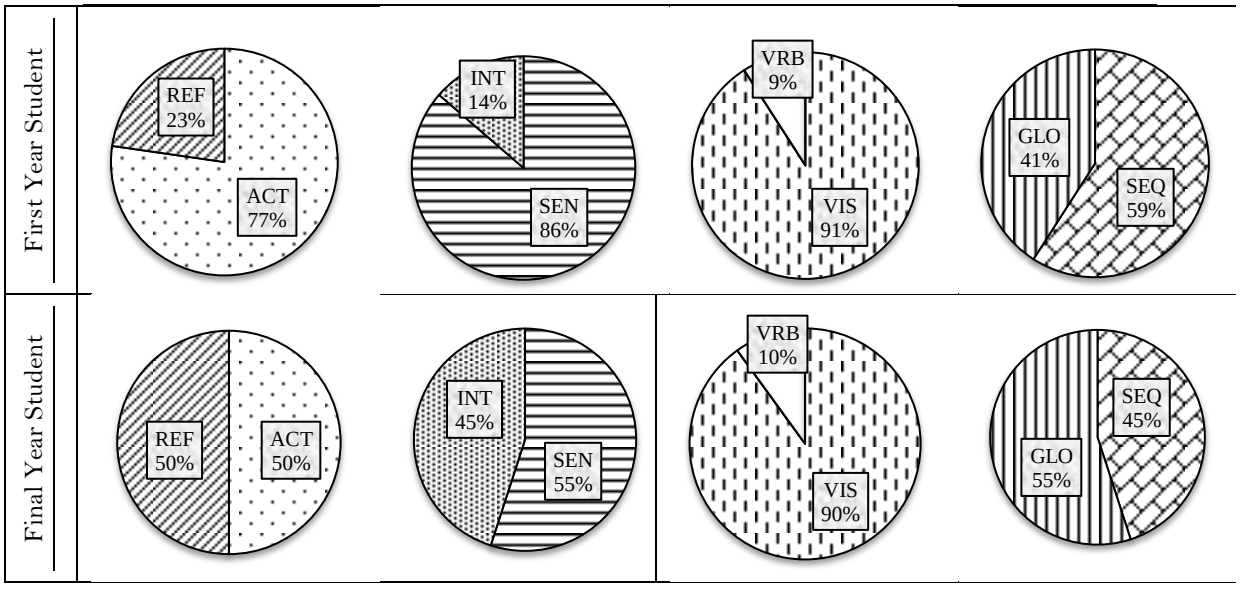
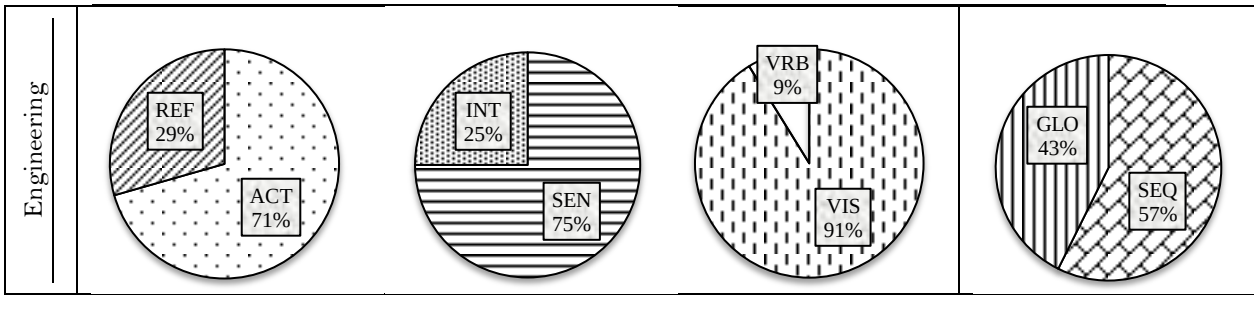
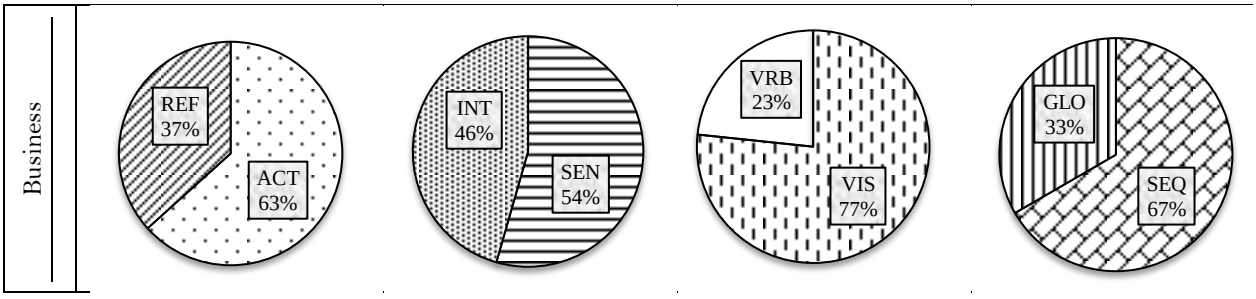


Figure- 4. Distribution of Learning Preferences of Business and Engineering Students





The distribution of the four dimensions of learning style preferences of students with engineering majors was compared with that of students with business majors from all three universities and is presented in Figure 4. Students from both majors preferred active to reflective and sequential to global learning styles.

Table- 2. Comparison of Current Data with Previous Results

Population	ACT	SEN	VIS	SEQ	Total	Reference
	Percentages					
Iowa State , Materials Eng.	63	67	85	58	129	(Constant, 1997)
Michigan Tech, Environmental, Eng.	56	63	74	53	83	(Patterson, 1999)
Ryerson University , Electrical Eng.						
Students 2000	53	66	86	72	87	(Zywno and Waalen, 2001)
Students 2001	60	66	89	59	119	(Zywno, 2002)
Students 2002	63	63	89	58	132	(Zywno, 2003)
Tulane University, Engr.						
Students Second Year	62	60	88	48	245	(Livesay *et al.*, 2002)
Students First Year	56	46	83	56	192	(Dee *et al.*, 2003)
University of Limerick Mfg., Eng.	70	78	91	58	167	(Seery *et al.*, 2003)
University Of Michigan , Chemical Eng.,	67	57	69	71	143	(Montgomery, 1995)
Electrical and Comp Eng.	47	61	82	67	?	(Baxeda *et al.*, 2001)
University of Sao Paolo, Eng.						
Civil	69	86	76	54	110	(Kuri and Truzzi, 2002)
Electrical	57	68	80	51	91	(Kuri and Truzzi, 2002)
Mechanical	53	67	84	45	94	(Kuri and Truzzi, 2002)
Industrial	66	70	73	50	56	(Kuri and Truzzi, 2002)
University Of Technology Kingston Jamaica	55	60	70	55	?	(Smith *et al.*, 2002)
University of Western Ontario , Engr.	69	59	80	67	858	(Rosati, 1999)
First	66	59	78	69	499	(Rosati, 1996)
Fourth	72	58	81	63	359	(Rosati, 1996)
Eng. Student Average	61.3	64.1	81	58.6	3364	
UM-Flint Mechanical Engineering	67	67	91	56	43	Current Data-Mazumder
Khulna University URP. - Bangladesh	76	88	92	60	25	Current Data-Mazumder
Current Eng. Student Average	62.4	65.5	82	58.5	3432	Current Data-Mazumder

Business majors are more intuitive and verbal compared to engineering students as substantiated by the statistical analysis. This is an area that requires attention from engineering educators to improve the verbal communication skills of engineering students.

The data collected from the students from the three different universities was compared with previous data reported in the literature(Richard and Rebecca, 2005) and is presented in Table 2. It can be observed that the current data shows similar learning preferences with the previous data, validating the integrity and reliability of the data.

5. SUMMARY AND CONCLUSION

A study was conducted to evaluate the similarities and differences of the learning style preferences of students using the Fielder-Silverman index of learning styles (ILS) using student response data from two different universities in Bangladesh and from an American university. Statistical analysis of the data concluded that engineering students from different cultural backgrounds show similar learning style preferences. The current results were consistent with previous studies conducted on the engineering students in different countries and universities as reported in the literature. Additionally, engineering students prefer sensing, active, visual, and sequential styles of learning. The study also showed a difference between freshman and senior engineering students, especially on the sensing/intuitive dimension. Freshman students appear to be more sensing than senior students, and vice versa. This finding validates previously reported data on the difference in the learning style preferences of freshman students compared to those of senior students. Finally, the study also revealed the difference between engineering students and business students: business students prefer visual and sensing learning styles.

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