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Attitude toward Artificial Intelligence amongst undergraduate Students of Kolkata

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ABSTRACT

The aim of the present study was to assess the differences (if any) between different undergraduate students of streams of education (B.A., B.Com., B.Sc., M.B.B.S., B.Tech., and L.L.B) in their attitude toward Artificial Intelligence. The Scale for Attitude Toward Artificial Intelligence was used. Data was collected from 751 (389 female and 326 male) undergraduate students of Kolkata. B.Tech. students were found to have the most positive attitude toward AI and Law students were found to be least positive. The attitude of Medical students was also highly positive toward AI. B.A., B.Com., and B.Sc. students were moderately positive. ANOVA showed a significant difference between stream of study and attitude toward AI. Post-Hoc analysis indicated that M.B.B.S. and B.Tech. students have similar attitudes towards AI, as do B.A., B.Com., and B.Sc. students. Law students' attitudes did not match that of any other stream.

KEYWORDS: Artificial Intelligence, Difference in attitude between streams of study.

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INTRODUCTION

According to McCarthy[1] (2004), artificial intelligence (AI) is the science of making intelligent machines, especially intelligent computer programs; however, AI does not have to confine itself to methods that are biologically observable. Artificial Intelligence attempts to simulate human intelligence which encompasses decision making, pattern recognition, problem solving, etc. AI is increasingly being incorporated into public life. In 2019, the then Union Minister of Commerce and Industry, and Civil Aviation announced that India will increasingly use artificial intelligence and data science for good governance (Press Information Bureau, 2019)[2].

An online survey conducted by NIAS Bangalore (Sai Baba et al. 2019)[3] found that respondents expressed their concern about the potential loss of jobs, loss of privacy, and a widening gap between the rich and the poor brought about due to the spread of AI in public life. Worldwide, studies have been conducted to assess the attitudes of people toward AI being applied in various fields. Results have shown that attitudes toward AI vary significantly based on the field of work where it is being applied (Horsfall et al., 2021[4]; Vasiljeva et al., 2021[5,7]; Aitken et al., 2020[6]).

Most studies on AI have been conducted on individuals from specific professions like medical personnel, mental health professionals, hospitality, teachers, banking staff etc. Each of these studies have found different results in terms of the professionals' attitude towards and acceptance of AI. Students from those streams who feel AI may affect their work life the most may have different attitudes toward AI than those who feel their life will be less affected. Vasiljeva et al. (2021)[5,7] found that attitudes towards AI differ significantly among industries. Hence, the role of stream of study on attitude towards AI needs to be investigated. Streams were categorised broadly as Arts, Science, Commerce, Medical, Law, Engineering etc. Social context has been found to play a major role in the attitude-behaviour connection (Baron & Branscombe, 2017 p. 175[8]). Since expected consequences play an important role in attitudes and behaviour, the consequences of AI implementation, expected by students of different streams, with respect to their personal, social, and professional lives may affect their attitudes toward AI.

The present study aims to assess whether there exists a significant difference in attitude toward Artificial Intelligence in undergraduate students, on the basis of stream of study and sex.

METHOD

Objectives

1. To assess the attitude towards Artificial Intelligence amongst undergraduate students in kolkata
2. To determine whether undergraduate students vary in their attitude towards Artificial Intelligence on the basis of their sex and stream of study.

Hypothesis

H_1 There exists a significant difference between undergraduate students of Kolkata with regard to their attitude toward Artificial Intelligence on the basis of their stream of study.

H_2 There exists a significant difference between undergraduate students of Kolkata with regard to their attitude toward Artificial Intelligence on the basis of their biological sex.

Sampling technique

Multistage Systematic Random Sampling was used partially for both the preliminary survey and the main study. A list was prepared of Undergraduate colleges in Kolkata. The list included colleges of all disciplines and streams including medical, engineering, and performing arts. These colleges were categorised geographically into North, East, West, South, and Central. An attempt was made for there to be an equal representation of colleges from all streams.

Sample

The present study was done on undergraduate students from Kolkata. The student population was chosen because the current college-level population is going to be the workforce that uses Artificial Intelligence first in a major way, yet, did not grow up with it. Data was collected from 389 male and 362 female undergraduate students from colleges in Kolkata from the streams of Arts, Science, Commerce, Medicine, Law, and Engineering.

Table 1. ***Distribution of the sample across streams and the two sexes (N=751)***

Sex/Stream	B.A.	B.Sc.	B.Com.	B.Tech.	M.B.B.S.	L.L.B.	Total
Male	67	70	67	75	58	52	389
Female	80	62	63	41	61	55	362
Total	147	132	130	116	119	107	751

Inclusion Criteria. The inclusion criteria of the sample are as follows.

Age. 18-23 years

Education. Minimum level of education is Higher Secondary. The respondents were enrolled in an undergraduate college in an Honours course or equivalent.

Location. Data was collected from students studying in undergraduate colleges in Kolkata, West Bengal.

Exposure to Technology. Only those students who own personal smartphones were included in the study.

Tools

Information Schedule. An information schedule seeking demographical was prepared and used.

Scale for Attitude Toward Artificial Intelligence. The SATAI (Mukherjee & Dasgupta, 2024[9]) comprises 30 statements and follows a 5-point Likert format (ranging from 1-5), measuring attitude toward AI along the dimensions of (a) General, (b) Applications, (c) Perceived benefits, (d) Concerns. The scale is self-administering in nature with the instructions printed on the data sheet. There is no time limit for completion. The respondents' scores have a possible range of 30-150. Higher mean values indicate more positive attitudes toward Artificial Intelligence. Inter-rater reliability (Fliess Multirater Kappa) was calculated to be 0.438. Reliability (Cronbach's alpha) found to be 0.832 and Construct Validity of 0.679 show that the scale is sound.

Procedure

A list of colleges randomly selected from each of the five zones of Kolkata was prepared according to the sampling procedure described previously. Three colleges were desired to be selected from each zone which amounts to 3 colleges X 6 streams X 5 zones = 90 colleges .Permission for data collection and lack of equal distribution of colleges with all streams in every zone narrowed the list down to 51 colleges. 20 male and 20 female students were selected randomly from each college which created a pool of 40 X 51 = 2040 students. The purpose of research and the procedure of data collection were discussed with the participants. The initial consent form and information schedule were filled up by 1951 students. Out of these 268 did not meet the inclusion and exclusion criteria. From the remaining 1683 students, 618 students scored higher than 5 on the General health Questionnaire. The 1065

participants were administered the Scale for Attitude Toward AI. Finally 751 (389 male and 362 female) undergraduate students from Kolkata completed all the questionnaires properly and became the final sample of the study. The distribution of this sample across streams has been mentioned previously in Table 1. Statistical analysis was carried out on the collected data and the results were interpreted.

Statistical Analysis

Descriptive Statistics used were Mean, Median, and Standard Deviation.

Inferential Statistics used were two-way ANOVA and Tukey-Kramer post-hoc test.

RESULTS AND DISCUSSION

Table 2. Mean and Standard Deviation of scores obtained by male and female undergraduate students of different streams on the Scale for Attitude Toward Artificial Intelligence

Stream	Sex	Mean	S.D.
B.A.	Male	103.15	11.97
	Female	96.36	13.4
	Combined	97.29	13.38
B.Com.	Male	97.19	7.98
	Female	92.84	5.54
	Combined	95.8	7.54
B.Sc.	Male	96	11.75
	Female	93.79	9.91
	Combined	94.15	10.21
M.B.B.S	Male	103.50	15.48
	Female	101.57	14.62
	Combined	102.79	15.07
B.Tech.	Male	107	16.35
	Female	109.03	14.79
	Combined	108.62	14.92

L.L.B.	Male	84.38	14.78
	Female	87.14	17.71
	Combined	85.76	15.47
Combined Streams (Total Sample)	Male	97.19	13.477
	Female	96.24	13.166
	Combined	96.54	13.283

- Higher Mean values indicate more positive attitudes toward Artificial Intelligence.
- B.Tech students were found to have the highest mean score which indicates the most favourable attitude towards AI followed by M.B.B.S. and B.A. students in that order.
- Law students were the only group found to have a mean score lower than the median indicating a negative attitude toward AI.
- In all the streams except B.Tech. and L.L.B., males were found to have higher mean scores than females indicating a more favourable attitude towards AI.
- Amongst male respondents, the highest mean score was that of B.Tech students followed by M.B.B.S. and then B.A.
- Amongst female respondents, the highest mean score was also that of B.tech students followed by M.B.B.S. and then B.A.

Table 3 Domain-wise scores for Attitude towards Artificial Intelligence

Stream	Sex	General		Benefits		Concerns		Applications	
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
B.A.	Male	16.89	4.006	15.74	3.114	9.15	2.430	54.58	7.586
	Female	17.90	3.892	16.75	2.381	9.90	2.732	58.60	5.862
	Combined	17.03	3.993	15.88	3.037	9.25	2.477	55.13	7.485
B.Sc.	Male	15.75	4.119	15.41	2.461	7.69	2.429	54.00	4.399
	Female	17.59	4.093	15.16	2.531	9.12	3.174	55.32	5.018

	Combined	17.00	4.171	15.24	2.499	8.66	3.019	54.90	4.846
B.Com.	Male	15.01	3.779	16.32	2.628	8.00	2.479	54.59	6.288
	Female	16.71	3.875	15.76	2.531	8.00	3.066	55.52	5.018
	Combined	15.28	3.831	16.23	2.695	8.00	2.568	54.73	6.478
M.B.B.S	Male	17.29	2.392	17.82	2.270	9.59	4.139	60.00	8.434
	Female	17.15	2.863	17.70	2.186	9.42	4.131	59.24	9.388
	Combined	17.20	2.688	17.74	2.193	9.48	4.092	59.50	8.995
B.Tech.	Male	16.81	5.833	19.10	2.166	9.06	5.360	47.76	7.252
	Female	17.25	5.776	17.70	2.186	8.25	5.676	63.00	7.483
	Combined	16.90	5.748	17.74	2.193	8.90	5.360	63.85	6.360
L.L.B.	Male	16.14	4.464	19.10	2.166	10.38	4.272	47.76	7.252
	Female	14.90	4.866	18.97	2.277	9.40	4.553	44.30	6.171
	Combined	15.41	4.700	18.97	2.277	9.80	4.423	45.73	6.788
Combined Streams (Total Sample)	Male	16.11	4.172	16.21	3.051	8.72	3.111	55.23	7.591
	Female	16.96	4.116	15.93	2.945	9.14	3.657	55.03	8.356
	Combined	16.41	4.168	16.11	3.015	8.86	3.314	55.16	7.859

Table 4 ANOVA Values for sex and stream (N=751)

Variable	Df	F	sig.
Sex	1	2.649	.104
Stream	5	9.815*	<.001
sex*stream	5	11.108*	<.001

- There exists no significant difference between male and female undergraduate students in their attitude towards Artificial Intelligence.
- There exists a significant difference between undergraduate students in their attitude towards Artificial Intelligence on the basis of their stream of study.
- There is a significant effect of the interaction of sex and stream on the attitude toward Artificial Intelligence amongst undergraduate students of Kolkata

Table 5 Tukey-Kramer's Post-Hoc Test (N=751)

Table 5(a) *Tukey-Kramer's Post-Hoc Test values (N=751)*

Streams (I)	Streams (J)	Mean Difference (I-J)	Significance
B.A.	B.Com.	1.49	.942
	B.Sc.	3.14	.292
	M.B.B.S.	-5.50*	.045
	B.Tech.	-11.33**	<.001
	L.L.B.	6.89**	<.001
B.Com.	B.A.	-1.49	.942
	B.Sc.	1.65	.918
	M.B.B.S.	-6.99*	.010
	B.Tech.	-12.82**	<.001
	L.L.B.	5.40*	.043
B.Sc.	B.A.	-3.14	.292
	B.Com.	-1.65	.918
	M.B.B.S.	-8.64**	<.001
	B.Tech.	-14.47**	<.001
	L.L.B.	3.75*	.027
	B.A.	5.50*	.045
M.B.B.S.	B.Com.	6.99*	.010
	B.Sc.	8.64**	<.001
	B.Tech.	-5.83	.218
	L.L.B.	12.39**	<.001

B.Tech	B.A.	11.33**	<.001
	B.Com.	12.82**	<.001
	B.Sc.	14.47**	<.001
	M.B.B.S.	5.89	.218
	L.L.B.	18.22**	<.001
L.L.B.	B.A.	-6.89**	<.001
	B.Com.	-5.40*	.043
	B.Sc.	-3.75*	.027
	M.B.B.S.	-12.39**	<.001
	B.Tech.	-18.22**	<.001

Table 5(b) ***Homogenised subsets as revealed by Tukey-Kramer's Post-Hoc test (N=751)***

Stream	Subset 1	Subset 2	Subset 3
B.A.	99.75		
B.Sc.	95.8		
B.Com.	94.89		
M.B.B.S.		102.53	
B.Tech.		108.62	
L.L.B.			85.76
Significance	.086	.635	.1.000

Table 5(c) ***Tukey-Kramer's Domain-wise Post-Hoc Test values (N=751)***

		General		Benefits		Concerns		Applications	
Streams (I)	Streams (J)	Mean Difference (I-J)	Significance	Mean Difference (I-J)	Significance	Mean Difference (I-J)	Significance	Mean Difference (I-J)	Significance
B.A.	B.Com.	.03	1.000	.64	.578	.59	.805	.23	1.000
	B.Sc.	1.75*	.008	-.35	.943	1.25*	.026	.40	.999
	M.B.B.S.	-.17	1.000	-1.86	.001	-.23	1.000	-4.37*	.002
	B.Tech.	.13	1.000	-3.10*	<.001	.36	.997	-8.72*	<.001
	L.L.B.	1.62	.191	1.19	.122	-.55	.946	9.40*	<.001
B.Com.	B.A.	-0.3	1.000	-.64	.578	-.59	.805	-.23	1.000
	B.Sc.	1.72*	.027	-.99	.109	.66	.734	.17	1.000
	M.B.B.S.	-.20	1.000	-2.50*	<.001	-.82	.777	-4.60*	.002
	B.Tech.	.10	1.000	-3.73*	<.001	-.24	1.000	-8.95*	<.001
	L.L.B.	1.59	.269	.55	.911	-1.14	.398	9.17*	<.001
B.Sc.	B.A.	-1.75*	.008	.35	.943	-1.25*	.026	-.40	.999
	B.Com.	-1.72*	.027	.99	.109	-.66	.734	-.17	.896
	M.B.B.S.	-1.92	.073	-1.51*	.020	-1.48	.096	-4.77*	<.001
	B.Tech.	-1.62	.316	-2.75*	<.001	-.90	.744	-9.11*	<.001
	L.L.B.	-.13	1.000	1.54*	.015	-1.80*	.016	-9.01*	<.001
	B.A.	.17	1.000	1.86*	.001	.23	1.000	4.37*	.002
M.B.B.S.	B.Com.	.20	1.000	2.50*	<.001	.82	.777	4.60*	.002

	B.Sc.	1.92	.073	1.51*	.020	1.48	.096	4.77*	<.001
	B.Tech.	.30	1.000	-1.23	.372	.58	.982	-4.35*	0.43
	L.L.B.	1.79	.301	3.05*	<.001	-.32	.999	13.77*	<.001
B.Tech	B.A.	-.13	1.000	3.10*	<.001	-.36	.997	8.72*	<.001
	B.Com.	-.10	1.000	3.73*	<.001	.24	1.000	8.95*	<.001
	B.Sc.	1.62	.747	2.75*	<.001	.90	.744	9.11*	<.001
	M.B.B.S.	-.30	.875	1.23	.372	-.58	.982	4.35*	0.43
	L.L.B.	1.49	.613	4.29*	<.001	-.91	.852	18.12*	<.001
L.L.B.	B.A.	-1.62	.191	-1.19	.122	.55	.946	-9.40*	<.001
	B.Com.	-1.59	.269	-.55	.911	1.14	.398	-9.17*	<.001
	B.Sc.	.13	.676	-1.54*	.015	1.80*	.016	-9.01*	<.001
	M.B.B.S.	-1.79	.815	-3.05*	<.001	.32	.999	-13.77*	<.001
	B.Tech.	-1.49	.872	-4.29*	<.001	.91	.852	-18.12*	<.001

Tukey-Kramer's Post-Hoc Test revealed the following.

- There is a significant difference between the attitude towards AI of B.A. students and students of M.B.B.S., B.Tech., and L.L.B streams.
- There is a significant difference between the attitude towards AI of B.Com. students and students of M.B.B.S., B.Tech., and L.L.B streams.
- There is a significant difference between the attitude towards AI of B.Sc. students and students of M.B.B.S., B.Tech., and L.L.B.streams.
- There is a significant difference between the attitude towards AI of M.B.B.S. students and students of B.A., B.Com., B.Sc., and L.L.B.streams.
- There is a significant difference between the attitude towards AI of B.Tech. students and students of B.A., B.Com., B.Sc., and L.L.B. streams

- There is a significant difference between the attitude towards AI of L.L.B. students and students of B.A., B.Com., B.Sc., B.Tech., and M.B.B.S. streams.

Mean scores indicate that M.B.B.S. and B.Tech. students are the most positive toward Artificial Intelligence out of all the streams considered (B.A., B.Com., B.Sc., M.B.B.S., B.Tech., and L.L.B.). Various studies conducted on medical professionals in different countries have found them to be positive toward Artificial Intelligence (Al-Medfa et al., 2023[10]; Horsfall et al., 2021[4.11]; Dasgupta & Chatterjee, 2020[12]; Oh et al., 2019[13]). Thus, it can be seen that medical students in Kolkata have shown similar attitudes toward AI as medical professionals around the world. B.Tech students have the highest means score out of all the streams indicating that they are most positive about AI. A possible reason could be that being in the 'Tech' field, AI is viewed, not as competition, but rather an opportunity. Understanding of technology and a feeling of control over it could also be contributing factors towards this positive attitude. Oksanen et al. (2020)[14] found that having a degree in technology or engineering, exposure to robots online and robot use self-efficacy predicted higher trust toward robots and AI. Gessl et al., (2019)[15] reported that experience with technology and technology acceptance are highly correlated. Possible causes may be investigated further.

Students of B.A., B.Com. and B.Sc. streams have shown similar attitudes toward AI which are overall positive and show no statistically significant difference from each other. While several studies have been conducted to assess the attitudes of medical professionals and students, there are very few studies on other streams, specially non-technical ones. However, it must be noted, that while Medical, Law, and Technology are streams that are more or less channelled toward specific professional fields, B.A. and B.Sc. are umbrella streams that comprise varied subjects. For example, B.A. includes Languages, Political Science, History, and Sociology, while B.Sc. includes Zoology, Psychology, Physics, and Chemistry to name a few. Hence, the sample within these groups are more varied in terms of their future professions. This could be what sets them apart from students belonging to the other streams and what is common within themselves.

Mean score for Law students was the lowest indicating least favourable attitudes toward AI. The mean score (85.63) was also below the median (90) indicating that Law students have a negative attitude toward AI. Post-Hoc analysis of ANOVA results showed that law students' attitudes toward Artificial Intelligence was separate from all other streams and did not match the attitudes of students from any other stream. This is because while students from all the other streams showed an overall positive

attitude toward AI, Law students obtained a mean score indicating negative attitudes toward Artificial Intelligence. Towards the end of 2022, the Honourable Supreme Court of India constituted an Artificial Intelligence Committee to identify application of AI technology in translation of judicial documents, legal research assistance and process automation. Keeping this in mind, a negative attitude of Law students could be at odds with the policy decisions being made for the field of Law. A 2024 study by Thomson Reuters surveyed over 1,128 respondnets, half of whom were from the legal professionfrom the US, UK, Canada, New Zealand and Australia about their opinions on AI. Over half of the respondents said they were worried about the ethical implications of AI in legal practice. 59% respondents believed AI was a threat to the legal profession. (artificiallawyer, 2024)[16]. The specific reasons behind Law students' attitudes being negative toward AI need to be investigated so that concerns can be addressed by AI developers and decision-making bodies and corrective measures can be taken.

No statistically significant difference was found in attitudes toward AI on the basis of sex of the respondent. Busch (1995)[17] found that there exists no difference between gender and attitude towards computers. Even though stereotyping in mass media and textbooks perpetuate traditional views of women not being comfortable with technology and science (Steinke et. al., 2007[18]), the findings of the present study further indicate that there is no statistical basis for differentiation between men and women in their attitude towards technology, specifically Artificial Intelligence.

In a domain-wise discussion of attitude scores divided between streams and sex the picture presented shows that the primary difference between the streams in their attitude towards AI is in the domain of 'Applications of AI'. This shows that while there is not much significant difference in the 'General', 'Benefits', or 'Concerns' domains of attitude towards AI. In these domains, the attitude towards AI is more or less similar amongst the different streams. When it comes to the applications of AI, the streams show significant differences, in the same pattern as when the total attitude scores are considered. A possible reason for this could be that students from each stream share different opinions about the applications of Ai based on their own specific field. Since B.A., B.Sc., and B.Com. are not professionally specific fields, the attitudes of these three streams are grouped together in the post-hoc test, while students from Medical, Engineering, and Law vary significantly in their attitude about the applications of AI. It is also interesting to note that the overall low score of Law students on the AI scale is not due to the 'Concerns' domain, rather the 'Applications' domain. Hence, it is not that students from

the L.L.B. stream have high concerns regarding AI, but rather the negative attitude is with regard to its application.

The implications of these findings are manifold. Artificial Intelligence is already present in our lives and its applications are becoming increasingly pervasive. The current student population is the next workforce and also consumers of technology and services. There are already debates in various communities about the extent to which AI will replace human interaction and the ethics and implications of that. Use of AI in diagnostics and surgery is already being extensively experimented with and even implemented to a limited extent. Hence, the fact that medical students are positive towards AI is a sign that they do not feel threatened by it and may be willing to embrace its application in their profession and personal lives. B.Tech students were found to be most positive towards AI which may lead to increase in research and development of AI in India. The fact that students from all streams included in the study except Law were positive towards AI may foretell a generally good acceptance of AI amongst the near-future workforce of Kolkata and India. The specific concerns of Law students may be investigated further to understand whether their reservations regarding AI are ethical, legal, or professional in nature. Lawyers uphold the very fabric of democracy by standing up for people's rights. Many lawyers also become future lawmakers or upholders of the law and constitution (judges). Hence, if law students are negative towards Artificial Intelligence the implications of that may be far-reaching.

CONCLUSION

The present study shows that there exists a significant difference between Attitudes toward Artificial Intelligence on the basis of stream of study but not on the basis of sex of the undergraduate students of Kolkata. Students from the fields of technology and medicine were most positive towards AI while law students were found to be negative in their attitude towards AI.

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