ENGINEERING GRADUATES' VOICES ON ARTIFICIAL INTELLIGENCE (AI) - A COHORT STUDY

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Abstract:

To nurture a future where AI is leveraged to the benefit of people and society, it is crucial to bring together a wide array of voices and viewpoints. With this goal in mind, a cohort study has been undertaken to delineate the voices of Engineering Graduates on Artificial Intelligence(AI) in the State of Telangana. The sample constitutes One hundred and nineteen (119) Engineering Graduates. Simple random sampling technique was employed to elicit information from the selected sample . A self-designed questionnaire was developed keeping in view the objectives and hypotheses of the study. It contained twenty (20) statements on the Five-point Likert Scale. The results of the study demonstrated that there exists no statistically significant difference in the voices of Graduate Engineers on Artificial Intelligence (AI) in the State of Telangana with special reference to location and semester. Conversely, a significant difference was reported in Artificial Intelligence (AI) with regard to gender and major subjects. Thus, it is evident from the research that AI holds enormous promise to enrich lives of prospective and young Engineering Graduates. The findings of the study provide robust implications for Engineering Graduates, Professors and policy makers. Directions for further research were also portrayed.

Index Terms **- Artificial Intelligence (AI); Engineering Graduates; voices; empirical study.**

I. INTRODUCTION

The use of Artificial intelligence (AI) has gained popularity during the last few decades and its use in engineering is increasing globally. Generally speaking, Artificial Intelligence(AI) is a computing concept that helps a machine think and solve complex problems as we humans do with our intelligence Specifically, AI is the simulation or combination of machine learning and deep learning, the application of which results in deliberate outcomes. Furthermore, the use of AI is pervasive and primarily focuses on numerous disciplines in all industries (Syed, W,2023).

John McCarthy, for the first time invented the concept in 1956 at the Dortmund Conference as 'the computational part of the ability to achieve goals in the world' . The fact that artificial intelligence has many different application areas makes it difficult to make a common definition about the concept (Birdman, 2015). According to the most common definition in the related literature, artificial intelligence; the ability of a computer or a computer controlled machine to perform tasks related to higher mental processes, such as reasoning, inference, generalization, and learning from past experiences, which are generally assumed to be human-specific qualities (Nabiyev, 2005).

The definition of Artificial Intelligence, as stated in the first Volume of the Handbook of Artificial Intelligence is that "Artificial Intelligence (AI) is the part of computer science concerned with designing intelligent computer systems, that is, systems that exhibit the characteristics we associate with intelligence

in human behavior - understanding language, learning, reasoning, solving problems, and so on" (Barr & Feigenbaum, 1981).

1.1 SIGNIFICANCE OF THE STUDY

Today, we live in the age of big data and this situation can easily create many different applications, such as artificial intelligence. The field of use of artificial intelligence in education has brought with it new teaching and learning approaches that are being tested in different contexts. The most common examples of artificial intelligence applications in education can be shown as intelligent and intelligent teaching systems, also called adaptive learning management systems. Halili (2019) stated in his study that technological developments exist in education and explained the importance of using dimensions in learning and teaching processes. Technological products used in education directly affect productivity and creativity, such as Industry 4.0 technology, artificial intelligence, augmented reality, cloud computing and hologram. The use of developments such as technology in every field of education will increase success and learning.

Ouyang and Jiao's (2021) identifies three paradigms shaping AI-student interaction. The first paradigm positions AI as an assistant guiding learning, the second as a tool supporting active student collaboration, and the third empowers students to lead their learning. Highlighting the need to integrate educational theories, such as constructivism and situated learning, the article underscores the significance of aligning AI applications with theoretical foundations. This approach enriches AI's educational impact, addressing the challenge of empowering students to navigate their learning journey within the complexity of modern educational processes.

1.2 NEED FOR THE STUDY

Artificial Intelligence (AI) is transforming every walk of life. Artificial Intelligence not only offers quality education, and individualizes learning but also assist, enhance, or streamline the academic journey of students, especially engineering graduates.

To nurture a future where AI is leveraged to the benefit of people and society, it is crucial to bring together a wide array of voices and viewpoints. With this goal in mind, a cohort study has been undertaken to delineate the voices of Engineering Graduates on Artificial Intelligence(AI) in the State of Telangana.

1.3 OBJECTIVES OF THE STUDY

1. To delineate the voices of Graduate Engineers on Artificial Intelligence (AI) in the State of Telangana.

2. To assess the voices of Graduate Engineers on Artificial Intelligence (AI) in the State of Telangana with special reference to gender.

3. To evaluate the voices of Graduate Engineers on Artificial Intelligence (AI) in the State of Telangana with special reference to semester.

4. To study the voices of Graduate Engineers on Artificial Intelligence (AI) in the State of Telangana with special reference to major subjects.

5. To investigate the voices of Graduate Engineers on Artificial Intelligence (AI) in the State of Telangana with special reference to location.

1.4 .RESEARCH HYPOTHESIS

1. There is no statistically significant difference in the voices of Graduate Engineers on Artificial Intelligence (AI) in the State of Telangana.

2. There is no statistically significant difference in the voices of Graduate Engineers on Artificial Intelligence (AI) in the State of Telangana with special reference to gender.

3. There is no statistically significant difference in the voices of Graduate Engineers on Artificial Intelligence (AI)in the State of Telangana with special reference to semester.

4. There is no statistically significant difference in the voices of Graduate Engineers on Artificial Intelligence (AI) in the State of Telangana with special reference to major subjects.

5. There is no statistically significant difference in the voices of Graduate Engineers on Artificial Intelligence (AI) in the State of Telangana with special reference to location.

1.5 LITERATURE REVIEW

Khare, Kriti; Stewart, Brian and Khare, Anshuman (2018) outlines the potential for Artificial Intelligence (AI) to positively impact student success. The paper viewed the adoption of AI in education from a comprehensive perspective, considering technological, social, political, economic, cultural and ethical factors in the educational realm.

Jeffrey, T.R. (2020) explored student perceptions of AI through quantitative statistical methods. The results of this study suggest that the general perception of AI is positive, but there exists some concern about the rapid development of AI and how it will affect humankind.

Keleş, Pınar Ural, and Suleyman Aydın.(2021) evaluated the perceptions of university students about the concept of artificial intelligence. It was found that artificial intelligence perceptions of the students of the Faculty of Education were richer than the students of the Faculty of Economics and Administrative Sciences and the Faculty of Arts and Sciences.

Ahmed, Zaboor et al (2022) conducted a cross-sectional study to determine the knowledge, attitude, and practice of AI among doctors and medical students in Pakistan. It was found that the majority of doctors and medical students lack knowledge about AI and its applications, but had a positive view of AI in the field of medicine and were willing to adopt it.

V V Ravi Kumar and Ramakrishnan Raman (2022) conducted a study on the student perceptions on the usage of Artificial Intelligence (AI) in higher education.. The results indicated that student had a perception that AI can be effectively used in teaching learning process, academic administration processes, and should not be used in a few processes related to admission, examination and placements.

Idroes, Ghazi et al (2023) examined students' perspectives on using AI within educational settings to gain insights about the role of AI in education and investigate their perceptions regarding the advantages, challenges, and expectations associated with integrating AI into the learning process. the results show that, in general, students had a positive perception of AI and believe AI is beneficial for education. However, they are still concerned about some of the drawbacks of using AI.

Buabbas AJ, et al (2023) investigated students' perceptions of AI in medical education at Kuwait University, Kuwait. Most students (349) (99.1%)) agreed that AI would play an important role in healthcare. More than half of the students (213) (60.5%)) understood the basic principles of AI, and (329 (93.4%)) students showed comfort with AI terminology. Many students (329 (83.5%)) believed that learning about AI would benefit their careers, and (289 (82.1%)) believed that medical students should receive AI teaching or training. The study revealed that most students had positive perceptions of AI.

Petrescu, M.A., Pop, E., & Mihoc, T.D. (2023) analyzed students' expectations and points of view related to the Artificial Intelligence. It was concluded that students are interested in Artificial Intelligence due to its trendiness, applicability, their passion and interest in the subject, the potential for future growth, and high salaries. However, the students' expectations were mainly related to achieving medium knowledge in the Artificial Intelligence field, and men seem to be more interested in acquiring high-level skills than women.

Syed, W. et al (2023) evaluated awareness, perceptions, and opinions towards Artificial intelligence (AI) among pharmacy undergraduate students at King Saud University (KSU), Riyadh, Saudi Arabia. More than half 57.3% (n = 90) of the students were aware that AI would assist healthcare professionals in becoming better with the widespread use of AI. Furthermore, 75.1% of the students agreed that AI reduces errors in medical practice. The mean positive perception score was 29.8 (SD = 9.63; range-0–38). The mean score was significantly associated with age ($p = 0.030$), year of study ($p = 0.040$), and nationality ($p = 0.013$). The gender of the participants was found to have no significant association with the mean positive perception score ($p = 0.916$). It was indicated that pharmacy students showed good awareness of AI in Saudi Arabia. Moreover, the majority of the students had positive perceptions about the concepts, benefits, and implementation of AI.

Chan, Cecilia and Hu, Wenjie (2023) explored university students' perceptions of generative AI (GenAI) technologies, such as ChatGPT, in higher education, focusing on familiarity, their willingness to engage, potential benefits and challenges, and effective integration. A survey of 399 undergraduate and postgraduate students from various disciplines in Hong Kong revealed a generally positive attitude towards GenAI in teaching and learning. Students recognized the potential for personalized learning support, writing and brainstorming assistance, and research and analysis capabilities. However, concerns about accuracy, privacy, ethical issues, and the impact on personal development, career prospects, and societal values were also expressed.

Suri, Irfan et al (2023) conducted using the Statistical Analysis (SA) approach. The research evaluated seven criteria, including Learning Outcomes, Cost-effectiveness, Accessibility, Efficient Learning, Adaptability , Customization , and Career Readiness. The results of the study emphasized the primary criteria

that have a significant impact on student acceptance, namely learning outcomes ,cost-effectiveness and accessibility.

Alberto Grájeda, Johnny Burgos, Pamela Córdova & Alberto Sanjinés (2024) assessed the adoption and impact of Artificial Intelligence (A.I.) tools in higher education, Major findings indicate a significantly positive impact of A.I. tools on student academic experiences, including enhanced comprehension, creativity, and productivity. Importantly, the study identifies areas with low and high A.I. integration, serving as an institutional diagnostic tool.

. All these studies underline the importance of assessing the perceptions of Engineering Graduates committed to knowledge acquisition using artificial intelligence (AI).

1.6 RESEARCH DESIGN.

This is a cohort study. A cohort study is a particular form of longitudinal study, where the individuals in the panel share a common characteristics. This study utilizes both descriptive statistics to provide information about the participant's perception of AI and correlational statistics to aid in the identification of possible relationships among study variables. This study utilizes a purposeful sampling design. The sample of the study consists of One hundred and nineteen (119) Engineering Graduates.

The instrument used in this study is a combination of new items developed by the researcher and items modified from a study conducted by Suri, Irfan et al (2023). The survey was administered online during December,2023 and consisted of four demographic questions and twenty closed-ended questions regarding AI were incorporated. Descriptive statistics viz., frequencies, t-test and ANOVA were used to organize and summarize data for exploring variable relationships by other statistical methods.

1.7 ANALYSIS AND INTERPRETATION

Table 1.1 showing demographic details of respondents

	Frequency	Percent
Male	55	46.6
Female	63	53.4
Total	**119**	**100.0**
First Semester	82	69.5
Second Semester	6	5.1
Third Semester	17	14.4
Fourth Semester	13	11.10
Total	**119**	**100.0**
C-language	99	83.9
Python	10	16.1
Total	**119**	**100.0**
Urban	68	57.6
Semi-urban	21	17.8
Rural	29	2436
Total	**119**	**100.0**

It can be inferred from the given table that a good majority of the sample (53.4%) were female and the residual sample (46.6%) were male chosen for the present investigation.

With regard to semester, a scintillating majority (69.5%) were from first semester, followed by (14.4%) third semester; (11.10%) fourth semester and the residual sample (5.1%) belongs to fourth semester.

As per the major subjects are concerned, an exciting majority (83.9%) were from c-language as the major subject and the remaining (16.1%) from Python language.

With respect to location, more than half of the sample (57.6%) were from urban; followed by (24.36%) were from rural and the remaining (17.8%) were from semi-urban area

HO₁. There is no statistically significant difference in the voices of Graduate Engineers on Artificial Intelligence (AI) in the State of Telangana.

Statistics									
	Gender	Year	subjects	Locality	AI	Q7	Q8	Q9	Q10
Mean	1.5339	1.6695	1.1610	1.6695	2.5847	1.6864	6.2881	1.7712	1.4407
Median	2.0000	1.0000	1.0000	1.0000	3.0000	1.0000	7.0000	2.0000	1.0000
Mode	2.00	1.00	1.00	1.00	3.00	1.00	7.00	2.00	1.00
Std. Deviation	.50098	1.08648	.36911	.84787	.74336	.91239	1.15545	.42186	.49859

The mean indicates that the sample is slightly skewed towards males, as the value is closer to 1. The median and mode being higher (closer to 2) support this interpretation. The low standard deviation suggests that the data points are relatively close to the mean.

The mean is closer to 2, indicating a slight skew towards the higher end of the year. However, the median and mode being 1 suggest that the majority of the data is concentrated in the lower year values. The higher standard deviation indicates greater variability in the data.

The mean, median, and mode are all close, indicating a relatively balanced distribution of subjects. The low standard deviation suggests that the data points are clustered tightly around the mean.

Similar to the year variable, the mean suggests a slight skew towards higher values, but the median and mode being 1 indicate that most data points are concentrated in the lower locality values. The higher standard deviation implies greater variability in the data.

AI (Q7-Q10) the Mean, Median, Mode, and Standard Deviation are provided for each question separately. These statistics provides insights into the distribution of responses to questions related to AI. The mean, median, and mode can indicate central tendencies, while the standard deviation gives a measure of dispersion or variability in the responses.

HO₂. There is no statistically significant difference in the voices of Graduate Engineers on Artificial Intelligence (AI) in the State of Telangana with special reference to gender.

Table 1.2 showing voices of respondents

Group Statistics					
Gender		N	Mean	Std. Deviation	Std. Error Mean
Valid	Male	55	72.8364	7.70705	1.03922
	Female	63	76.1111	4.21254	.53073

		t-test for Equality of Means						
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
Total	Equal variances assumed	-2.912	116	.004	-3.27475	1.12457	-5.50210	-1.04740
	Equal variances not assumed	-2.806	81.040	.006	-3.27475	1.16690	-5.59649	-.95300

The t- test was administered found that t-value is -104740 for 116 degrees of freedom and the p-value is .0001,which is less than .05. Therefore, it may be concluded that with respect to Artificial Intelligence (AI) with respect to gender differ significantly. Hence, the null hypothesis is rejected .

HO₃. There is no statistically significant difference in the voices of Graduate Engineers on Artificial Intelligence (AI)in the State of Telangana with special reference to semester.

Table 1.3 showing voices of respondents

Descriptives

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
First Sem	82	75.7317	5.66568	.62567	74.4868	76.9766	50.00	100.00
Second Sem	6	73.1667	7.49444	3.05959	65.3017	81.0316	58.00	77.00
Third Sem	17	70.8824	5.72148	1.38766	67.9406	73.8241	58.00	81.00
Fourth Sem	13	72.8462	8.29504	2.30063	67.8335	77.8588	58.00	81.00
Total	118	74.5847	6.28569	.57864	73.4388	75.7307	50.00	100.00

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	392.265	3	130.755	3.524	.017
Within Groups	4230.388	114	37.109		
Total	4622.653	117			

The ANOVA test demonstrates the voices of Engineering Graduates on artificial Intelligence (AI) with respect to location. services. Since the table value of F (6.87) is > Calculated F- value (3.527) at 0.05 level of significance. Hence, the null hypothesis is accepted and it is concluded that there exists significant difference in Artificial Intelligence (AI) with regard to semesters.

HO₄. There is no statistically significant difference in the voices of Graduate Engineers on Artificial Intelligence (AI) in the State of Telangana with special reference to major subjects.

Table 1.4 showing voices of respondents

Group Statistics

subjects	N	Mean	Std. Deviation	Std. Error Mean
C language	99	75.3333	5.86237	.58919
Python	19	70.6842	7.11065	1.63130

		t-test for Equality of Means					
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference
							Lower	Upper
Total	Equal variances assumed	3.057	116	.003	4.64912	1.52105	1.63649	7.66175
	Equal variances not assumed	2.680	22.931	.013	4.64912	1.73444	1.06057	8.23768

The t- test was administered found that t-value is 7.66175 for 116 degrees of freedom and the p-value is .0001,which is less than .05. Therefore, it may be concluded that Artificial Intelligence (AI) with respect to major subjects differ significantly. Hence, the null hypothesis is rejected .

HO$_5$ There is no statistically significant difference in the voices of Graduate Engineers on Artificial Intelligence (AI) in the State of Telangana with special reference to location.
Table 1.5 showing voices of respondents

Descriptives

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Urban	68	74.3235	7.06989	.85735	72.6123	76.0348	50.00	92.00
Semi-urban	21	75.6667	2.26569	.49441	74.6353	76.6980	73.00	81.00
Rural	29	74.4138	6.38367	1.18542	71.9856	76.8420	65.00	100.00
Total	118	74.5847	6.28569	.57864	73.4388	75.7307	50.00	100.00

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	30.069	2	15.035	.376	.687
Within Groups	4592.584	115	39.936		
Total	4622.653	117			

The ANOVA test demonstrates the voices of Engineering Graduates on artificial Intelligence (AI) with respect to location. services. Since the table value of F (6.87) is > Calculated F- value (.376) at 0.05 level of significance. Hence, the null hypothesis is accepted and it is concluded that there exists no significant difference in Artificial Intelligence (AI) with regard to location.

1.8 PRINCIPAL FINDINGS

1.The findings of the study revealed that a good majority of the sample (53.4%) were female Engineering Graduates; a scintillating majority (69.5%) were from first semester; an exciting majority (83.9%) were from C-language as the major subject; more than half of the sample (57.6%) were from urban.

2. The results of the study demonstrated that there exists no statistically significant difference in the voices of Graduate Engineers on Artificial Intelligence (AI) in the State of Telangana with special reference to location and semester.

3. It was found that exists a significant difference in Artificial Intelligence (AI) with regard to gender and major subjects.

1.9 IMPLICATIONS OF THE STUDY

Though the present study was restricted to a limited number of respondents its findings have important educational implications for Engineering Graduates, professors, and Policy makers.

The 21st Century has witnessed a paradigm shift in Engineering education. The future Engineers will address the complex societal challenges by building a new generation of machines, materials, and systems. Further, Big data tools, automated computer-aided design (CAD) operations, and software applications capable of minimizing human effort required in mundane tasks are used in engineering educational institutions. Thus, it is imperative for the Engineering graduates to prepare themselves to seize every opportunity that the Artificial Intelligence is in store for them. The present study amply demonstrated a significant difference in Artificial Intelligence (AI) with regard to gender and major subjects. Therefore, it is necessary to take steps to minimize the negative impact while continuing to take advantage of AI in engineering education.

As higher education grapples with AI technology making its way into classrooms, some professors are embracing what they see as a tool for learning and a chance to hop on ever-more prevalent technology. It is a sanguine sign that a handful of Professors are incorporating artificial intelligence, into their curriculum with a fond hope of teaching students its benefits and drawbacks, and how to properly use different programs to their fullest in their classrooms. Faculty Development programmes among the teaching faculty in extending the intricacies related to spread of knowledge related to Artificial Intelligence (AI) would go a long way in inculcating adequate skills in using Artificial Intelligence (AI) in Engineering Graduates' specific areas.

The current research also holds implications for the policy makers, where they have to create a congenial atmosphere to implement State policies to make the fruits of Artificial Intelligence (AI) reach all Engineering Graduates.

1.10 DIRECTIONS FOR FURTHER RESEARCH

Since improvement and innovations are the hallmark of research, the present study explores many avenues for carrying further research.

1. A similar study with a larger sample can be conducted to have an in-depth knowledge on Artificial Intelligence (AI) for Engineering graduates in the State of Telangana.

2. There is a need to explore the role of Professors in teaching Artificial Intelligence (AI) for Engineering graduates.

3. An explorative study can be undertaken in Colleges of Engineering with respect to enhancement of Artificial Intelligence among Engineering Graduates in allied subjects.

1.11 CONCLUSION

This study aims to determine Engineering Graduates students' voices on using Artificial Intelligence (AI) . Based on the analysis of the survey results, it was found that, in general, Engineering Graduates had a positive perception of the use of Artificial Intelligence (AI) because it provides many benefits. Several studies internationally revealed that Artificial Intelligence (AI) has a positive impact on Engineering Graduates. It should be noted that the ultimate impact of Artificial Intelligence (AI) in Engineering education will decided by the time.

Competing Interests

Authors declare that no competing interests exists.

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