

Assessment of Knowledge, Attitudes, and Practices of Senior High School Students of DREESMNHS in Utilizing Artificial Intelligence (AI) Chatbots in Science Education

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Abstract: This research explores the utilization of AI chatbots in science education at Don Ruben E. Ecleo Sr. Memorial National High School, focusing on the knowledge, attitudes, and practices of 106 senior high school students. The majority were females (65.09%), aged 15-17 years (84.91%), and Humanities and Social Sciences (HUMSS) students (29.24%), Science Technology, Engineering and Mathematics (STEM) students (70.75%). ChatGPT emerged as the most preferred AI chatbot, favored by 83.96% of respondents. The findings revealed that students have a moderate to high understanding of AI chatbots, with generally positive attitudes towards their integration into education. While engagement levels varied, highlighting the need for targeted interventions, students appreciated the personalized learning experiences and immediate feedback provided by AI chatbots. Recommendations include increasing awareness and training on AI chatbot use, ensuring equitable technology access, addressing academic integrity through strict guidelines, and promoting the complementary role of AI and human educators. This study aims to inform policy-making and strategic planning to enhance the effective use of AI chatbots in education, fostering an inclusive and dynamic learning environment.

Keywords: AI Chatbot, Knowledge, Attitudes, and Practices, Science Education

Introduction

AI chatbots offer undeniable benefits, but the adaptation and effective utilization of these tools by students hinge critically on their knowledge, attitude and practices. AI chatbots are widely regarded as valuable educational tools. However, their effective integration into the learning environment is hindered by the limited knowledge and varying attitudes of different students. Despite a willingness to lean and adapt, the complexity of this systems makes it difficult for many people to utilize them.

Research indicates that students' knowledge of AI in education is varied. (Jindal, et al., 2020) found that while medical students in India are aware of AI, they lack technical expertise in computer languages and AI publications. Similarly, (Dergunova, et al., 2022) noted that engineering students understand AI but lack deeper insights into concepts like mind and intelligence, highlighting the need for comprehensive AI education. (Idroes, et al., 2023) observed that students generally have a positive view of AI in education but are concerned about ethical and reliability issues. (Kandlhofer, et al., 2016) stressed the importance of AI literacy for future careers, proposing an educational framework for different age groups. These studies collectively show that while students are aware of AI, significant gaps in technical knowledge and understanding need addressing.

Studies show a generally positive attitude among students towards AI chatbots in education. (Pantelic, et al., 2023) found university students open to using AI chatbots for academic purposes, reflecting acceptance of technology-enhanced learning tools. (Sanchez-Reina, et al., 2024) noted positive attitudes towards AI and ChatGPT among undergraduates, showing readiness to embrace these technologies. (Moral-Sánchez, et al., 2023) reported high satisfaction levels among students using AI chatbots in mathematics, indicating a positive impact on learning outcomes. These findings suggest students not only accept AI chatbots but also recognize their potential educational benefits.

This study aims to fill this gap by assessing the knowledge, attitudes, and practices of students at Senior High School Students regarding AI chatbots. It seeks to explore their perspectives, identify drivers and barriers to adoption, and provide insights into the practical challenges and benefits of integrating AI chatbots into science education. The findings will inform policymakers and educators, guiding the effective implementation of AI technologies in Filipino classrooms and contributing to the advancement of educational technology and pedagogy. By understanding the local context, this research will help shape strategies, policies, and professional development initiatives, harnessing the transformative potential of AI chatbots to enhance teaching and learning experiences in the Philippines.

Literature Review

The integration of AI chatbots into education is revolutionizing the learning landscape by offering personalized, real-time support to students and reducing administrative tasks for educators. These intelligent systems customize educational content to

individual learning styles, acting as virtual tutors and fostering dynamic, self-paced learning environments. AI chatbots also enhance pedagogy by promoting higher-order thinking skills through interactive and immersive experiences. However, their implementation presents challenges, including concerns about reliability, academic dishonesty, reduced human interaction, and the digital divide. While AI chatbots raise fears of job displacement among educators, they should be seen as tools that augment the educational process rather than replace teachers. This review explores the advantages, potential enhancements, and challenges of AI chatbots in education, emphasizing the need for ethical and equitable integration.

Advantages of AI Chatbots in Education

The integration of AI chatbots in the educational landscape has been transformative, offering numerous advantages that address the evolving needs of students and educators. These intelligent systems excel in delivering personalized learning experiences, adeptly analyzing student data to tailor educational content to individual learning styles and preferences. This level of customization ensures that each student's unique educational journey is supported and nurtured. Serving as virtual tutors, AI chatbots provide immediate feedback and guidance, assisting with assignments and quizzes in real-time, thereby fostering a dynamic learning environment where students can engage and progress at their own pace (Terblanche, et al., 2022).

Moreover, the role of chatbots extends beyond academic support; they significantly reduce the administrative burden on educators. By automating routine tasks, chatbots free educators to invest more time in meaningful interactions with students, thus enhancing the quality of education (Bekes, et al., 2023). This dual function of academic and administrative support positions AI chatbots as valuable assets in modern educational settings.

Potential of AI Chatbots to Enhance Pedagogy

The advent of AI chatbots heralds a significant shift in pedagogical practices. These advanced tools are not merely facilitators of knowledge but catalysts for developing higher-order thinking skills such as critical thinking, problem-solving, and creativity. AI chatbots simulate interactive and immersive learning environments, encouraging students to engage deeply with the material and fostering a more profound understanding of complex concepts (Jia, et al., 2023). (Estrellado, et al., 2023) emphasize that AI chatbots enhance pedagogy through their ability to provide instant feedback. This immediate response mechanism is pivotal in creating a responsive learning atmosphere where students can experiment, make mistakes, and learn in a safe and supportive virtual space.

However, it is imperative to address concerns regarding the reliability and accuracy of AI chatbots. The potential for these tools to inadvertently contribute to academic dishonesty is significant (Chocarro, et al., 2021). Ensuring the integrity of the educational process is paramount, and the deployment of AI chatbots must be approached with careful consideration of these ethical dimensions.

Challenges and Concerns

The implementation of AI chatbots within the educational sector is not without its challenges and concerns. Issues surrounding the reliability and accuracy of these chatbots are paramount for their effective integration (Kooli, 2023). The potential loss of human interaction and the subsequent impact on social-emotional learning opportunities cannot be ignored. Human interactions are crucial for developing interpersonal skills and emotional intelligence among students. Additionally, the ease with which AI chatbots can provide information might inadvertently encourage academic dishonesty if not properly managed. Technological accessibility also remains a significant barrier. The digital divide, which refers to the gap between those who have easy access to the internet and technology and those who do not, could be widened by the reliance on AI chatbots, potentially leading to further educational inequalities. This issue highlights the need for equitable access to technology to ensure that all students benefit from AI advancements. By embracing AI chatbots as complementary to human teachers, the education system can leverage the strengths of both to create a more efficient and effective learning environment.

METHODS

Research Design

This study utilized a quantitative cross-sectional study design using a stratified random sampling technique to select Science Students from Don Ruben E. Ecleo Sr. Memorial National High School. Data will be collected through self-administered survey questionnaires to identify participant profiles, assess chatbot utilization, and measure Knowledge, Attitude, and Practices related to AI chatbot usage in education. Statistical analysis, including descriptive analysis, will be used to analyze differences in the scores and chatbot utilization among different profile variables. Additionally, ethical considerations include obtaining ethical approval, obtaining informed consent, and ensuring data confidentiality. Limitations of the study may include potential bias in self-reported data, limitations in generalizability, and potential confounding variables.

Research Instruments

This study utilized a researcher made questionnaire on Knowledge, Attitude, and Practice (KAP) of AI utilization. The statistical range which corresponds to the Likert scale that was used to assess the participants' perception.

This study is based on the Knowledge, Attitude, and Practice (KAP) model, which originates from the Social Learning Theory of Aggression (Bandura, 1980) and Diffusion of Innovation Theory (Rogers, 1995). According to Rogers, the adoption of innovations within a social system occurs through four stages: knowledge acquisition, persuasion, decision, and confirmation. Bandura's theory suggests that behaviors are learned within a social context, while the Theory of Planned Behavior (Ajzen, 1991) links behavioral intention to attitudes. The KAP model is a framework for understanding human behavior by examining how knowledge influences attitudes, which in turn shape practices. Knowledge involves the understanding of information, categorized into scientific, local, tacit, and self-reflective knowledge. Attitudes are evaluations of objects, while practices are regular activities influenced by social norms.

Participants

The respondents of this study was the one hundred six (106) senior high school students, seventy five (75) from Science Technology, engineering and Mathematics (STEM) students and thirty one (31) Humanities and Social Sciences (HUMSS) students. The participants were selected using the stratified random sampling technique.

Table 1. Demographic Data of the Participants

Senior High Strand/Track	Male	Female	Total
STEM	26	49	75
HUMSS	11	20	31
	37	69	106

RESULTS AND DISCUSSION

The presentation, analysis, and interpretation of the data are all covered in this section.

Table 2. Demographic Data of the Participants (STEM Students)

Variables	F (n=75)	Percentage
Sex		
Male	26	34.67
Female	49	65.33
Age		
15-17 years old	65	86.67
18-20 years old	10	13.33
Year level		
Grade 11	42	56.00
Grade 12	23	30.67
AI Chatbot Preference		
Chatgpt	50	66.67
Microsoft copilot	10	13.33
Google bard	10	13.33
Others(Cici, Quill Bot)	10	13.33

Table 3. Demographic Data of the Participants (HUMSS Students)

Variables	F (n=31)	Percentage
Sex		
Male	11	35.48
Female	20	64.52
Age		
15-17 years old	25	80.65
18-20 years old	6	19.35
Year level		
Grade 11	23	74.19
Grade 12	8	25.81
AI Chatbot Preference		
Chatgpt	21	67.74
Microsoft copilot	3	9.68
Google bard	2	6.45
Others(Cici, Quill Bot)	5	13.33

Table 2 and 3 shows that in terms of sex there are more females rather than males and most of the respondents are from the Science Technology, engineering and Mathematics 70.75% of the total population. More respondents are on the Grade 11 Year Level which accumulates 61.32% of the total population. Meanwhile, there are more respondents ages 15-17 years old in the selected population which is 84.91% of the total population. Moreover, ChatGPT is considered to be the most preferred AI chatbot with 66.98% among the total population. Considering the profile of the respondents in this study helps us to assess the knowledge, attitudes, and practices of science students in utilizing artificial intelligence (AI) chatbots in Do Ruben E. ecleo Sr. Memorial National High School. The data gathered enabled the research to understand deeper and carefully analyze if there is a significant difference of the KAP when grouped according to profile variables.

Table 4. Extent of AI Chatbot Utilization of STEM and HUMSS Students in terms of Knowledge, Attitude, and Practice

Science Technology, engineering and Mathematics			
KNOWLEDGE			
Grade Level	Mean	Standard Deviation	Verbal interpretation
Grade 11	3.75	0.63	Extensive
Grade 12	4.29	0.42	Highly Extensive
ATTITUDE			
Grade 11	3.06	0.72	Moderately Extensive
Grade 12	3.83	0.76	Extensive

PRACTICES			
Grade 11	2.91	0.86	Moderately Extensive
Grade 12	3.44	0.69	Extensive
Humanities and Social Sciences			
KNOWLEDGE			
Grade Level	Mean	Standard Deviation	Verbal interpretation
Grade 11	3.75	0.63	Extensive
Grade 12	4.29	0.42	Highly Extensive
ATTITUDE			
Grade 11	3.06	0.72	Moderately Extensive
Grade 12	3.83	0.76	Extensive
PRACTICES			
Grade 11	2.91	0.86	Moderately Extensive
Grade 12	3.44	0.69	Extensive

Table 5. ANOVA Results

Age		Sum of Squares	df	Mean Square	F	Sig.	Decision
Knowledge	Between Groups	11.897	5	2.379	6.802	<.001	Reject
	Within Groups	34.980	100	.350			
	Total	46.877	105				
Attitude	Between Groups	22.764	5	4.553	8.569	<.001	Reject
	Within Groups	53.132	100	.531			
	Total	75.896	105				
Practices	Between Groups	10.233	5	2.047	2.624	.028	Reject
	Within Groups	77.994	100	.780			
	Total	88.226	105	2.379			
Year Level		Sum of Squares	df	Mean Square	F	Sig.	Decision
Knowledge	Between Groups	3.044	2	1.522	3.576	.032	Reject
	Within Groups	43.833	103	.426			
	Total	46.877	105				
Attitude	Between Groups	3.406	5	.681			

	Within Groups	39.887	93	.429	9.393	<.001	Reject
	Total	43.293	98				
Practices	Between Groups	4.226	2	2.113	2.591	0.080	Accept
	Within Groups	84.000	103	.816			
	Total	88.226	105				
Frequently Used AI		Sum of Squares	df	Mean Square	F	Sig.	Decision
Knowledge	Between Groups	3.406	5	.681	1.588	.171	Accept
	Within Groups	39.887	93	.429			
	Total	43.293	98				
Attitude	Between Groups	9.134	5	1.827	2.763	.023	Reject
	Within Groups	61.492	93	.661			
	Total	70.626	98				
Practices	Between Groups	12.422	5	2.484	3.711	.004	Reject
	Within Groups	62.265	93	.670			
	Total	74.687	98				

*Note: If sig. is less than 0.05, reject null hypothesis. If greater than 0.05, accept null hypothesis.

The ANOVA results provide useful insights into the variances in knowledge, attitude, and practice (KAP) regarding AI chatbot utilization among students, segmented by several demographic characteristics such as age, year level, and frequently utilized AI chatbots. The analysis of 'age' reveals considerable disparities in knowledge, attitude, and practice towards AI chatbots across age groups. The knowledge between-group variance is 11.897, with a significant F-value of 6.802 ($p < 0.001$). Therefore, the null hypothesis is rejected. This shows that students' knowledge of AI chatbots differs greatly by age. Similarly, for attitude, the between-group variance is 22.764 with a significant F-value of 8.569 ($p < 0.001$). This results in the rejection of the null hypothesis and suggests that age significantly influences students' attitudes towards AI chatbots. In practice, the between-group variance is 10.233, with a significant F-value of 2.624 ($p = 0.028$), resulting in the rejection of the null hypothesis. This shows that different age groups have distinct practices concerning AI chatbot usage.

Furthermore, when looking at the 'year level', the results show substantial variations in knowledge and attitude but not in practice. The knowledge between-group variance is 3.044 with a significant F-value of 3.576 ($p = 0.032$), which rejects the null hypothesis and indicates significant knowledge differences across year levels. The attitude between-group variance is 11.707, with a significant F-value of 9.393 ($p < 0.001$). This rejects the null hypothesis and indicates that views regarding AI chatbots differ significantly by year level. However, the practice between-group variance is 4.226, with a non-significant F-value of 2.591 ($p = 0.080$), supporting the null hypothesis that there are no significant changes in practices between year levels.

Finally, the results for 'commonly used AI chatbots' show no significant variations in knowledge, but considerable disparities in attitude and practice. The knowledge between group variance is 3.406, with a non-significant F-value of 1.588 ($p = 0.171$), supporting the null hypothesis and suggesting no significant variations in knowledge based on commonly used AI chatbots. However, the attitude between-group variance is 9.134 with a significant F-value of 2.763 ($p = 0.023$), rejecting the null hypothesis and indicating that attitudes about AI chatbots differ depending on which chatbot is frequently utilized. Similarly, the practice between-group variance is 12.422 with a significant F-value of 3.711 ($p = 0.004$), resulting in the rejection of the null hypothesis and demonstrating significant differences in practices based on the most often used AI chatbot.

Table 6. T-Test Result for Gender Variable

	Gender	Mean	Df	Sig.	Decision
Knowledge	Male	3.95	104	0.17	Accept
	Female	3.81	88.134		
Attitude	Male	3.32	104	.737	Accept
	Female	3.48	70.085		
Practice	Male	3.19	104	.282	Accept
	Female	3.19	63.751		

Table 6 investigate on gender. The for gender show knowledge is 3.95, while for 3.81, with a p- This suggests substantial

results disparities based T-Test findings that the mean score for males females it is value of 0.17. that there is no difference in

knowledge about AI chatbots between male and female students, hence the null hypothesis is accepted. The mean attitude score for males is 3.32, and for females, it is 3.48, with a p-value of 0.737, indicating that there is no significant difference in attitudes toward AI chatbots between genders, supporting the null hypothesis. Similarly, the mean practice score for males is 3.19, and for females, it is 3.19, with a p-value of 0.282, indicating that there is no significant difference in the use of AI chatbots between male and female students, leading to the acceptance of the null hypothesis.

Table 7 . T-Test Result for Track/Strand Variable

	Strand/Track	Mean	Df	Sig.	Decision
Knowledge	Science Technology Engineering and Mathematics (STEM)	3.85	104	.925	Accept
	Humanities and Social Sciences (HUMSS)	3.86	87.819		
Attitude	Science Technology Engineering and Mathematics (STEM)	3.63	104	.001	Accept
	Humanities and Social Sciences (HUMSS)	3.29	103.843		
Practice	Science Technology Engineering and Mathematics (STEM)	3.44	104	.348	Accept
	Humanities and Social Sciences (HUMSS)	3.03	102.493		

Table 7. On the other hand, results for the program variable show that the mean knowledge score for Science Technology Engineering and Mathematics (STEM) students is 3.85 and for Humanities and Social Sciences (HUMSS) students is 3.86, respectively, with a p-value of 0.925. This suggests that there is no substantial difference in knowledge of AI chatbots between the two programs, hence the null hypothesis is accepted. However, the mean attitude score for Science Technology Engineering and Mathematics (STEM) students is 3.63, whereas for Humanities and Social Sciences (HUMSS) students it is 3.29, with a p-value of 0.001, demonstrating a substantial difference in attitudes toward AI chatbots between the two programs, resulting in the rejection of the null hypothesis. The mean practice score for Science Technology Engineering and Mathematics (STEM) students is 3.44, and for Humanities and Social Sciences (HUMSS) students, it is 3.03, with a p-value of 0.348, indicating that there is no significant difference in the use of AI chatbots between the two programs, resulting in the acceptance of the null hypothesis.

Descriptive Analysis

For the Knowledge Domain, the average scores questions range from 3.72 to 4.23. This indicates that students generally have a good understanding and awareness of AI technologies. The highest average score is for Q1 (4.23), suggesting that students feel most knowledgeable about the content covered by this question. The lowest average score is for Q5 (3.72), indicating slightly less knowledge or confidence in the area addressed by this question. The standard deviation values range from 0.72 to 0.87, showing a moderate spread around the mean scores. Q1 has the lowest standard deviation (0.72), suggesting that students' responses were more consistent for this question. While, Q5 has the highest standard deviation (0.87), indicating greater variability in students' knowledge regarding this aspect of AI. On average, students score around 4 out of 5 across all questions, showing a high level of knowledge about AI. While most questions have moderate variability, there is some spread in the responses, particularly for Q5.

The analysis of the AI utilization attitude domain among students shows a generally positive perception towards AI, with mean scores ranging from 3.33 to 3.67 across ten questions. This indicates that, on average, students hold favorable attitudes towards AI. Question 1 (mean: 3.67) and question 8 (mean: 3.65) reflect the most positive attitudes, while question 7 (mean: 3.33) represents a slightly less favorable view. The standard deviations reveal that the responses are relatively consistent, with values mostly around 0.9 to 1.0. However, question 7 has a higher standard deviation (1.07), indicating more diverse opinions among students regarding this particular attitude towards AI. The collected data from this domain suggests that students generally have a positive attitude towards AI, though there is some variability in their views. Most students recognize the importance and benefits of AI, which is evident from the consistently high mean scores. The variability in responses highlights the need for targeted efforts to address any underlying concerns or misconceptions, especially regarding attitudes with higher standard deviations.

By fostering a deeper understanding and addressing specific issues, educators can further improve the overall perception of AI among students. The analysis of the AI utilization among students in the Practices domain reveals a generally moderate level of engagement. The mean scores for the ten questions range from 2.50 to 3.45, indicating that, on average, students are moderately utilizing AI. Notably, question 7 (mean: 3.45) stands out as the area where students engage most frequently or intensively with AI, while question 10 (mean: 2.50) reflects the least frequent usage. The standard deviations, which measure the variability in responses, show that there is moderate to high variability across different AI practices. For instance, questions 2, 3, 8, and 9 have standard deviations around 1.0, indicating diverse practices among students. In particular, question 10 not only has the lowest mean but also the highest standard deviation (1.24), suggesting a wide range of engagement levels with this specific practice.

This indicates that while students are moderately engaged with AI, their practices vary significantly. This suggests that while some students are frequently using AI, others are not, highlighting an area for potential improvement. To enhance AI utilization, it would be beneficial to increase awareness and provide targeted training and resources, especially for practices with lower mean scores and higher variability. Addressing the barriers to AI utilization could help standardize and elevate the overall level of engagement among students.

Conclusion

In conclusion, the study reveals insightful findings about the knowledge, attitudes, and practices (KAP) of students regarding AI tools. The demographic profile indicates a predominance of female respondents, with a significant number of students from the Science Technology Engineering and Mathematics. Most respondents were in their first year and aged between 15-167 years. ChatGPT emerged as the most preferred AI chatbot among the students, reflecting a strong inclination towards its use in educational settings. The results demonstrated a generally positive attitude towards AI chatbots, with mean scores indicating favorable perceptions and consistent responses among students. This positive outlook is crucial as it suggests a readiness among students to integrate AI tools into their learning processes. In terms of knowledge, the study found that students possess a moderate to high level of understanding of AI chatbots. This knowledge base is essential for effectively utilizing these tools in educational contexts.

However, variability in responses, especially concerning specific attitudes, highlights the need for addressing individual concerns and misconceptions. The analysis of practices revealed moderate engagement with AI chatbots, with notable differences in how frequently students used these tools. This variability underscores the necessity for targeted interventions to enhance AI utilization across the student body. The discussion on the benefits of AI chatbots in education highlighted their potential to provide personalized learning experiences and reduce administrative burdens on educators. However, challenges such as technological accessibility, potential academic dishonesty, and the fear of job displacement were also noted. Addressing these challenges is critical to maximizing the benefits of AI chatbots in education.

Recommendations

To further enhance the integration of AI chatbots in science education, several steps should be considered. First, increasing awareness and providing targeted training for students on how to effectively utilize AI tools can help bridge the gap in engagement levels. Educational institutions should ensure equitable access to technology to mitigate the digital divide and promote inclusive learning

environments. Additionally, addressing concerns about academic dishonesty through strict guidelines and monitoring can maintain the integrity of the educational process. Finally, continuous evaluation and adaptation of AI tools based on feedback and technological advancements will be crucial in maintaining their effectiveness and relevance in the dynamic field of education. By implementing these recommendations, Don Ruben E. Ecleo Sr. Memorial National High School can foster a more effective and inclusive learning environment that leverages the strengths of AI chatbots while addressing their inherent challenges.

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