



Usage of AI-based Learning Tools in Agricultural Education: Perceived Learning Outcomes and Attitude of Undergraduate Students

M. U. Bhaskar¹, M. Usha¹, N. Hareesha² and B. Srisailam³

¹Dept. of Agricultural Extension Education, Agricultural College, Bapatla- ANGRAU, A. P. (522 101), India

²Dept. of Agricultural and Horticultural Sciences, Vignan University, Vadlamudi, A. P. (522 213), India

³Dept. of Agricultural Extension Education, ICAR-National Research Centre on Camel, Bikaner, Rajasthan (334 001), India



Corresponding  udaybhaskarext@gmail.com

 0000-0002-5070-0991

ABSTRACT

The study was conducted during December, 2025 at the Agricultural College, Bapatla, Andhra Pradesh to examine the effectiveness of AI-based learning tools with respect to learning outcomes and attitude among undergraduate students. A sample of 120 undergraduate students was selected using purposive and proportionate random sampling techniques. Data were collected through a structured questionnaire comprising Likert-type statements and analysed using frequency, percentage, mean score and ranking techniques. The findings revealed that smartphones were the most commonly used devices for accessing AI-based learning tools, with mobile data serving as the primary source of internet connectivity. The majority of students reported a moderate level of daily usage of AI tools for academic purposes. Among the various AI platforms, ChatGPT emerged as the most widely used tool, followed by other AI-based applications. Students primarily utilized these tools for understanding difficult concepts, clarifying academic doubts, preparing assignments, obtaining instant information and supporting coursework activities. The results further indicated that the respondents possessed a generally favourable attitude towards AI-based learning tools, recognizing their usefulness in enhancing learning efficiency and academic performance. However, students also expressed concerns regarding excessive dependence on AI-generated responses and the need for responsible and ethical use. The study highlighted the growing role of AI in transforming agricultural education and emphasizes the importance of integrating AI literacy, ethical usage practices and digital competencies into the curriculum.

KEYWORDS: AI-based learning tools, learning outcomes, attitude

Citation (VANCOUVER): Bhaskar et al., Usage of AI-based Learning Tools in Agricultural Education: Perceived Learning Outcomes and Attitude of Undergraduate Students. *International Journal of Bio-resource and Stress Management*, 2026; 17(10), 01-07. [HTTPS://DOI.ORG/10.23910/1.2026.7225](https://doi.org/10.23910/1.2026.7225).

Copyright: © 2026 Bhaskar et al. This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License, that permits unrestricted use, distribution and reproduction in any medium after the author(s) and source are credited.

Data Availability Statement: Legal restrictions are imposed on the public sharing of raw data. However, author have full right to transfer or share the data in raw form upon request subject to either meeting the conditions of the original consents and the original research study. Further, access of data needs to meet whether the user complies with the ethical and legal obligations as data controllers to allow for secondary use of the data outside of the original study.

Conflict of interests: The author has declared that no conflict of interest exists.

1. INTRODUCTION

The rapid advancement of Artificial Intelligence (AI) has emerged as one of the most transformative developments of the twenty-first century, influencing diverse sectors including healthcare, industry, business, governance and education. In recent years, AI-powered applications have significantly reshaped educational practices by facilitating personalized learning, intelligent tutoring, adaptive assessment and learner-centered instructional approaches (Holmes et al., 2019). The emergence of generative AI platforms such as ChatGPT, Google Gemini, Microsoft Copilot and other large language model-based tools has further accelerated this transformation by enabling students to access information, generate content, clarify concepts and receive real-time academic assistance. Artificial intelligence is increasingly recognized as a powerful educational technology capable of enhancing learning experiences through personalized feedback, self-paced learning opportunities and improved access to educational resources (Chen et al., 2020; Alotaibi and Alshehri, 2023). Unlike conventional digital learning systems, AI-based learning tools provide interactive and adaptive learning environments that respond to the specific needs and preferences of learners. Recent systematic reviews have highlighted the growing role of AI in improving student engagement, learning efficiency and academic achievement across higher education institutions worldwide (Luo et al., 2025; Crompton and Burke, 2023). In the context of agricultural education, the integration of AI-based learning tools assumes particular importance because agriculture is inherently multidisciplinary, encompassing biological sciences, environmental sciences, economics, engineering and social sciences. Agricultural students are expected to develop both theoretical understanding and practical problem-solving abilities to address emerging challenges in the agricultural sector. Traditional teaching approaches, although effective, may not always accommodate the diverse learning requirements of students. Consequently, AI-based learning tools are increasingly being viewed as supplementary educational resources that can support continuous learning, concept clarification and academic skill development beyond classroom settings (Lazarus and Nlebem, 2026; Thamotharan et al., 2025). The relevance of AI in agricultural education has become even more significant with the growing adoption of artificial intelligence technologies in modern agriculture. Applications such as precision farming, smart irrigation, crop monitoring, disease diagnosis, yield prediction and decision-support systems are transforming agricultural production systems (Valova et al., 2024). Therefore, familiarizing agricultural students with AI-enabled technologies during their academic training is essential for preparing a future-ready agricultural workforce

capable of operating in digitally transformed agricultural environments. Despite the potential benefits of AI-based learning tools, concerns have also been raised regarding their impact on learning behaviour, critical thinking abilities and academic integrity. Excessive dependence on AI-generated responses may reduce independent thinking, analytical reasoning and problem-solving skills among learners (Cotton et al., 2024). Furthermore, the effectiveness of AI-assisted learning depends not only on the availability of technology but also on the perceptions, attitudes and acceptance levels of students. According to the Technology Acceptance Model, perceived usefulness and perceived ease of use are among the key determinants influencing adoption of technological innovations in educational settings. Attitude towards AI-based learning tools plays a crucial role in shaping students' willingness to adopt and utilize these technologies effectively. Students with favourable attitudes are more likely to engage actively with AI tools and derive meaningful educational benefits, whereas negative perceptions may hinder their utilization and learning outcomes (Pardamean et al., 2022; Chan and Hu, 2023). Therefore, examining students' attitudes alongside learning outcomes provides a comprehensive understanding of the educational effectiveness of AI-based learning tools. In view of the growing importance of AI in education and the limited empirical evidence available in the context of agricultural education, there is a need to systematically examine the effectiveness of AI-based learning tools with respect to students' learning outcomes and attitudes. Hence, the present study was undertaken to examine the effectiveness of AI-based learning tools with respect to learning outcomes and attitude among undergraduate students.

2. MATERIALS AND METHODS

The present study was conducted during December, 2025 at Agricultural College, Bapatla of Acharya N.G. Ranga Agricultural University. The population for the study comprised undergraduate students from first year to final year. A combination of purposive and proportionate random sampling techniques was employed for the selection of respondents. Initially, students who were using AI-based learning tools were purposively identified, as the study aimed to assess the effectiveness of such tools. From this identified group, respondents were selected randomly in proportion to their representation across different academic years. Thus, a total sample of 120 undergraduate students was constituted for the study.

Data was collected using a structured questionnaire developed in accordance with the objectives of the study. A set of Likert-type statements was used to measure attitude and learning outcomes, with responses recorded on a five-

point continuum ranging from strongly agree to strongly disagree. The statements were framed based on relevant literature, expert consultation and field relevance covering dimensions such as usefulness, conceptual understanding, self-directed learning and ethical considerations. The finalized questionnaire was administered to the respondents and care was taken to ensure clarity of questions and reliability of responses. The collected data were coded, tabulated and analysed using appropriate statistical tools such as frequency, percentage, mean score and ranking to draw meaningful interpretations.

3. RESULTS AND DISCUSSION

3.1. Digital access, usage behaviour and purpose of using AI-based learning tools among undergraduate students

3.1.1. Digital access and infrastructure of students

The data presented in Table 1 indicated that students operate within a mobile-centric digital ecosystem, which forms the foundational base for AI-based learning. A majority of respondents (37.50%) reported spending 1–2 h day⁻¹ on digital learning tools, suggesting a moderate level of engagement. The relatively lower proportion of students spending more than 3 h indicated that digital tools were primarily used as supplementary learning resources rather than primary study platforms.

Table 1: Digital access and infrastructure of students (n=120)

Component	Category	Frequency	Percentage (%)
Average daily time spent	< 1 h	39	32.50
	1–2 h	45	37.50
	2–3 h	19	15.83
	> 3 h	17	14.17
Internet access	Mobile data	115	95.83
	Wi-Fi	5	4.17
Devices used	Smartphone	108	90.00
	Laptop	12	10.00

The overwhelming dependence on mobile data (95.83%) and smartphones (90.00%) reflected the accessibility-driven adoption of AI tools. This highlighted that the effectiveness of AI-based learning was strongly influenced by portability, affordability and ease of access, rather than high-end infrastructure. However, such dependence might also limit the depth of engagement due to constraints such as screen size and data limitations.

3.1.2. AI-based learning tools used by students

Table 2 revealed that ChatGPT emerged as the dominant AI-based learning tool (89.17%), significantly outperforming

other platforms. This dominance could be attributed to its conversational interface, ability to generate structured responses and ease of use. The moderate usage of Google Gemini (55.83%) and other tools indicated partial diversification, while the low usage of Bing AI/Copilot suggested limited awareness or perceived utility.

Table 2: AI-based learning tools used by students (n=120)

Sl. No.	Tools used	Frequency*	Percentage (%)
1.	ChatGPT	107	89.17
2.	Google gemini / Bard	67	55.83
3.	Other AI tools	32	26.67
4.	Bing AI / Copilot	12	10.00

*Multiple responses

This pattern indicated that students tend to concentrate on a few highly accessible and familiar platforms, rather than exploring multiple AI tools. Such concentration might influence learning experiences, as dependency on a single tool could limit exposure to diverse knowledge sources.

3.1.3. Frequency of use of AI-based learning tools

It was evident from the Table 3 that nearly half of the respondents (48.33%) used AI tools frequently, indicating that AI has become an integral part of student's academic activities. However, the lower proportion of very frequent users (18.33%) suggested that AI tools were not yet the primary mode of learning but rather function as support systems.

Table 3: Frequency of use of AI-based learning tools (n=120)

Sl. No.	Frequency of Use	Frequency	Percentage (%)
1.	Very Frequently	22	18.33
2.	Frequently	58	48.33
3.	Occasionally	29	24.17
4.	Rarely	11	9.17
	Total	120	100.00

The presence of occasional and rare users indicated variability in usage behaviour, which might be influenced by factors such as digital literacy, academic needs and individual learning preferences. This reflected that AI adoption was progressive rather than uniform, highlighting the need for structured guidance to enhance effective utilization.

3.1.4. Purpose of using AI-based learning tools

The data in Table 4 clearly demonstrated that AI-based

learning tools were predominantly used for cognitive and academic purposes. The highest proportion of respondents used AI tools for understanding concepts (75.00%) and clarifying doubts (70.00%), indicating their strong role in enhancing conceptual learning.

Table 4: Purpose of using AI-based learning tools (n=120)

Sl. No.	Frequency of use	Frequency*	Percentage (%)
1.	Understanding concepts	90	75.00
2.	Clarifying doubts	84	70.00
3.	Exam preparation	67	55.83
4.	Assignment support	61	50.83
5.	General agriculture knowledge	55	45.83
6.	Practical problem solving	39	32.50

*Multiple responses

More than half of the respondents used AI tools for exam preparation and assignment support, suggesting their importance in academic performance-related activities. However, the relatively lower usage for practical problem solving (32.50%) highlighted a critical limitation, indicating that AI tools were currently less effective in addressing field-based and experiential learning needs in agriculture.

3.2. Perceived learning outcomes of AI-based learning tools among undergraduate students

The data presented in Table 5 below clearly elucidated

about the perceived effectiveness of AI-based learning tools in enhancing different dimensions of learning outcomes among undergraduate students. The statement “AI-based learning tools helped me understand difficult agricultural topics more easily” secured the first rank (Mean=3.94), with 76.67% of respondents expressing agreement. This clearly indicated that AI tools were highly effective in simplifying complex agricultural concepts. The probable reason might be the ability of AI tools to provide step-by-step explanations, instant clarification and simplified content, which enhanced comprehension, especially for difficult and abstract topics. The present findings corroborate the results of Holmes et al. (2019) and Chen et al. (2020), who emphasized that AI-supported learning environments improve conceptual understanding by providing adaptive explanations, personalized feedback and learner-centered instructional support. Similarly, Crompton and Burke (2023) reported that AI-assisted educational tools positively influence students’ comprehension and knowledge acquisition across diverse disciplines.

The second-ranked statement “Using AI tools improved my clarity in subjects that I previously found difficult” (Mean=3.89) further supported this observation, with 75.84% of respondents agreeing. This suggested that AI tools reinforced learning by offering multiple perspectives and repeated explanations, enabling students to achieve better clarity compared to traditional one-time classroom instruction. A similar improvement in subject clarity and learning confidence was reported by Pardamean et al. (2022), who found that AI-enabled personalized learning systems significantly enhanced students’ understanding by adapting

Table 5: Self-reported learning outcomes of AI-based learning tools (n=120)

Sl. No.	Statements	SA (%)	A (%)	N (%)	D (%)	SD (%)	Mean score	Rank
1.	AI-based learning tools helped me understand difficult agricultural topics more easily	26 (21.67)	66 (55.00)	24 (20.00)	3 (2.50)	1 (0.83)	3.94	I
2.	Using AI tools improved my clarity in subjects that I previously found difficult	23 (19.17)	68 (56.67)	23 (19.17)	5 (4.17)	1 (0.83)	3.89	II
3.	AI-based learning tools helped me improve my academic performance or grades	16 (13.33)	49 (40.83)	41 (34.17)	12 (10.00)	2 (1.67)	3.54	VI
4.	AI-based learning tools reduced my dependence on rote memorization for learning agriculture subjects	13 (10.83)	50 (41.67)	43 (35.83)	10 (8.33)	4 (3.33)	3.48	VII
5.	Using AI-based learning tools increased my confidence in learning agriculture subjects	13 (10.83)	56 (46.67)	38 (31.67)	10 (8.33)	3 (2.50)	3.55	IV
6.	AI tools helped me explain agricultural concepts more clearly during exams, discussions or presentations	21 (17.50)	66 (55.00)	27 (22.50)	6 (5.00)	0 (0.00)	3.85	III
7.	My overall learning effectiveness has improved after I started using AI-based learning tools	18 (15.00)	46 (38.33)	49 (40.83)	6 (5.00)	1 (0.83)	3.54	V

SA: Strongly agree; A: Agree; N: Neutral; D: Disagree; SD: Strongly disagree

educational content to individual learning needs.

The statement “AI tools helped me explain agricultural concepts more clearly during exams, discussions or presentations” ranked third (Mean=3.85), with a substantial proportion of respondents agreeing. This indicated that AI tools not only enhanced understanding but also improved knowledge articulation and communication skills. The probable reason might be that AI-generated structured responses helped students organize their thoughts more effectively during exams and discussions.

The statement “Using AI-based learning tools increased my confidence in learning agriculture subjects” ranked fourth (Mean=3.55), indicating a moderate positive influence. While 57.50% of respondents agreed, a considerable proportion remained neutral. This suggested that although AI tools supported learning, confidence building depended on individual engagement and depth of usage, which might vary among students.

The statement on “My overall learning effectiveness has improved after I started using AI-based learning tools” ranked fifth (Mean=3.54), with a high proportion of neutral responses (40.83%). This indicated that students perceived AI tools as beneficial, but their impact was not uniformly strong across all aspects of learning. The variability might be attributed to differences in learning styles, frequency of usage and the extent of reliance on AI tools.

The statement “AI-based learning tools helped me improve my academic performance or grades” ranked sixth (Mean=3.54), suggesting a moderate impact. Although more than half of the respondents expressed agreement, a significant proportion remained neutral or disagreed. This indicated that while AI tools facilitated learning, their direct influence on academic performance was indirect and mediated by other factors such as study habits, evaluation methods and individual effort.

The lowest ranked statement was “AI-based learning tools reduced my dependence on rote memorization for learning agriculture subjects” (Mean=3.48), indicating limited effectiveness in changing traditional learning practices. The relatively higher neutral and disagreement responses suggested that students continued to rely on memorization despite using AI tools. The probable reason might be that academic assessments still emphasized recall-based evaluation, thereby reinforcing rote learning behaviour.

The overall findings indicated that AI-based learning tools have a predominantly positive influence on students’ learning, particularly in enhancing conceptual understanding, clarity of subjects and the ability to articulate knowledge effectively, thereby strengthening the cognitive domain of learning. However, their impact on academic performance, reduction in rote memorization and overall learning effectiveness

appeared to be moderate, suggesting that these tools function more as supportive aids rather than transformative solutions.

The overall positive influence of AI tools on learning outcomes observed in the present study is supported by Luo et al. (2025) and Alotaibi and Alshehri (2023), who concluded that AI-based educational systems contribute significantly to learning effectiveness, student engagement and academic performance when used appropriately.

3.3. Attitude of students towards AI-based learning tools in agricultural education

The data presented in Table 6 below revealed about the attitude of undergraduate students towards AI-based learning tools in agricultural education. The analysis of mean scores, ranks and response distribution indicated that students possessed a favourable yet cautious attitude towards the use of AI tools.

The statement related to the negative impact of excessive dependence on AI tools secured the first rank (Mean=4.33), with a majority of respondents expressing agreement. This indicated a high level of awareness among students regarding the potential risks of over-reliance on AI, particularly in relation to independent thinking. The probable reason might be that students recognized that excessive dependence could reduce analytical ability and critical thinking skills. Similar concerns have been expressed by Cotton et al. (2024) and Chan and Hu (2023), who reported that students and educators recognized the risk of overdependence on AI-generated content, which may adversely affect critical thinking, creativity and independent problem-solving abilities.

The statement “AI-based learning tools are useful for agriculture students” ranked second (Mean=4.13), with nearly 89.17% of respondents agreeing. This reflected strong acceptance of AI tools as valuable learning aids. Similarly, the need for training on ethical and effective use of AI tools ranked third (Mean=4.00), indicating that students acknowledged the importance of guided usage and institutional support.

The statement that AI tools should complement rather than replace teachers ranked fourth (Mean=3.93), suggesting that students preferred a blended learning approach. The probable reason might be that traditional teaching provided contextual and experiential learning, while AI tools served as supportive resources. Similar views were reported by Holmes et al. (2019) who argued that AI should function as an assistive educational technology supporting teachers rather than replacing the human dimensions of teaching, mentoring and experiential learning.

Statements related to engagement (Mean=3.91) and self-

Table 6: Attitude towards AI-based learning tools in agricultural education (n=120)

Sl. No.	Statements	SA (%)	A (%)	N (%)	D (%)	SD (%)	Mean Score	Rank
1.	AI-based learning tools are useful for agriculture students	29 (24.17)	78 (65.00)	12 (10.00)	1 (0.83)	0 (0.00)	4.13	II
2.	AI-based learning tools make agricultural education more interesting and engaging	27 (22.50)	60 (50.00)	28 (23.33)	5 (4.17)	0 (0.00)	3.91	V
3.	AI-based learning tools help improve the quality of agricultural education	23 (19.17)	62 (51.67)	29 (24.17)	5 (4.17)	1 (0.83)	3.84	VII
4.	AI-based learning tools should complement classroom teaching, not replace teachers	35 (29.17)	55 (45.83)	17 (14.17)	12 (10.00)	1 (0.83)	3.93	IV
5.	I feel comfortable using AI-based learning tools for academic learning in agriculture	20 (16.67)	59 (49.17)	27 (22.50)	12 (10.00)	2 (1.67)	3.69	X
6.	AI-based learning tools encourage self-directed learning among students	23 (19.17)	61 (50.83)	29 (24.17)	7 (5.83)	0 (0.00)	3.83	VIII
7.	Excessive dependence on AI-based learning tools may negatively affect independent thinking skills	60 (50.00)	42 (35.00)	16 (13.33)	2 (1.67)	0 (0.00)	4.33	I
8.	AI-based learning tools can support personalized learning according to individual student needs	13 (10.83)	77 (64.17)	27 (22.50)	3 (2.50)	0 (0.00)	3.83	IX
9.	The use of AI-based learning tools prepares students for future digital agriculture careers	16 (13.33)	67 (55.83)	29 (24.17)	8 (6.67)	0 (0.00)	3.76	XI
10.	Training on ethical and effective use of AI-based learning tools should be included in the curriculum	30 (25.00)	63 (52.50)	24 (20.00)	3 (2.50)	0 (0.00)	4.00	III

SA: Strongly agree; A: Agree; N: Neutral; D: Disagree; SD: Strongly disagree

directed learning (Mean=3.83) indicated that AI tools enhanced student interest and promote independent learning behaviour. However, the moderate mean scores suggested that the level of engagement might vary depending on how effectively students utilize these tools.

The perception that AI tools improved the quality of agricultural education (Mean=3.84) and supported personalized learning (Mean=3.83) further indicated positive acceptance. These findings suggested that students recognized the potential of AI tools to cater to individual learning needs, although their full potential might not yet be realized.

Relatively lower mean scores were observed for comfort in using AI tools (Mean=3.69) and their role in preparing students for future careers (Mean=3.76). This indicated that some students might still be in the process of adapting to AI-based learning or were uncertain about its long-term implications in professional contexts.

The overall analysis indicated that undergraduate students possessed a favourable yet cautious attitude towards AI-based learning tools, characterized by strong recognition of their usefulness and potential in enhancing learning, alongside a clear awareness of the risks associated with excessive dependence. Students perceive AI tools as supportive

aids that complement traditional teaching, promoted engagement and self-directed learning and offered scope for personalized education. However, moderate perceptions regarding comfort and future applicability suggested that adaptation to AI-based learning was still evolving. These findings highlighted that while students were receptive to AI integration in agricultural education, effective utilization required guided usage, ethical training and alignment with educational practices to maximize benefits while minimizing potential drawbacks.

3.4. Overall attitude of students towards AI-based learning tools

The data presented in Table 7 revealed that majority of the respondents (70.83%) were found to possess a moderately favourable attitude towards AI-based learning tools, while still maintaining a balanced and cautious approach. A smaller proportion of respondents (14.17%) exhibited a highly favourable attitude, suggesting that only a limited group of students have fully embraced AI-based learning tools and were highly confident in their benefits. This might be attributed to higher levels of digital literacy, frequent usage and better understanding of AI tools. On the other hand, 15.00% of respondents were categorized under less favourable attitude, indicating that a section of students still hold reservations regarding the use of AI-based learning

tools. This might be due to concerns related to reliability of information, lack of familiarity or fear of over-dependence.

Table 7: Distribution of students according to their attitude towards AI-based learning tools (n=120)

Sl. No.	Frequency of use	Frequency	Percentage (%)
1.	Less favourable attitude	18	15.00
2.	Moderately favourable attitude	85	70.83
3.	Highly favourable attitude	17	14.17
	Total	120	120

4. CONCLUSION

Agricultural students generally possessed a favourable attitude towards AI-based learning tools and perceived them as valuable supplementary resources for enhancing learning. Although the level of adoption remained moderate, AI tools were found to support information access, conceptual understanding and academic engagement. The findings highlighted the need for AI literacy training, faculty guidance, supportive policies and improved digital infrastructure to facilitate the effective, ethical and educationally meaningful integration of AI tools in agricultural education.

5. REFERENCES

Alotaibi, N.S., Alshehri, A.H., 2023. Prospects and obstacles in using artificial intelligence in Saudi Arabia higher education institutions-The potential of AI-based learning outcomes. *Sustainability* 15(13), 10723. DOI: <https://doi.org/10.3390/su151310723>.

Chan, C.K.Y., Hu, W., 2023. Students' voices on generative AI: Perceptions, benefits, challenges and implications for higher education. *International Journal of Educational Technology in Higher Education* 20, 43. DOI: <https://doi.org/10.1186/s41239-023-00411-8>.

Chen, L., Chen, P., Lin, Z., 2020. Artificial intelligence in education: A review. *IEEE Access* 8, 75264–75278. DOI: <https://doi.org/10.1109/ACCESS.2020.2988510>.

Cotton, D.R.E., Cotton, P.A., Shipway, J.R., 2024. Chatting and cheating: Ensuring academic integrity in the era of ChatGPT. *Innovations in Education and Teaching International* 61(2), 228–239. DOI: <https://doi.org/10.1080/14703297.2023.2190148>.

Crompton, H., Burke, D., 2023. Artificial intelligence in higher education: The state of the field. *International*

Journal of Educational Technology in Higher Education 20, 22. DOI: <https://doi.org/10.1186/s41239-023-00392-8>.

Holmes, W., Bialik, M., Fadel, C., 2019. Artificial intelligence in education: promises and implications for teaching and learning. Center for Curriculum Redesign. Available from: https://www.researchgate.net/publication/332180327_artificial_intelligence_in_education_promise_and_implications_for_teaching_and_learning.

Lazarus, S.T., Nlebem, B.S., 2026. Integration of artificial intelligence in practical agricultural activities for students' skill development in rivers state. *International Journal of Educational Management, Rivers State University* 2(2), 141–153. Available from: https://www.researchgate.net/publication/404805696_integration_of_artificial_intelligence_in_practical_agricultural_activities_for_students_skill_development_in_rivers_state.

Luo, J., Zheng, C., Yin, J., Teo, H.H., 2025. Design and assessment of AI-based learning tools in higher education: A systematic review. *International Journal of Educational Technology in Higher Education* 22(1), 42. Available from: <https://link.springer.com/article/10.1186/s41239-025-00540-2>.

Pardamean, B., Suparyanto, T., Cenggoro, T.W., Sudigyo, D., Anugrahana, A., 2022. AI-based learning style prediction in online learning for primary education. *Ieee Access* 10, 35725–35735. Available from: https://www.researchgate.net/publication/359294466_ai-based_learning_style_prediction_in_online_learning_for_primary_education.

Thamotharan, B., Sriram, A.L., Kalyanaraman, H., Bhalarao, Y.R., 2025. An ai-based efficient method for remote experimentation and learning analytics using IoT for agricultural students. In: *Revolutionizing Education with Remote Experimentation and Learning Analytics*. IGI Global Scientific Publishing, pp. 1–18. Available from: https://www.researchgate.net/publication/390298065_an_ai-based_efficient_method_for_remote_experimentation_and_learning_analytics_using_iiot_for_agricultural_students.

Valova, I., Mladenova, T., Kanev, G., 2024. Students' perception of ChatGPT usage in education. *International Journal of Advanced Computer Science & Applications* 15(1). Available from: <https://thesai.org/Publications/ViewPaper?Volume=15&Issue=1&Code=IJACSA&SerialNo=43>.