Assessing Artificial Intelligence (AI) Literacy among Students at the Higher School of Saharan Agriculture Adrar, Algeria

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***Abstract*—AI literacy enables agricultural engineers to harness the best of machine learning and transform raw data into concrete actions for solving agricultural problems. The purpose of this research is to assess AI literacy among the students of Adrar Higher School of Saharan Agriculture. This exploratory study opted for a mixed-methods approach using different types of instruments for gathering data. Triangulation of methods is used to check and get more valid and reliable results. The sample consists of 56 third-year students. The main findings show that students are familiar with generative AI tools but are less familiar with specialized agricultural platforms. The respondents demonstrate limited awareness of the importance of effective prompt writing, evaluating the accuracy of AI-generated information, understanding ethical considerations, and the limitations of AI models. Therefore, the findings highlight the importance of raising students' awareness about the importance of AI literacy, focusing on its practical aspect, and providing students with access to advanced AI-powered applications.**

Keywords—AI literacy – agriculture - higher education – Adrar - Algeria.

Résumé : La littératie en intelligence artificielle permet aux ingénieurs agronomes d'exploiter le potentiel de l'apprentissage automatique et de transformer les données brutes en actions concrètes visant à résoudre les problèmes agricoles. Cette modeste étude vise à évaluer le niveau de littératie en IA chez les étudiants de l'École Supérieure d'Agriculture Saharienne d'Adrar. Elle a opté pour une approche mixte en associant différents types d'instruments pour la collecte des données. La triangulation des méthodes a été son outil afin de vérifier les résultats et d'en améliorer la validité et la fiabilité. L'échantillon est composé de 56 étudiants de troisième année. Les principaux constats révèlent que les étudiants sont, de plus en plus, familiarisés avec les outils d'IA générative, par contre, ils connaissent moins bien les plateformes spécialisées dans le domaine. Les répondants sont également moins conscients de l'importance de la formulation efficace des prompts, de l'évaluation des informations générées, de la compréhension des considérations éthiques et des limites des modèles d'IA. En conséquence, les résultats soulignent l'importance de sensibiliser les étudiants à la littératie en IA, tout en mettant l'accent sur ses applications pratiques dans le domaine de l'agronomie et en leur donnant accès à des applications avancées basées sur l'IA.

Mots- clés : Littératie en intelligence artificielle – agriculture – enseignement supérieur – Adrar – Algérie

I. INTRODUCTION

The beginning of the third millennium witnessed a remarkable expansion in the use of artificial intelligence across all sectors, fields, and aspects of human life, and it is therefore not surprising that agriculture has become one of the major sectors to benefit from its applications.

Throughout its history, the agricultural sector has undergone remarkable transformations in terms of the technologies employed. In its early stages, Agriculture 1.0 relied primarily on human and animal labour. In the second stage, Agriculture 2.0 shifted toward the use of synthetic fertilizers, pesticides, and mechanized machinery. The third stage, Agriculture 3.0, was characterized by the adoption of digital technologies, including GPS and the Internet of Things (IoT). Finally, and most recently, Agriculture 4.0 has taken a further leap forward by integrating AI-driven analytics, robotics, and advanced environmental sensing technologies (NAWAZ et al., 2025).

AI literacy enables future agricultural engineers to harness the best of machine learning and transform raw data collected by sensors, drones, and satellites into concrete actions for solving agricultural problems such as desertification, soil salinization, water scarcity, etc. This will help professionals to optimize scarce resources, automate complex irrigation, and secure food production in fragile desert ecosystems ((ARANGURI et al., 2025; KISLIUK et al., 2024; NAWAZ et al., 2025; REINA, 2024; SON et al., 2024)

The Higher School of Saharan Agriculture of Adrar _ ESASA-Adrar _is a national academic institution created on December 26th, 2021, by Presidential Decree No. 21-520 for training intellectual elites and agricultural engineers. The school's activities rest upon two core pillars: scientific

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research and educational training. Building upon these foundations, the school aims, on the one hand, to develop scientific and practical solutions to the various problems, obstacles, and challenges facing crop production in desert regions. On the other hand, it aims to establish a scientific basis for sustainable desert agriculture by employing modern technologies in the cultivation of strategic crops and by integrating renewable energy into diverse agricultural activities. The school opened its doors for the first time in the 2021–2022 academic year. It currently offers two specializations—Crop Production and Food Industries—and is actively working to expand its training programs by introducing new specializations.

The school is located in Adrar, a wide southern wilaya with promising prospects for strengthening Algeria's national food security and advancing the development of desert agriculture. It is a key Saharan agricultural hub in Algeria with an emphasis on strategic crops such as wheat, maize, and cotton, supported by substantial investments, center-pivot irrigation systems, and international agro-industrial enterprises aimed at enhancing national food security (Adrar .Agriculture, 2026)

Artificial intelligence, encompassing its study, applications, and the development of a robust understanding of its principles, has emerged as a subject of paramount importance in both education and research. This prominence stems from AI's essential role in enabling users to harness the best of its services to the hilt. However, research on AI literacy—particularly within the Algerian higher education context and, more specifically, in agricultural sciences—remains scant, and in the southern regions it is scarcely available. Accordingly, within this framework, the present study assumes considerable significance as it aims to examine the perspectives of students at Adrar Higher School of Saharan Agriculture regarding artificial intelligence and to evaluate their comprehension of its fundamentals, inputs, outputs, potential, and limitations.

This study primarily provides policy-makers with robust data on the current state of AI from the learner's perspective, thereby narrowing the divide between theory and practice, between expectations and actual outcomes, between optimal applications and actual applications, and, indeed, between teachers and learners. Second, it contributes to the design or revision of educational curricula to align with real-world conditions and needs, thereby supporting more effective and seamless attainment of intended objectives. Lastly, the research addresses the knowledge gap concerning AI literacy within higher education.

The main objective of this study is to assess AI literacy among students at the Higher School of Saharan Agriculture, and identify ways to integrate AI literacy into the curriculum. This objective can be broken down into the following specific objectives:

• To assess students' overall level of AI literacy.

• To examine students' AI literacy in terms of knowledge, application and practical skills, evaluation and critical thinking, and ethics.

• To suggest recommendations for integrating AI literacy into the curriculum.

In order to attain these objectives, three main research questions were formulated:

1. What is the overall level of AI literacy among students at ESASA-Adrar?
2. How do students perform across the main dimensions of AI literacy (knowledge, application/skills, evaluation/critical thinking, and ethics)?
3. What recommendations can be made for integrating AI literacy into the curriculum?

II. Literature Review

A. Definition of AI Literacy

Before we tackle the concept of "Artificial Intelligence Literacy" as one entity, i.e. in a synthetic way, let us first break it down and study it in an analytic way.

First, let us start from the end, i.e., from the term "literacy". The classic definition of the term literacy is the ability to read, write and count; however, in this digital era the modern definition of this term also encompasses "*means of identification, understanding, interpretation, creation, and communication in an increasingly digital, text-mediated, information-rich and fast-changing world.*" (UNESCO: Literacy, n.d.)

Second, Artificial Intelligence, often abbreviated as AI, refers to "*a machine-based system and the branch of computer science focused on creating systems capable of performing some tasks that typically require human intelligence, such as understanding language, recognizing patterns, and making decisions*" (What Is AI?, 2026). This term was officially brought to light by Minsky and McCarthy in 1956 during the Dartmouth Conference.

AI literacy, as a concept, is still evolving, but some definitions are widely cited and have become foundational in research and education. The European Commission (Artificial Intelligence Act, 2024) defines AI literacy as "*the skills, knowledge, and understanding that allow providers, deployers, and affected persons to make an informed deployment of AI systems while being aware of the opportunities, risks, and possible harm AI can cause*" (EU Artificial Intelligence Act | Up-to-Date Developments and Analyses of the EU AI Act, 2024)**.** Long & Magerko, for instance, see AI literacy as "*a set of competencies that enables individuals to critically evaluate AI technologies; communicate and collaborate effectively with AI; and use AI as a tool online, at home, and in the workplace*" (2020).

B. Conceptualization ofAI literacy

Given the growing importance of AI literacy, several models have emerged to facilitate the teaching and learning of artificial intelligence. Among these, the four-dimensional framework presented below is one of the most prominent and widely adopted models.

C. The four dimension AI literacy Framework

Seeking to develop a common framework that brings together the aspects of AI literacy on which researchers have reached a consensus, Ng et al. (2021) reviewed more than thirty articles and, based on their analysis, proposed a four-dimensional AI literacy framework.

A. **Know and understand AI**

In this regard, AI literacy can be understood as the ability to understand the basic techniques and concepts behind AI in different products and services. In other words, learners should develop foundational concepts, knowledge, skills, and attitudes related to AI without necessarily requiring prior technical expertise. The objective is to enable learners to understand the technologies underlying AI and to develop the confidence and readiness needed to engage with AI-related learning. For this reason, some scholars have associated AI literacy with learners' perceived abilities, confidence, and readiness to learn about and interact with AI (Ng et al., 2021). For instance, Druga et al. (2019) proposed curriculums that emphasize how learners understand and develop foundational AI concepts.

B. **Use and apply AI**

The second aspect focuses on enabling learners to understand and apply AI-related concepts in different contexts and applications in everyday life. Some researchers, such as Rodríguez-García et al. (2020), examined a machine learning model to enhance understanding of different AI applications, their use in everyday life, and the ethical issues associated with them.

C. **Evaluate and create AI**

The third aspect of AI literacy involves engaging learners in higher-order thinking tasks. Besides knowing AI concepts and using their related applications and practices, some researchers have expanded more AI literacy to include two other skills. The latter have to with individuals' ability to critically evaluate AI technologies and apply technological knowledge to solve practical problems (Ng et al., 2021).

D. **AI ethics**

Ethics is a branch of philosophy (Ethics, n.d.) and it is "*based on well-founded standards of right and wrong that prescribe what humans ought to do, usually in terms of rights, obligations, benefits to society, fairness, or specific virtues*." (What Is Ethics?, n.d.). AI ethics has to do with the human principles and moral values that should govern the use of AI applications and activities.

D. Bloom's taxonomy

Bloom's Taxonomy is a classification of the different dimensions of human learning. It consists of six hierarchical levels, arranged from the simplest to the most complex, with progression from one cognitive level to the next based on mastery of the preceding level. The importance of this taxonomy lies, first, in its connection between learning and action or behaviour; therefore, experts have associated each level with a set of appropriate action verbs. Second, it helps in designing course inputs and assessing learning outcomes by providing a basis for varying exercises according to the different learning levels (Bloom, 1956). For this reason, Ng et al. considered it appropriate to link their own framework to Bloom's architecture and map its dimensions onto Bloom's levels, given that they share the same overarching goal: learning, and, in this particular context, developing AI literacy (Ng et al., 2021).

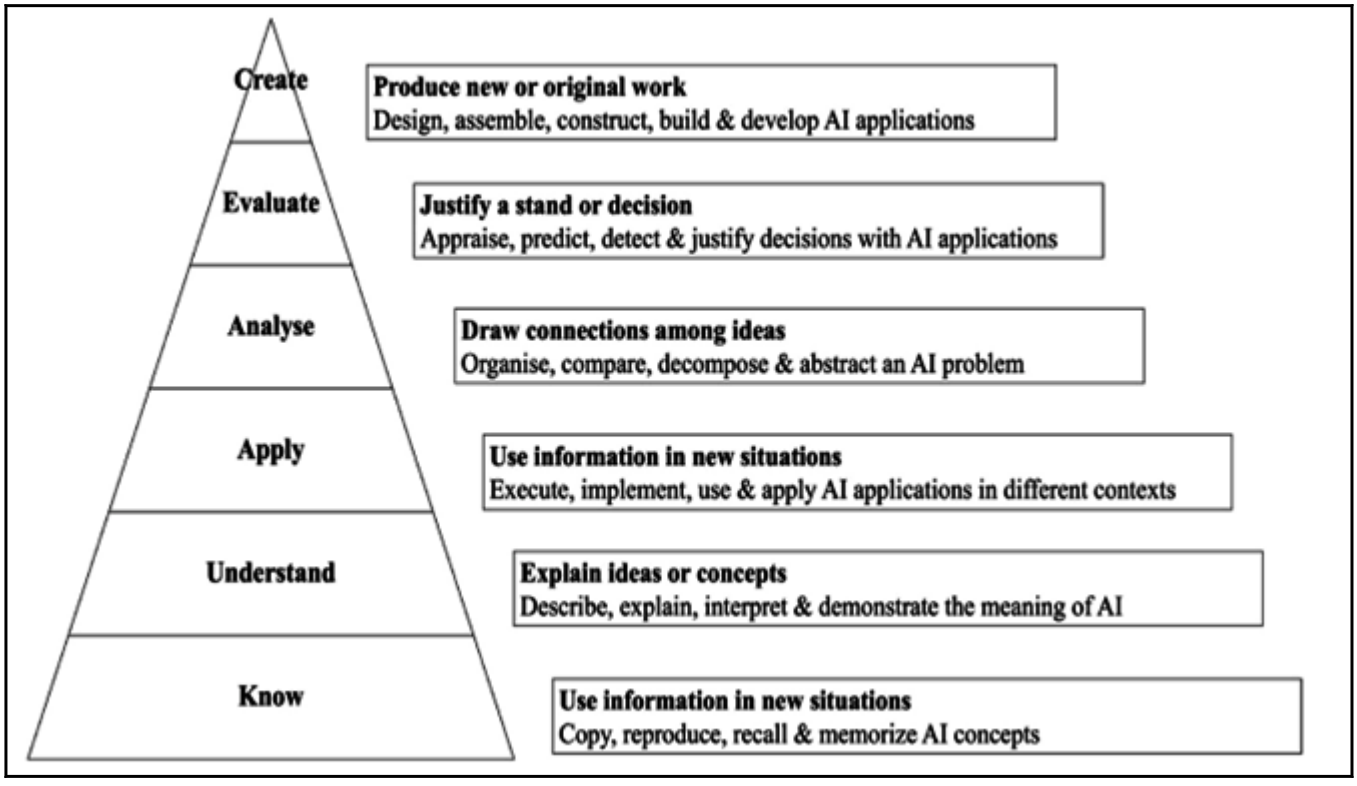


Fig. 1. Bloom's Taxonomy and AI literacy(Ng et al., 2021).

E. AI Literacy in Higher Education

Artificial intelligence has permeated almost every sector and aspect of life, including higher education, as evidenced

by AI-driven applications ranging from step-by-step personalized instructional and dialogue systems, analysis of student writing, intelligent agents in game-based environments, and student-support chatbots to AI-facilitated student–tutor matching (HOLMES et al., 2019). This widespread integration of AI into education has led to the emergence of a distinct field of study devoted to examining this phenomenon, namely, Artificial Intelligence in Education (AIED).

F. AI Literacy in Algeria: Texts and Context

In its pursuit of keeping pace with global developments in AI, Algeria has adopted a comprehensive vision within the framework of the Digital Algeria 2030 agenda. This vision aims to boost the digital transformation of various sectors. To this end, Algeria has introduced a series of measures, established specialized institutions, and enacted laws and regulations designed to advance digitalization in general and AI in particular, which remains a strategic priority for the country.

G. Institutional Framework and Legislative Texts

Within this framework, Algeria has established the High Commission for Digitalization, which is responsible for overseeing the implementation of the Digital Algeria 2030 agenda (High Commission for Digitalization, 2026). Its main initiatives include:

- Adopting a unified national strategy for the promotion of AI, i.e., the National Artificial Intelligence Strategy (2020–2030).
- Targeting a 7% contribution to GDP from AI and emerging technologies by 2027 (AlgeriaTech, 2026; TechAfrica News, 2026).
- Establishing a National Artificial Intelligence Council to ensure coordination and coherence in implementation across government ministries.
- Developing AI competence centers and cloud infrastructure through partnerships with leading technology providers such as Huawei, NVIDIA, and Google Cloud.

Since its adoption in 2020, the National Artificial Intelligence Strategy has introduced a number of key measures and taken several decisions such as:

- The establishment of the Artificial Intelligence Center (SKAILAB): The first national AI centre in Algeria, SKAILAB, was established in February 2020 at the University of Skikda. Its main aim is to provide solutions for economic and industrial problems, besides ensuring professional training for personnel in computing and AI (*Artificial Intelligence Excellence Laboratory Skikda University (SKAILAB)*, 2026; BENHAH & OUASSAA, 2025).
- The creation of the National Higher School of Artificial Intelligence (ENSIA): This is a higher academic institution devoted to training specialized engineers in AI and data science (BENHAH & OUASSAA, 2025; *National School of Artificial Intelligence (ENSIA)*, 2026).
- The National Higher School of Mathematics (NHSM): Officially opened its doors in 2021, this educational institution is meant to provide the AI job market with highly qualified personnel and specialized engineers in mathematics (BENHAH & OUASSAA, 2025; *National Higher School of Mathematics (NHSM)*, 2026).

H. Context: population and digital infrastructure

According to the UN report of 2026, the Algerian population is nearly 47.6 million, of whom 49.0 % are female and 51.0 % are male. Meanwhile, 76.3 % of them live in cities and urban centers, whereas 23.7 % live in remote rural areas. The Algerian society can be said to be young, i.e., the median age is 28.6 years, and nearly 9.3 % are aged between 18 and 24 (Digital 2026, 2025).

On the one hand, the total number of active cellular mobile connections is 55.6 million, in other words, this is equivalent to 117 % of the total population. Besides, the number of individuals using the internet in Algeria is 37.8 million and online penetration reaches 79.5 % (Digital 2026, 2025).

But, on the other hand, the 2016 ITU (International Telecommunication Union) report stated that Algeria demonstrated a weak ICT leverage effect, with one of the lowest levels of economic and social impact worldwide. The same report emphasized that this was due to inadequate technological infrastructure, combined with a limited skills base resulting in very low levels of ICT utilization (ABOURA, 2025).

In its 2026 ICT Development Index (IDI) ranking, the International Telecommunication Union placed Algeria 74th out of 164 countries surveyed (ICT Development Index, 2026). In 2025, with regard to technology and innovation, Algeria ranked 115 out of 139 economies, i.e., it is among the lowest-performing countries worldwide (Global Innovation Index, 2025). According to the SCImago Journal **&** Country Rank, Algeria ranked seventh among Arab countries and 59th worldwide in scientific publication output over the 1996-2024 period (Zeravan Abdulmuhsen Asaad et al., 2026). Moreover, the Algerian government allocated only 0.44 % of GDP to research and development, compared with a global average of 1.92% (DataBank: World Development Indicators, 2025; R&D Expenditure (% of GDP) — Algeria, 2024)**.**

Zehaira (2023) went so far as to state that Algeria experienced a digital divide and she concluded that this was due to five main factors:

1. A lack of digital skills required for the effective use of information and communication technologies.
2. The high cost of access to communication services.
3. The absence of a robust legal framework governing the use of internet users' data.
4. Limited interest and investment by businesses in ICT adoption.
5. Weak technological infrastructure (ACHILI & ZERROUKI, 2024).

I. AI in Agriculture

On the one hand, agriculture is one of the oldest and most important activities practiced by human beings due to its connection to feeding the world’s growing population.

On the other hand, AI technologies are among the latest discoveries of the human mind. Since the development in agriculture is tightly linked to the technology used, this field is a strong candidate to open its doors to the whole spectrum of AI technology. And of course, field specialists argue that agriculture is one of the major fields of AI application, with AI technologies being increasingly used across a wide range of agricultural activities. (KISLIUK et al., 2024; NAWAZ et al., 2025).

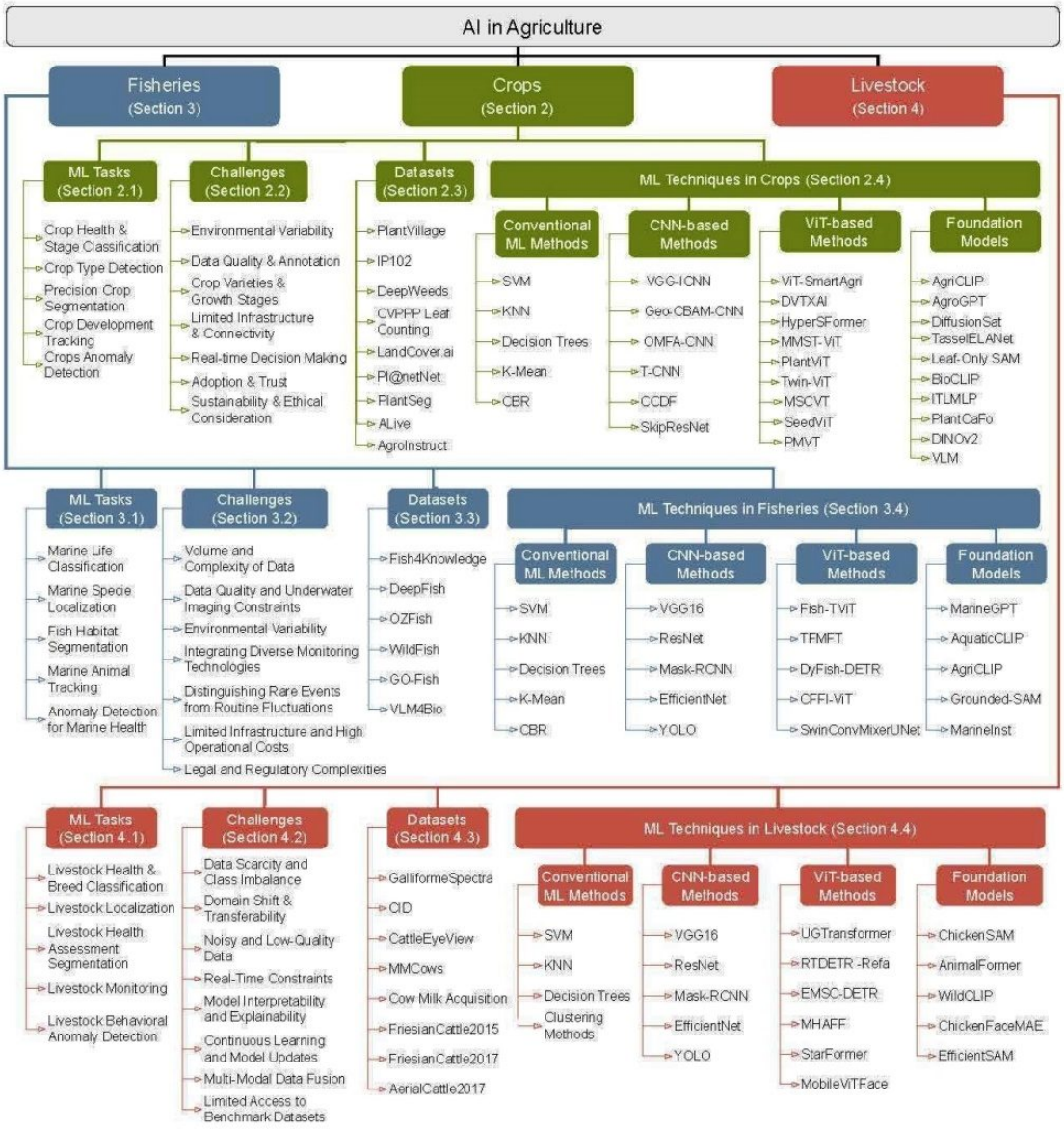


Fig. 2. Fig. 3. Taxonomy of AI applications in agriculture (NAWAZ et al., 2025)

STEM (Science, Technology, Engineering, and Mathematics) education in general aims to equip learners with the skills and competencies necessary to enable them to serve human needs and address technical issues. Problem-solving can be faster, easier and more efficient by using AI applications, for this reason, there is increasing attention towards this trend. In the field of agriculture, AI applications can be used for solving problems in one of the following three domains: crops, livestock, and fisheries.

III. Methodology

The purpose of this research is to assess artificial intelligence (AI) literacy among undergraduate students at Higher School of Saharan Agriculture Adrar. It seeks to examine the extent to which study participants understand the basic techniques and concepts behind AI products and services, genuinely use these concepts in different contexts, critically evaluate AI technologies, and ethically apply AI applications and activities.

To answer the aforementioned research questions, this exploratory study opted for a mixed-methods approach in the sense that two different types of instruments were used for gathering data. The purpose of exploratory studies is to investigate little-understood phenomena (Hammersley et al., 2001). Besides, a mixed-methods approach can be more insightful for understanding the issue in question (Dörnyei,

2007). Triangulation of methods/populations was used so as to obtain more valid and reliable results (Greener, 2008; Hammersley et al., 2001).

The target population is all third-year undergraduate students at the Higher School of Saharan Agriculture Adrar equally divided into two specialties (Food Technology and Plant Production Technology). As to the issue of sampling, the convenience technique was used, whereby participants were chosen based on their availability, accessibility, and willingness to participate in the study. As a result, of the 80 students invited to participate in this research, 56 completed the questionnaire survey, resulting in a 70% response rate, which is considered adequate for the purposes of the present exploratory study. This sample can be considered reasonably representative of the target population.

Two main data collection instruments were used, i.e., one quantitative and the other qualitative. The first measurement tool was a self-designed questionnaire survey with a set of closed-ended questions measured using a Likert scale (1 to 5) divided into six categories: respondents' demographic profile, students' familiarity with AI and its current use, perceived importance, curricular content and institutional support, values and ethics, and finally suggestions. Data collection procedure was conducted online via Google Forms and the questionnaire administration took place during regular sessions so as to facilitate the task for students. The second measurement instrument was interviews, that is, a few semi-structured exploratory interviews were conducted with preselected students and another interview was conducted with one member of the teaching staff (the teacher in charge of teaching AI).

IV. Results

1) Quantitative Findings

A. Demographic Profile of Respondents

A. The demographic profile of students reveals that nearly three quarters of the participants (71%) were females whereas slightly more than one quarter (29%) are males.

B. As to the academic major of the respondents their percentages were equally distributed between the two specialties; that is, 50% enrolled in Food Technology and the remaining 50% in Plant Production Technology.

C. The enquiry into the practical experience of the students in agriculture shows that nearly two thirds (64%) had no practical experience. One fifth (20%) had experiences ranging from 6 months to two years. Whereas, the remaining students, nearly one sixth (16%) had less than six months of experience.

TABLE I.
STUDENTS' PRACTICAL EXPERIENCE IN AGRICULTURE

Students' practical experience	Number of students	Percentage (%)
No experience	36	64
Less than 6 months	9	16
Less than 2 years	11	20

B. Current Use of and Familiarity with Artificial Intelligence

A. The investigation into students' familiarity with generative AI tools (Figure 4) reveals that nearly one-third of the participants (32%) reported being moderately familiar with them, while slightly more than one-quarter (27%) reported being slightly familiar. Another quarter (25%) reported being very familiar, whereas less than one-sixth (14%) were extremely familiar. Only 2% reported being not familiar at all.

B. As to students' familiarity with AI-powered data analysis tools (Figure 5), slightly less than two-thirds of the respondents (61%) reported being not familiar at all with these tools, just over one-quarter (27%) were slightly familiar, one-tenth (10%) were moderately familiar, and 2% were very familiar.

C. Concerning the participants' familiarity with AI-powered image analysis tools (Figure 6), 45% reported being slightly familiar with these tools, one-quarter (25%) reported being not familiar at all, slightly less than one-quarter (23%) were moderately familiar, and 7% were very familiar.

D. The examination of students' familiarity with specialized agricultural AI platforms (Figure 7) shows that nearly three quarters (73%) were not familiar at all, one fifth (21%) were slightly familiar, 4% were very familiar, and 2% were moderately familiar.

E. Concerning the frequency of using AI tools (Figure 8), two thirds of the students (66%) said that they used them on a daily basis, one sixth (16%) used them a few times per week, slightly more than one tenth (11%) used them a few times per semester, and 7% used them a few times per month.

F. As to the purposes for using AI tools (Figure 9), they can be ranked according to the frequency with which they were reported by students, as follows: (1) translating foreign words, reported by 44 students (78%); (2) understanding complex concepts, reported by 39 students (69%); (3) writing or editing texts, reported by 38 students (67%); (4) identifying plants, pests, and other agricultural elements, reported by 30 students (53%); (5) interpreting or creating spatial data, reported by 23 students (41%); and (6) analyzing data, reported by 14 students (25%).

Figure 4:Students' familiarity with generative AI tools

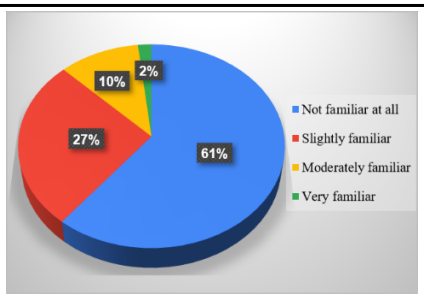


Figure 5:Students' familiarity with AI-powered data analysis tools

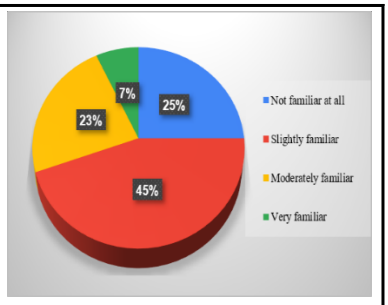


Figure 6:Students' familiarity with AI-powered image analysis tools

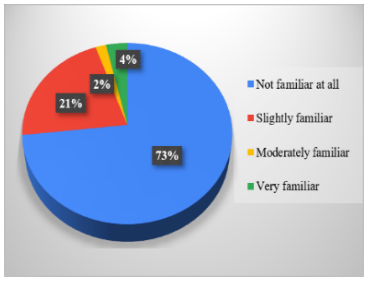


Figure 7: Students' familiarity with specialized agricultural AI platforms

Figure 8: Students' frequency of using AI tools in academic work

Figure 9: Purposes of using AI tools

C. Perceived Importance

A. The investigation into students' perceptions of the importance of writing prompts (Figure 10) demonstrates that 29% considered this skill very important, 27% considered it moderately important, and 25% considered it extremely important. However, 12% of the participants regarded it as slightly important, while 7% considered it not important at all.

B. As to the importance of evaluating the accuracy of AI-generated information (Figure 11), more than one third of the respondents (36%) classified it very important, less than one third of them ranked it extremely important (30%), less than one quarter (23%) perceived it moderately important, 9% saw it slightly important, and for 2% of them it not important at all.

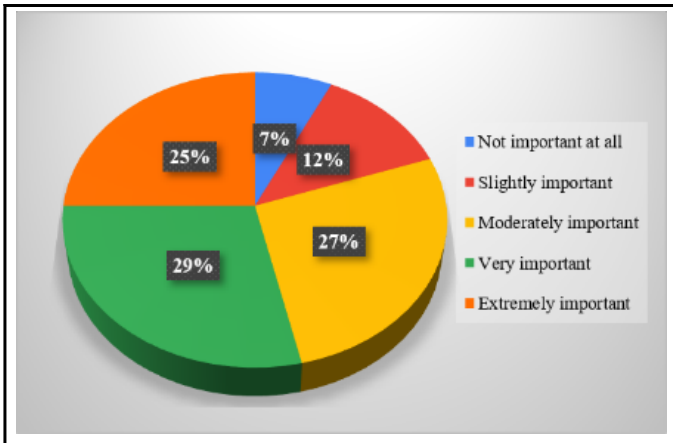


Figure 10:Importance of writing effective prompts

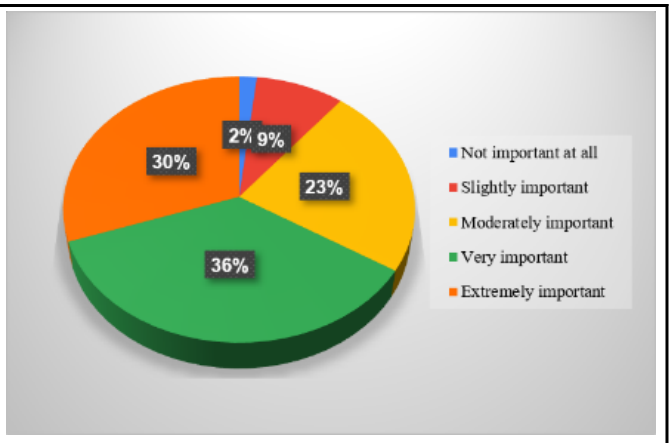


Figure 11:Importance of evaluating the accuracy of AI-generated information

C. Concerning the importance of understanding the ethical considerations related to the use of AI tools (Figure 12), less than one third of the respondents (30%) considered it extremely important, slightly more than one quarter (27%) ranked it very important, one quarter (25%) classified it moderately important, for 14% it was slightly important, and the remaining 4% considered it not important at all.

D. The inquiry into students' perceptions of the importance of understanding the limitations of AI models (Figure 13) reveals that 36 % is repeated twice, i.e., for those who saw it "extremely important" and for those who considered it "very important". Besides, 18% perceived it "moderately important", and the rest (10%) is equally divided between the options "slightly important" and "not important at all"0.

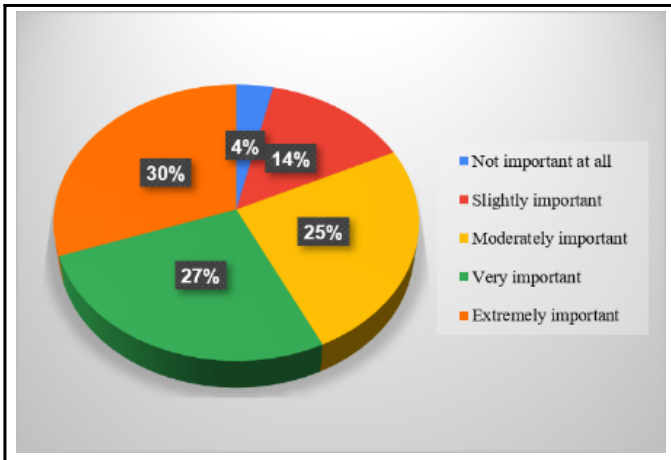


Figure 12:Importance of understanding AI ethical considerations

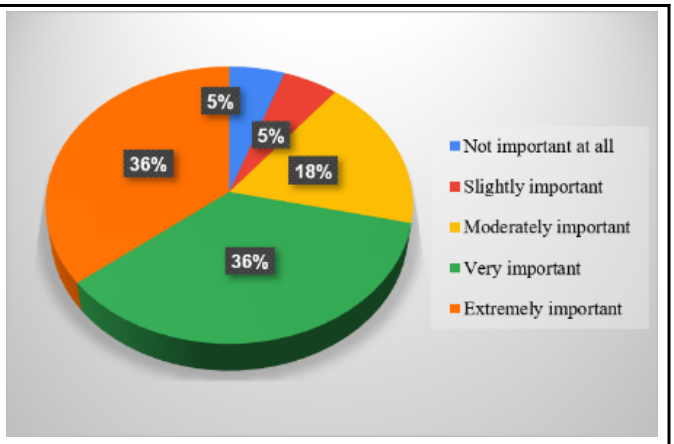


Figure 13:Importance of understanding the limitations of AI models

D. Curricular Content and Institutional Support

A. With regard to the suitability of the methods of course delivery (Figure 14), nearly half of the respondents (48%) agreed with the current method, 30% were neutral, 14% strongly agreed, and the remaining 8% was evenly divided between the "disagree" and "strongly disagree" options, with 4% selecting each.

B. As to the course content and its adequacy for the students' future professional career (Figure 15), the majority (54%) agreed that the actual content of the course was adequate, one-fifth (21%) strongly agreed, while 12% were neutral, 9% disagreed, and 4% strongly disagreed.

C. The investigation into the willingness of students to receive additional training on AI tools (Figure 16) demonstrates that 90% were equally divided between those who agreed and strongly agreed (45% selecting each option). The remaining (10%) was also evenly distributed between those who disagreed and those who were neutral, with 5% selecting each option.

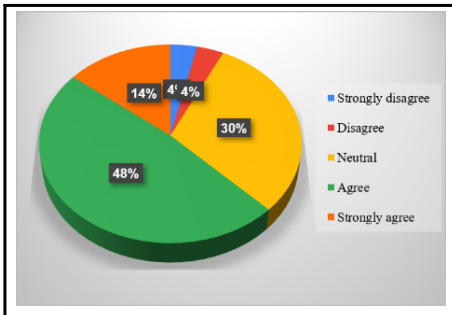


Figure 14:Suitability of course delivery methods

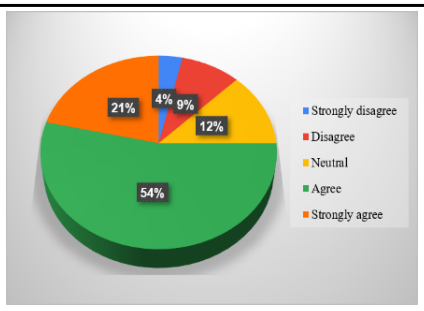


Figure 15:Adequacy of the course for students' future professional career

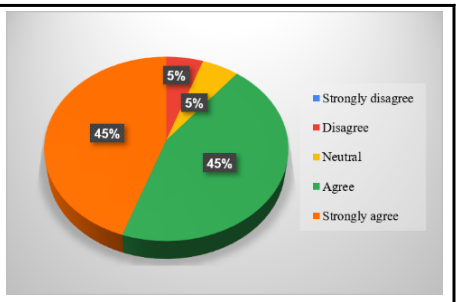


Figure 16: Students' willingness to receive additional training on AI

E. Values and Ethics

A. The enquiry into the extent to which AI tools can serve as a useful complement to both theoretical and practical learning (Figure 17) reveals that half of the participants (50%) agree, one fifth (20%) disagree, 12% were neutral, and equal percentages (9%) strongly agreed and strongly disagreed.

B. As to the negative effect of overreliance on AI on students' skills (Figure 18), slightly less than half of the participants (45%) agreed with this view, just over one quarter (28%) strongly agreed, one fifth (20%) were neutral, and 7% disagreed.

C. With regard to the ethical responsibility of agricultural engineers (Figure 19), half of the students (50%) agreed, 12% strongly agreed, one third (34%) were neutral, and 4% disagreed.

F. Suggestions

The last question was optional and invited students to add any suggestions. The thematic analysis of the 42 responses identified the following suggestions:

- Raising students' awareness of the importance of AI literacy.
- Providing courses on AI (starting from secondary school level).
- Addressing both the theoretical and practical aspects of AI through TD sessions.
- Linking AI to its practical application in the field of agronomy

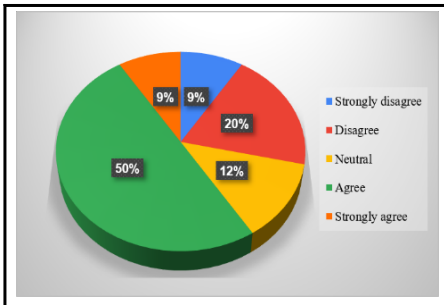


Figure 17:AI tools' usefulness in learning

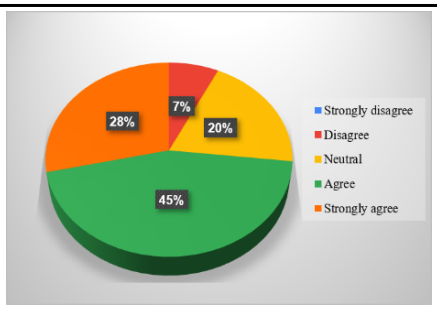


Figure 18: Negative effects of overreliance on AI on students' skills

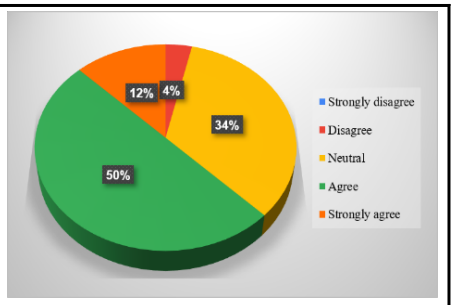


Figure 19: Agricultural engineers' ethical responsibility

(irrigation, pest control, food industry technology).

- And, providing students with access to advanced AI-powered applications.

1) Qualitative Findings (Interviews)

G. Interview 1: An interview with the AI Course Teacher

The interview with Professor M.B., the teacher of AI at the Higher School of Saharan Agriculture Adrar, revealed four main themes:

- Potential applications of AI in saharan agriculture

Professor M.B highlights the significant potential of using artificial intelligence in saharan agriculture, particularly in environmental monitoring, data analysis, and predictive applications such as weather forecasting, epidemic outbreak, and disease prediction.

- AI course content and delivery

AI is taught as a module at both the third- and fourth-year levels. The course at third-year level focuses on the basic principles and theoretical foundations of AI, whereas fourth-year instruction emphasizes its various applications in the field agriculture.

- Theory–practice integration

The professor stressed the importance of using a hybrid teaching approach that integrates theoretical frameworks with hands-on practice. In particular, classroom concepts should be directly connected to practical applications in relevant agricultural settings.

- Technological and practical constraints.

Limited access to the technological equipment required for AI applications, including sensors, cameras, networks, software programs, and drones, was identified as a major constraint. The lack of field-based practical activities may consequently limit students' opportunities to develop practical AI skills.

H. Interview 2: An Interview with a Third-Year Student

The interview with student M.D. revealed four main themes.

- AI uses and perceived benefits

The student viewed AI primarily as a tool for saving time and effort facilitating review, and supporting further learning and development. She reported using a range of AI applications such as Notebook, Gemini, Grammarly, Quillbot, and ChatGPT in her studies.

- AI applications in agriculture

The student was not familiar with specific AI applications used in agriculture but viewed AI as a supporting component within a broader technological system involving software programs, technological devices, sensors, and surveillance cameras. She also highlighted its potential to facilitate program design and algorithm development.

- AI literacy and teaching requirements

The student emphasized the importance of combining theoretical foundations with practical applications in AI teaching, particularly those related to agriculture. She also stressed the need for students to understand the wider technological system, develop prompt engineering skills, and acquire field-based application skills.

- Financial and contextual constraints

The cost of advanced AI tools was identified as a major obstacle, as students often have access only to limited free versions. The student also pointed to differences in perspectives between generations as a potential challenge to the adoption of modern AI technologies in the local agricultural context.

I. Interview 3: An Interview with a Second Third-Year Student

The interview with student B.M. revealed four main themes.

- Understanding and using AI applications

The student described AI as a computer-based system capable of generating responses based on given inputs. He reported using a range of applications such as ChatGPT, Gemini, Claude, and Grok for various academic and creative purposes, including image generation and video editing.

- AI applications in agriculture

The student reported using Google Lens to identify plants, their scientific names, and basic information about their families. He also used Gemini to identify certain plant diseases by consulting reliable sources, demonstrating some practical use of AI in his agricultural field.

- Accessibility and local adoption of AI

The cost of advanced AI technologies was identified as a major barrier, particularly when access requires paid subscriptions and international payment methods. At the local level, the student also noted a degree of distrust among

farmers towards adopting advanced technologies, despite the potential of large-scale agricultural areas to benefit from AI-based monitoring and management.

- AI awareness and ethics

The student emphasized the need to raise students' awareness of AI, particularly its basic principles and practical applications in the field of agriculture. He also stressed the importance of teaching AI ethics and promoting its use as a learning aid rather than as a substitute for learning.

V. Discussion

- The demographic profile of students reveals that the overwhelming majority of the students (71%) were females majoring in a field of study well known for its dominance by males, which reflects the emergence of a new tendency.
- The equal distribution of participants from both fields of study (Food Technology and Plant Production Technology) can help to obtain more reliable results.
- Nearly two-thirds of the participants (64%) have no experience in agriculture. This means that they have no idea about the present state of the art of the agricultural sector, a claim which is endorsed by the results showing students' familiarity with specialized AI tools used in the field of agriculture (73% not familiar at all), data analysis tools (61% not familiar at all), and image analysis tools (25% not familiar at all and 45% slightly familiar).
- Despite the fact that two-thirds of the participants (66%) affirmed that they use AI tools for academic work on a daily basis, the classification of the purposes behind this usage shows that the overwhelming majority of the participants use AI technology only for very basic functionalities and services, i.e., translating foreign words (78%), clarifying concepts (69%), and writing texts (67%). Besides, 41% use AI applications for interpreting or creating spatial data, and 25% use them for analyzing data. These two skills are of paramount importance for undergraduate students and agricultural engineers.
- Slightly more than half of the participants recognize the importance of writing effective prompts, yet the rest see it as either moderately important or not important, which means that they are not aware of the great importance of writing prompts or, more accurately, "prompt engineering. "
- Two-thirds of the participants (66%) perceive the skill of evaluating the accuracy of AI-generated information as important; that is, only this category of students knew that AI tools' outputs are not always accurate and should be checked. The rest might not be aware of this issue.
- The great majority of the participants consider that AI tools are useful in learning, but they also have concerns over the negative effects of these tools on students' skills due to misuse and overreliance.
- Nearly three-fifths of the participants (59%) see understanding ethical considerations of AI in agriculture as important for a graduate in agricultural sciences. In other words, for the remaining two-fifths (41%), ethical issues do not matter the most. Despite the fact that the second category is smaller than the first one, this finding shows us the extent to which students are aware of the importance of ethics and moral values and proves that more should be done to raise their awareness.

VI. Conclusion

The present research aimed to assess AI literacy among undergraduate students at Higher School of Saharan Agriculture Adrar. Based on a mixed-methods approach, this exploratory study involved 56 third-year students, equally divided between two specialties: Food Technology and Plant Production Technology. A self-designed questionnaire comprising seven sets of closed-ended questions measured using a five-point Likert scale was administered to the study population to collect quantitative data.

The main findings of the study showed that third-year students were familiar with generative AI tools, such as ChatGPT, unlike data analysis tools, AI-powered image analysis tools, and specialized agricultural AI platforms, with which they were largely unfamiliar. Generative AI tools were primarily used for academic purposes and accessed approximately on a daily basis. The purposes for using AI tools ranged from translating foreign words and understanding complex concepts to editing texts. The respondents demonstrated limited awareness of the importance of writing prompts effectively, evaluating the accuracy of AI-generated information, understanding AI-related ethical considerations, and recognizing the limitations of AI models.

Therefore, the present research stresses the importance of raising students' awareness of AI literacy, focusing on the practical aspects of AI alongside the theoretical ones by linking AI to practical applications in agronomy, such as irrigation, pest control, and food industry technology, and providing students with access to advanced AI-powered applications.

References

ADDIN Mendeley Bibliography CSL_BIBLIOGRAPHY ABOURA, B. (2025). Teaching and Learning in the Age of Artificial Intelligence : Towards an Integrated Approach to Digital Literacy in Algerian Higher Education. *International Conference on Education, Language, Literacies, and Literary Studies (ICONELS)*, *02*(Nomor 01), 1–14. https://doi.org/10.63011/iconels.v2i1.94 Teaching

ACHILI, N., & ZERROUKI, N. (2024). Using Artificial Intelligence in Algerian Higher Education : Opportunities and Challenges from Teachers ' Perspectives. *ATRAS*, *5*(Special Issue on AI and Education, Online Learning and Education), 541–556.

Adrar .Agriculture. (2026). https://www.wilaya-adrar.dz/ctoic/Fr/Data/Dossier_html/0101/agr.html

AlgeriaTech. (2026). https://www.linkedin.com/posts/algeria-ai-six-pillar-strategy-gdp-contribution-share-7484132362398789632-dQtA/

ARANGURI, M., MERA, H., NOBLECILLA, W., & LUCINI, C. (2025). Digital Literacy and Technology Adoption in Agriculture : A Systematic Review of Factors and Strategies. *AgriEngineering*, 1–29. https://doi.org/10.3390/ agriengineering7090296

Artificial Intelligence Act (2024). https://europa.eu

Artificial Intelligence Excellence Laboratory Skikda University (SKAILAB). (2026). https://skailab.algeria-ai.com

BENHAH, M., & OUASSAA, H. (2025). Artificial Intelligence in Algeria : Between Reality and Ambition. *Journal of Economic Growth and Entrepreneurship JEGE*, *8*(4), 46–59.

Bloom, B. S. (1956). *Taxonomy of Educational Objectives*. Longman.

BOUSTIL, Z. (2023). The digital divide in Algeria: Current situation and perspectives. *Revue Recherches et Études En Sciences Humaines*, *17*(01), 1182–1201.

DataBank: World Development Indicators. (2025). World Bank Group. https://databank.worldbank.org/source/world-development-indicators/Series/GB.XPD.RSDV.GD.ZS

Digital 2026:Algeria. (2025, November). DataReportal – Global Digital Insights.

Dörnyei, Z. (2007). *Research methods in applied linguistics*. Oxford University Press.

Druga, S., Vu, S. T., Likhith, E., & Qiu, T. (2019). Inclusive AI literacy for kids around the world. *ACM International Conference Proceeding Series*, 104–111. https://doi.org/10.1145/3311890.3311904

ethics. (n.d.). Britannica. Retrieved August 24, 2026, from https://www.britannica.com/topic/ethics-philosophy

EU Artificial Intelligence Act | Up-to-Date Developments and Analyses of the EU AI Act (2024).

Global Innovation Index. (2025). https://www.wipo.int/en/web/global-innovation-index

Greener, S. (2008). *Business research methods*. MAERSK.

Hammersley, M., Woods, P., & Gomm, R. (2001). Research Methods in Education. *The Open University*, *53*(9), 239.

High Commission for Digitalization. (2026). https://www.hcn.dz/pres-HCN/Haut-Commissariat-à-la-Numérisation

HOLMES, W., BIALIK, M., & FADEL, C. (2019). *Artificial Intelligence in Education . Promise and Implications for Teaching and Learning* . (Number March). The Center for Curriculum Redesign.

ICT Development Index. (2026). https://composite-indicators.jrc.ec.europa.eu/explorer/indices/idi/ict-development-index

KISLIUK, B., CHRISTOPH, J., HENDRIK, K., JUAN, M., SABORIO, C., MULLER, H., & HERTBERG, J. (2024). AI in Current and Future Agriculture : An Introductory Overview. *KI - Künstliche Intelligenz*, *37*(2), 117–132. https://doi.org/10.1007/s13218-023-00826-5

LONG, D., & MAGERKO, B. (2020). What is AI Literacy ? Competencies and Design Considerations. *The 2020 CHI Conference on Human Factors in Computing Systems*, 1–16. https://doi.org/10.1145/3313831.3376727

National Higher School of Mathematics (NHSM). (2026). https://nhsm.dz/about/

National School of Artificial Intelligence (ENSIA). (2026). https://www.ensia.edu.dz/

NAWAZ, U., ZAHEER, M. Z., KHAN, F. S., CHOLAKKAL, H., & KHAN, S. (2025). AI in Agriculture : A Survey of Deep Learning Techniques for Crops , Fisheries and Livestock. *ArXiv.Org*, 1–42.

Ng, D. T. K., Leung, J. K. L., Chu, S. K. W., & Qiao, M. S. (2021). Conceptualizing AI literacy: An exploratory review. *Computers and Education: Artificial Intelligence*, *2*, 100041. https://doi.org/10.1016/j.caeai.2021.100041

R&D expenditure (% of GDP) — Algeria. (2024). Scraping Agency. https://scraping-agency.com/stats/education/research-and-development-expenditure/algeria/?utm_source=chatgpt.com

REINA, G. (2024). Robotics and AI for Precision Agriculture. *Robotics*, 10–12. https://doi.org/10.3390/robotics13040064

Rodríguez-García, J. D., Moreno-León, J., Román-González, M., & Robles, G. (2020). Introducing Artificial Intelligence Fundamentals with LearningML: Artificial Intelligence made easy. *ACM International Conference Proceeding Series*, 18–20. https://doi.org/10.1145/3434780.3436705

SON, N., CHEN, C., & SYU, C. (2024). Towards Artificial Intelligence Applications in Precision and Sustainable Agriculture. *Agronomy*, 14–17. https://doi.org/10.3390/agronomy14020239

TechAfrica News. (2026). https://techafricanews.com/

UNESCO: Literacy. (n.d.). Retrieved August 23, 2026, from https://www.unesco.org/en

What is AI? (2026). UNESCO. https://www.unesco.org/en/query-list/a/ai

What is Ethics? (n.d.). Markkula Center for Applied. Retrieved August 24, 2026, from https://www.scu.edu/ethics/ethics-resources/ethical-decision-making/what-is-ethics/

Zeravan Abdulmuhsen Asaad, Amjad S. Al - Delawi, & Omed R. Fatah. (2026). (PDF) Chapter 3: SCImago Country Rank Background. In *International Collaborations of Universities in Kurdistan Region, Iraq: Insights and Opportunities* (Chapter 3). Deep Science Publishing. https://www.researchgate.net/publication/403376439_Chapter_3_SCImago_Country_Rank_Background