

EDITORIAL

AI and NextGen Entomologists: Use it to Learn, not to replace Learning

Artificial intelligence (AI) is increasingly being incorporated into scientific education and research, and entomology is no exception. AI opens new possibilities for students and researchers, ranging from automated insect identification and image-based pest recognition, to literature discovery, molecular analysis, data interpretation and scientific writing. The critical question for the next generation of entomologists is not whether to use AI but how to use it responsibly. Entomology is an observational and evidence-based science. Correct identification of an insect requires knowledge of morphology, biology, ecology, behavior, distribution and increasingly, molecular characters. Artificial intelligence can help with these processes but should not replace the development of these foundational skills. An AI-generated identification is a hypothesis and only said to be accurate when it is tested using appropriate taxonomic keys, authoritative literature, reference specimens, expert knowledge or molecular evidence. In recent times we observe executive “help-seeking behaviour” of students that is looking for an immediate answer or fix to a problem rather than trying to understand the concept. This is not restricted to students only it extends to young faculty too.

Next generation entomologists should therefore view AI as a learning assistant rather than an answer generating machine. Instead of asking AI simply to provide the answer to an entomology question, students should use ai to explain difficult concepts, generate self-assessment questions, clarify terminologies or organize information for further reading. There are many examples in the field of entomology where young entomologists can use AI, like to understand difference between complete vs incomplete metamorphosis, principles of IPM, mode of action for insecticide etc. Later they must consult original and authoritative literature to confirm the authenticity.

Responsible use becomes particularly important in scientific writing. AI can help improve grammar, structure and clarity, but young entomologists should not submit AI-generated text as their own intellectual work. Scientific arguments, interpretations, observations and conclusions must originate from the researcher and be supported by evidences or references. AI will also suggest references but, references suggested by AI should always be checked against the original publication because AI systems can produce inaccurate, incomplete or even nonexistent citations. Similarly, students should never fabricate observations, experimental results, specimen records, statistical values or references with the help of AI. AI also brings significant opportunities for entomology. Image recognition tools can assist with preliminary pest identification, machine-learning approaches can support automated insect monitoring; computer vision can quantify damage and AI can help analyse large datasets generated from biodiversity surveys, trapping projects and molecular studies. However, young entomologists should understand the limitations of datasets, model bias, false positives, false negatives and the importance of expert validation.

The goal of education is not merely to obtain correct answers, it is to develop the ability to observe, question, analyse, verify and think independently. If young entomologists use AI to avoid reading taxonomic literature, examining specimens, learning identification characters or understanding experimental

methods, they may become dependent on a tool without developing scientific competence. In contrary, when AI is used thoughtfully, it can make learning more interactive, accelerate routine tasks and allow young entomologists to spend more time on observation, experimentation and scientific reasoning.

It will be important that the future entomologist will likely work alongside AI, but not compete with it. The essential skill will therefore be neither rejecting AI nor accepting it unquestioningly, but learning to question, verify and responsibly use its outputs. Let AI help us identify faster, analyse better, summarize better and learn more but never let it replace the curiosity, observation and critical thinking that define an entomologist.

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