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AI AND THE PHD STUDENT: FRIEND OR FOE?

Graduate students increasingly use AI to draft, code and search – but many fear it could erode the very skills they are trying to build. **By Linda Nordling**

Leona Diala uses artificial-intelligence tools for many aspects of her PhD: to search the literature, design presentations, generate code and summarize papers. The tools save her time and give her ideas, she says. “I would say AI is a blessing for researchers today.”

At the same time, Diala, who is studying infectious-disease modelling at the University of Abuja, is concerned that AI overuse is undermining essential academic skills. She checks every reference and fact that AI tools give her and rewrites their text in her own words. But she worries about the next generation of researchers. When she was an undergraduate, she says, “there was no AI like this. We sat for hours and read, practised, tried and retried

until we got it. Now people want AI to write everything.” She adds: “AI is a blessing, but it has made students lazy. People don’t go the extra mile to build the skill.”

Diala’s ambivalence is typical of PhD students. When *Nature* surveyed almost 3,800 PhD students last year, three-quarters thought AI tools could help students to work more efficiently, and 71% felt it was acceptable to use them to support their studies – yet the majority also voiced strong concerns. Some 81% said they don’t fully trust AI tools and 65% worried that AI weakens thinking, research and writing skills.

Since ChatGPT launched in November 2022, AI use has exploded across higher education. In a survey of 1,041 UK undergraduates published

in February 2025, 88% admitted to using AI for assessments, up from 53% the year before (see go.nature.com/4d37rcc). The proportion of respondents who had used any AI tool also jumped, from 66% in 2024 to 92% in 2025. Such a rapid change in behaviour is “almost unheard of”, wrote study author Josh Freeman, policy manager at the Higher Education Policy Institute in Oxford, UK, in a statement accompanying the results.

Doctoral students are now charting paths through territory their supervisors never had to navigate. Some use AI daily and swear by it; others refuse to touch it, worried about the cost to their development as researchers. Most fall in between, working out their own rules for when AI helps and when it hinders.

“AI can be your greatest ally or your worst enemy. It all depends on how you use it,” says Yinghui He, a PhD student at Tsinghua University in Beijing who uses computer methods to study microorganisms in the deep ocean. She turns to AI tools such as ChatGPT and Gemini every day, as well as Chinese AI tools, for tasks including checking grammar in her written English and generating code. “The AI writes code faster than me, and saves me a lot of time,” she says. “But once it’s generated the code, I need to check if it’s right. That is very important.”

That’s a lesson that Richard Ang, a PhD student in soil microbiology at the University of Western Australia in Perth, learnt the hard way. He once asked ChatGPT to calculate fertilizer doses for an experiment. When the experiment failed, he asked the tool to show its thinking. “It totally misunderstood my question,” he says. “AI will never tell us that our design is uncommon, or wrong,” he adds. “If we ask AI to carry out a ridiculous or impossible task, it will do it.” Now, he always asks the tool to explain its reasoning step by step, and he cross-checks answers using multiple tools.

Diala learnt the same lesson when she plotted a graph and asked AI to explain it. “It said a value increased when the graph showed a decrease,” she says. “Before we use AI, we should have some knowledge of what we’re asking, so we can catch mistakes.”

Where to draw the line

The confusion many PhD students feel comes partly from AI’s technological acceleration outpacing the ability of universities to govern it. According to a report published in January by the European University Association in Brussels, which surveyed universities across Europe about their policies for doctoral education, only 5% felt the existing AI guidelines were sufficient (see go.nature.com/4stfdp). The largest group, 38%, reported that they were still establishing policies for the first time, and 13% had no policies at all.

In the absence of clear direction, students are turning to educators such as Amina Yonis for answers about how to use these tools responsibly. Yonis (who trained as a molecular biologist at University College London) now runs The Page Doctor, an academic-support company that helps students with writing and editing. She has built a YouTube following of almost 500,000 subscribers by offering practical tips for navigating academic life, including how to use AI ethically in a way that doesn’t harm intellectual development.

“There are parts where I’d say ‘use AI’ and parts where I’d say ‘don’t,’” says Yonis, who is based in Dubai, United Arab Emirates. Tasks such as finding, digesting and organizing research literature fall in the ‘use AI’ column. “It helps you read 50 papers in a month rather than 50 in a year.” But she urges students to



Amina Yonis offers tips on ethical AI use.

avoid the tools for data analysis, to stay in control of the intellectual work and because of data protection: many AI tools do not keep what you tell them confidential.

Yonis also urges caution in using AI to write a thesis. The technology is useful for coming up with a structure or cleaning up text, she says. But getting it to compose long sections from scratch can be problematic. “If you let AI write and then you look, you’ll struggle to break away from the example,” she says. “It’s better to write it yourself and then use AI to clean up.”

For language help, however, AI can be transformative. Manikandan Palanichamy, an electrical and computer engineer at Østfold University College in Fredrikstad, Norway, who supervises PhD students, says that it gives those who don’t have English as their first language access to cutting-edge research and helps them to express complex ideas more effectively, which “democratizes PhD training significantly”. However, although AI can be used to amplify thinking, it should not replace it, he says. “As a professor, my challenge for PhD or master’s or bachelor’s supervision is teaching students this distinction early.”

Not all AI tools are created equal, Yonis says. She recommends stepping away from generic AI tools and exploring applications that are purpose-built for academics, such as Paperpal for writing or Consensus for literature searches (see ‘AI joins the lab’).

What skills will matter?

Even with practical guidance on how to use AI responsibly, deeper questions remain. As the technology hurtles forwards, it’s difficult to say precisely what skills PhD students need to hone or protect to navigate the future.

Natalia Bielczyk, a computational neuroscientist who splits her time between California, Poland and the Netherlands and founded Ontology of Value, a company that helps professionals to navigate career transitions, says

AI joins the lab

A growing range of artificial-intelligence tools caters specifically to academics.

More AI apps are being purpose-built for research. Most have tiered pricing models, with free limited-use options or free trial periods. We highlight a selection.

For discovering and understanding literature, ResearchRabbit maps citation networks and helps to find connected papers. The tool Elicit searches a large body of academic papers and can extract key findings, summarize papers and answer research questions. Consensus returns evidence-based answers with linked citations. Scite looks at how other papers talk about a study — whether they support, contradict or simply mention its findings. Connected Papers, Litmaps and Inciteful (each has a free version) create visual maps of research fields and paper relationships.

For data analysis and coding, Julius analyses data sets through language prompts, and generates code and visualizations. Bohrium is a cloud platform for running scientific simulations, notebooks and managing research data, and GitHub Copilot suggests ways to complete your code as you type.

For writing and editing, Paperpal offers writing suggestions and language polishing specifically for research papers. The Prism workspace from ChatGPT creator OpenAI, based on the model GPT5.2, lets users refine documents written in LaTeX, a document-preparation system used for some scientific papers.

Remember, whichever tools you use, they should help you to learn — not replace your thinking. Never upload sensitive, proprietary or identifiable participant data to AI tools without proper data-use agreements and institutional approval, and don’t rely on AI-generated code without understanding and testing it thoroughly. Don’t use AI to write entire papers or manuscript sections without disclosing what you’ve done — this might violate academic-integrity policies.

Finally, if you feel you are becoming too dependent on AI systems, Amina Yonis at academic-support company The Page Doctor has some simple advice: go back to conventional methods. “AI has only been around for about three years. Most people finished PhDs without it. You can do it.”

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Samuele Ramellini with a superb fairywren.

PhD students might want to think about their value differently in the age of AI. Rather than competing with AI on speed or recall, doctoral students should lean into areas that machines still struggle with: framing good questions, navigating ambiguity and designing ways to test ideas in the real world.

“The superpower of the PhD is that it gives you a systematic approach to solving problems,” she says. AI can help with routine tasks such as scanning the literature or polishing drafts, and so leave more time for the kind of slow, conceptual work that underpins real breakthroughs. “It’s unlikely that AI will replace higher-range thinking any time soon,” Bielczyk suggests. “If anything, it raises the bar for humans to specialize in the parts of research that only humans can do.”

But to establish good habits, students must think about these issues long before they reach doctoral level, says Palanichamy. “Students need proper ethical guidance on responsible AI use from their school years onward,” he says. “Otherwise, we risk producing a generation of researchers who can operate AI tools but lack the fundamental skills to push boundaries and create genuine breakthroughs.”

PhD students must also learn skills, such as the ability to ask precise questions and check AI-generated answers, says Alex Sen Gupta, a climate scientist based at the University of New South Wales in Sydney, Australia. Last November, he published an essay calling for an overhaul of the PhD, from its duration to how it’s assessed and taught (see *Nature* 647, 27–28; 2025).

“If used well, AI can certainly massively enhance PhD capabilities. It frees up much more time to reflect on ideas, questions, solutions, translation to real-world impacts, big-picture stuff,” says Sen Gupta. But concerns about AI eroding skills are legitimate, he adds. Students who use it as a shortcut to avoid thinking will emerge with serious gaps

in expertise, whereas those who use it to push their thinking deeper could thrive.

The problem, Sen Gupta says, is that nobody can predict how the field will develop. “It could all change a year from now, or two years from now, or five years from now.” This uncertainty makes it difficult to know which skills will remain essential. Meanwhile, technology companies are attempting to inject AI across every cognitive domain, he says. “Every time we find a gap that it can’t do, it’s going to train on that gap.”

Opting out entirely

Not everyone is convinced that maintaining this balance is worth the effort.

In November, Samuele Ramellini used AI to help him plot a graph for the first time. “I’ve always coded myself. I learnt it the hard way – courses, long hours,” says Ramellini, who is halfway through his PhD researching the complex social behaviour of a bird called the superb fairywren (*Malurus cyaneus*) at the Australian National University in Canberra.

The AI worked well, he says. But a couple of weeks later, he couldn’t remember the code it had produced, or even what he had asked the AI to do. By contrast, he remembers exactly what he did for each plot in his undergraduate thesis almost ten years ago. “That’s what frustrates me about AI. It gives immediate reward, but you don’t learn or improve.”

“We risk producing a generation who can operate AI tools but lack the fundamental skills.”

As for putting his research ideas into AI tools, Ramellini gives an emphatic no. “Absolutely not. ChatGPT isn’t getting my ideas. I’m old-school: paper, Post-its on the floor, whiteboards. It’s much better.” He would rather brainstorm with his supervisor, and says that AI removes some of the fun of research. “I find my job extremely entertaining. I studied for years to get here. Now I would leave it to AI to save an hour and then what? Go on Facebook and look at AI pictures?”

There are probably others like Ramellini, and Bielczyk thinks that the current AI frenzy could lead some people to resist the technology entirely. But she also expects that competition for grants and jobs will tempt many to use AI tools in dubious ways, taking shortcuts to advance their careers. Those in between will get better at filtering information and understanding when the technology can and should be used, she says. “I think in five to ten years, it will be more obvious which tasks we can leave to AI, and which we have to do ourselves.”

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