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ARTIFICIAL INTELLIGENCE IN HIGHER EDUCATION THROUGH THE FOUNDATIONS OF BASIC RESEARCH, ECOLOGY AND ACADEMIC CONSCIENCE: A REFLECTIVE COMMENTARY

Chee Kong Yap [1*]
[1] Department of Biology, Faculty of Science, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia

ABSTRACT

Artificial intelligence is increasingly discussed through frameworks of adoption, automation, and organisational reinvention. Their application to higher education requires careful consideration of what education is intended to achieve. This reflective commentary examines McKinsey's three horizons of AI transformation through my experiences in ecological research, university teaching, postgraduate supervision, and academic writing. It develops ten connected arguments concerning scientific foundations, independent learning, field experience, curiosity, institutional resilience, academic conscience, respectful leadership, educational relationships, environmental responsibility, and selective adoption. Selected empirical studies and foundational ecological literature support the discussion, while personal judgments are distinguished from established findings. I argue that faster production of academic material alone cannot demonstrate deeper understanding or stronger research competence. AI can help when its use aligns with learning objectives and is supported by verification, fair assessment, and accountable human decisions. Risks include dependence on generated explanations, weakening of observational skills, restriction of exploratory inquiry, unfair judgments about authorship, increased workload, unequal access, and environmental costs. An ecological perspective also encourages attention to relationships, feedback, and institutions' ability to function when technological services fail. I propose that universities assess AI by what students can explain independently, how reliably they engage with evidence, and the quality of educational relationships. The central responsibility is to preserve the conditions that enable people to become capable researchers and conscientious members of society.

Keywords: Artificial Intelligence, Higher Education, Basic Research, Ecological Education, Academic Integrity, Independent Learning, Reflective Commentary

INTRODUCTION

When I read discussions about artificial intelligence transforming organisations, I naturally return to the foundations of my own academic life. My experience has been shaped by field observations, laboratory measurements, student supervision, manuscript revision, and the continuing effort to understand environmental processes. These activities have taught me that a convincing explanation must remain answerable to evidence. They have also taught me that becoming a researcher takes time. An answer can appear quickly, while the ability to recognise its limitations develops much more slowly. From this perspective, my first question about AI in a university concerns what happens to the person learning through it.

*Corresponding Author:
Email address: Chee Kong Yap (yapchee@upm.edu.my)

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De Smet et al. (2026) describe three horizons of AI transformation: enablement through access to tools, automation of existing processes, and reinvention of roles and organisational practices. Their article emphasises institutional change and trust. The survey included 750 English-speaking employees already using AI, with leaders reporting organisational outcomes. The authors acknowledge sampling limitations. These reported associations do not establish causation or demonstrate educational effectiveness. Nevertheless, the framework provides a useful occasion to examine how universities should define the purposes and consequences of technological change.

My response begins with a principle I return to repeatedly: basic is still basic Yap (2025), Yap (2026a). Scientific foundations remain necessary when tools become more capable. A student who obtains an analysis must still understand the sample, the variables, and the limits of inference. An educator who receives a lesson plan must still judge whether it serves the learners. UNESCO places human agency, inclusion, and educational suitability at the centre of its guidance on generative AI in education and research Miao and Holmes (2023). I interpret these concerns through the practical responsibilities of teaching ecology and supervising research, and I highlight the importance of education Yap (2026b).

This commentary presents ten connected reflections rather than a general rejection of AI. I use AI assistance in academic writing and recognise its potential to reduce repetitive work and clarify expression. My concern is that universities may mistake polished outputs for educated minds, or extensive adoption for institutional maturity. I argue that educational value should be assessed through independent competence, reliable engagement with evidence, and responsible conduct. The disagreements concern transferring a business framework into education; they do not imply that the original article recommends the educational practices criticised below.

This commentary's specific contribution is to connect a three-horizon organisational framework with ten questions arising from everyday academic practice. These questions are not proposed as a validated measurement scale. Rather, they offer educators a way to examine whether AI adoption protects scientific foundations, produces learning that persists without assistance, and strengthens the relationships through which research competence develops. In this sense, I regard technological transformation as an educational question before it becomes an administrative target.

REFLECTIVE PERSPECTIVE AND SCOPE

This paper is a personal and conceptual commentary informed by selected literature. It does not report a new experiment, a systematic review, or an evaluation of my university. The personal reflections draw on my experiences in aquatic ecology, contaminant research, teaching, supervision, and writing. Published sources provide specific evidence or conceptual foundations where relevant. Suggested classroom activities and institutional safeguards are proposals for evaluation, rather than interventions whose effectiveness this paper has established.

An ecological perspective guides my attention to relationships, variation, feedback, and persistence under disturbance. Holling (1973) distinguished ecological resilience from stability, focusing on whether a system can persist through change. Applying this perspective to universities is an interpretive analogy. Universities differ fundamentally from ecological communities because their members possess intentions, rights, and responsibilities. The analogy is useful when it encourages examination of dependence and institutional vulnerability, but it should not be treated as a biological explanation of educational behaviour.

To keep the argument transparent, I distinguish three forms of material throughout this paper: my direct professional observations, findings reported in the cited literature, and proposals that would require future evaluation. This distinction matters to me as a field researcher. A personal encounter can raise an important question, but it cannot by itself establish how frequently a problem occurs across universities. Equally, evidence from one educational setting should not automatically become a universal claim about all disciplines or AI systems.

TEN REFLECTIONS ON AI AND THE PURPOSES OF EDUCATION

Figure 1 presents an integrated conceptual framework comprising ten critical reflections on adopting artificial intelligence (AI) in higher education, emphasising that technological advancement must remain subordinate to education's fundamental purposes: scientific integrity and human intellectual development. The framework addresses scientific foundations (3.1), the distinction between genuine learning and AI assisted performance (3.2), the importance of direct encounters with real world complexity (3.3), academic freedom for basic research (3.4), institutional resilience against excessive technological dependence (3.5), academic conscience and the limitations of AI detection systems (3.6), respectful academic governance (3.7), the preservation of meaningful educational relationships (3.8), ecological and social responsibilities associated with AI infrastructure (3.9), and the selective adoption of AI according to pedagogical suitability (3.10). These interconnected dimensions converge on the central principle that educational purpose and human agency must take precedence over technological convenience, administrative efficiency, and institutional pressures. From an ecological and methodological perspective, the framework argues that sophisticated AI-generated outputs cannot replace direct field observations, independent scientific reasoning, methodological transparency, or the intellectual maturity developed through sustained engagement with complex natural systems. It also recognises that overreliance on AI may

weaken independent thinking, undermine academic accountability, increase institutional vulnerability, and create environmental burdens and inequalities in educational access. Ultimately, the framework advocates a balanced educational philosophy in which AI serves as a supportive instrument rather than a substitute for human curiosity, critical judgement, scientific conscience, mentorship, and the enduring foundations of basic research.

Figure 1

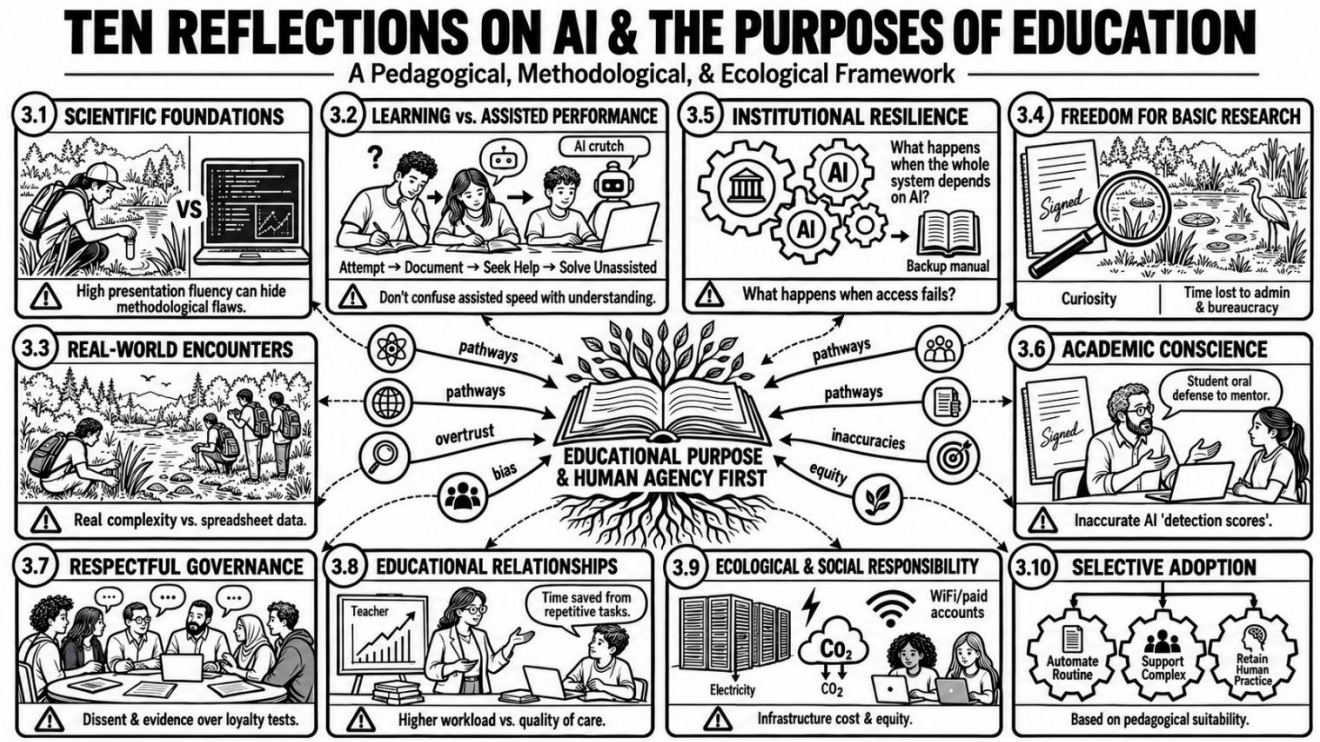


Figure 1 Ten Reflections on Artificial Intelligence and the Purposes of Education: A Pedagogical, Methodological, and Ecological Framework for Protecting Human Agency in Higher Education.

SCIENTIFIC FOUNDATIONS REMAIN NECESSARY

First, in environmental research, a conclusion's credibility begins well before statistical analysis. It depends on how the question was formulated, where and when samples were collected, what the measurements represent, and whether comparisons are appropriate. Hurlbert (1984) demonstrated the importance of experimental units and genuine replication in ecological field experiments. That foundational lesson remains relevant when analytical procedures can be generated almost instantly. Repeated measurements within one pond do not automatically become independent replicates of a comparison between pond types.

My concern is that students may gain access to sophisticated analysis before developing the judgment to use it. A generated script can run successfully while addressing an inappropriate question. A graph can appear persuasive while combining incompatible units. These are methodological problems that must be recognised through disciplinary understanding. AI may help students find such problems, but learners must still explain why a correction is needed.

I would therefore retain explicit assessment of scientific foundations. Students should justify their sampling units, describe quality assurance, distinguish observation from inference, and identify plausible alternative explanations. For metal concentrations, they should understand the difference between wet and dry weight and the implications of detection limits. My disagreement concerns any assumption that a more advanced tool makes these foundations less important. The risk is that methodological weaknesses become harder to notice because their presentation becomes more fluent.

LEARNING MUST BE DISTINGUISHED FROM ASSISTED PERFORMANCE

I understand the relief of completing a difficult task more efficiently. Academic life involves many competing responsibilities, and assistance can be valuable. However, the learner's development cannot be inferred from the quality of an assisted output. In an experiment with secondary school mathematics students, Bastani et al. (2025) found that a generated AI interface improved performance on supported practice but reduced subsequent performance without assistance. A tutor incorporating educational

safeguards largely mitigated that negative effect. The findings belong to that particular setting and do not establish that every form of AI assistance harms learning.

Deslauriers et al. (2019) provided a related caution from undergraduate physics education. Students in active classes learned more but felt they learned less than students receiving traditional lectures. Their study did not investigate generative AI, but it demonstrates that perceived ease and measured learning can diverge. I therefore hesitate to interpret students' satisfaction with immediate answers as sufficient evidence of educational benefit. The effort required to explain an answer may be precisely where useful learning occurs.

I propose a sequence in which students first attempt the task, document their reasoning, seek appropriate assistance, and then explain or solve a related problem independently. This approach should remain sensitive to disability and legitimate accommodation. The purpose is to establish which competence belongs to the learner and which depends on the assistance. A university should evaluate retention and transfer to unfamiliar problems alongside completion speed. Otherwise, it risks rewarding successful dependence while overlooking incomplete understanding.

A practical illustration would be to ask students to interpret an unfamiliar environmental dataset first without AI, then to compare their reasoning with a permitted AI supported analysis, and finally to defend their conclusions orally without the tool. The teacher could compare the accuracy of interpretation, identification of uncertainty, and justification of sampling assumptions across these stages. This is a suggested teaching design, not a classroom intervention tested in this commentary.

ECOLOGICAL EDUCATION REQUIRES ENCOUNTERS WITH REAL ENVIRONMENTS

My work with aquatic organisms, water, sediments, and contaminants has made direct observation central to my educational thinking. A sampling location contains information that a spreadsheet may omit. Recent rainfall, surrounding land use, discharge points, habitat structure, and organism condition can shape interpretation. Field experience teaches students to notice such details and to recognise how incomplete their initial explanations may be.

In teaching applied limnology, a campus pond or drainage channel can become an important place of inquiry. Students must consider where to measure, whether conditions differ among locations, and whether one visit represents the period they intend to discuss. A sudden change in electrical conductivity may suggest several explanations. It should prompt further observation and comparison rather than an immediate causal claim. The discipline of connecting evidence to an appropriately limited conclusion develops through these encounters.

AI could help students prepare questions, understand instrument procedures, or compare competing interpretations after collection. Simulations and existing datasets also have legitimate roles when field access is restricted. My concern is that these activities systematically displace the practical learning the course requires. The risk is graduating students who can describe an ecosystem confidently but cannot recognise unreliable measurements or overlooked habitat features. Educational design should preserve accessible opportunities for students to encounter the environmental complexity they are expected to understand.

BASIC RESEARCH NEEDS FREEDOM FOR UNCERTAIN QUESTIONS

Some of the questions that interest me begin with a modest observation rather than a predetermined institutional priority. A difference among organisms, an unexpected concentration, or a recurring pattern in a pond can invite further investigation. At the beginning, the eventual usefulness may be unclear. Yet this uncertainty is part of basic research's intellectual character Yap (2025), Yap (2026a). I would be concerned if its legitimacy depended entirely on immediate measurable returns.

The business emphasis on directing available capacity toward organisational priorities in De Smet et al. (2026) requires qualification when applied to universities. My disagreement concerns how this idea is translated and interpreted. Academic institutions have obligations that include preserving the freedom to investigate questions whose significance may emerge slowly. A lecturer's time spent exploring an unresolved question can contribute to education even before it produces a recognised output.

AI may create opportunities for exploratory thinking by reducing repetitive tasks. However, the time recovered can also be absorbed by additional reporting, publication expectations, or administrative work. I see that outcome as a plausible governance risk, not an inevitable consequence of AI. Universities should deliberately protect some time for reading, discussion, and exploratory inquiry. Efficiency should make space for curiosity, because an institution that continually fills every available hour may leave its researchers with little opportunity to think beyond what has already been assigned.

INSTITUTIONAL RESILIENCE DEPENDS ON RELATIONSHIPS AND ALTERNATIVES

In considering institutional resilience, the ecological perspective encourages me to examine what happens around a technological intervention. An automated service may reduce work in one office while increasing verification elsewhere. Faster feedback may improve access but also alter students' expectations of lecturer availability. Such effects are often distributed across people who have different responsibilities. An evaluation limited to the apparent efficiency of the tool may miss these consequences.

Holling (1973) account of resilience offers a conceptual reason to ask whether useful functions persist through disturbance. Within a university, I would interpret this as retaining the capacity to teach and supervise when a service becomes unavailable, unaffordable, or unreliable. Relying on a single provider could make an institution vulnerable. This is a proposed institutional concern, not a prediction derived directly from ecological theory.

Universities should therefore maintain accessible alternatives and preserve the expertise needed to assess technological outputs. Data and teaching materials should remain retrievable in usable forms. Staff should know how to continue essential activities during outages, and students should have realistic options when access fails. The risk of excessive dependence is that apparent convenience gradually conceals a loss of institutional capability. Resilience requires attention to what people can still do when the convenient arrangement is interrupted.

ACADEMIC CONSCIENCE MUST GUIDE THE USE OF ASSISTANCE

A refusal to produce assessed academic work for another person reflects a boundary we regard as essential. Mentorship can explain methods, challenge reasoning, and help a student improve expression. The assessed contribution must remain attributable to the learner. When assistance replaces that contribution, and the substitution is concealed, the qualification no longer reliably represents the competence it is intended to certify.

My own use of AI for language assistance makes me attentive to the need for honest distinction. Field measurements remain field measurements, while help with expression must be described appropriately under the relevant policy. Fluent writing does not prove trustworthy evidence, and awkward writing does not establish misconduct. Research by Liang et al. (2023) found that the detectors they examined frequently misclassified writing by people whose first language was not English. Their findings concern particular tools and samples, but they support caution about using detection scores as decisive evidence.

I would assess integrity by examining data provenance, accurate citations, documented development of the work, and the author's ability to explain decisions. Appropriate disclosure should support accountability rather than replace checks of the underlying research. Institutions also need clear procedures that let students and researchers raise concerns. The educational risk extends in both directions: concealed substitution may escape scrutiny, while legitimate work may be unfairly questioned. Conscience and fair judgment must guide the response to both.

RESPECTFUL LEADERSHIP MUST MAKE ROOM FOR DISAGREEMENT

I agree with the importance De Smet et al. (2026) place on trust. In academic life, I understand trust through everyday treatment: whether people can raise a concern, whether their knowledge is heard, and whether decisions are explained honestly. A lecturer may question an AI initiative because it affects the validity of an assessment. A laboratory officer may notice that generated instructions overlook a practical constraint. Such concerns deserve examination on their merits.

My experience in academia has made me sensitive to how disrespect affects people's willingness to contribute. Consultation becomes unconvincing when the answer appears to have been decided before staff are invited to speak. Equally, disagreement does not automatically make a concern correct. Respectful discussion should permit the institution to test both the proposal and the objection through evidence and disciplinary knowledge.

The risk is that visible enthusiasm becomes an informal test of loyalty. People may then comply publicly while withholding information that would help identify failures. I would prefer leadership that states what remains uncertain, invites criticism from those affected, and revises decisions when findings justify revision. Education depends on the ability to question a claim. A university introducing AI should practise that principle in its own governance.

EFFICIENCY SHOULD IMPROVE EDUCATIONAL RELATIONSHIPS

Supervision has taught me that students need more than corrections to their manuscripts. They may need help recognising a weak argument, recovering confidence after an unsuccessful analysis, or understanding why a revision remains necessary. These judgments develop through conversation and attention to the individual. I value the teacher's ability to notice when a student submits work without understanding it or avoids a question because of anxiety.

AI can offer preliminary explanations and assist with repetitive administrative activities. I welcome such possibilities when they improve the time available for meaningful supervision. However, universities should examine whether verification work offsets the anticipated savings. They should also ask whether efficiency gains lead to larger workloads that leave lecturers with less attention for each student. These are questions for evaluation rather than assumptions about every deployment.

I know the determination required to keep writing and working through academic pressure. I also recognise that exhaustion can reduce the patience good teaching depends on. The risk is that improved production becomes another reason to demand more, while the quality of educational relationships receives little attention. Evaluation should therefore include staff workload, the usefulness

of feedback, and students' access to thoughtful supervision. A saved hour can become time for a serious conversation, provided that institutions choose to protect it.

ECOLOGICAL RESPONSIBILITY INCLUDES MATERIAL COSTS AND UNEQUAL ACCESS

My ecological concerns extend to the infrastructure supporting AI. The International Energy Agency (2025) projects global data centre electricity consumption of approximately 945 TWh in 2030 under its base case. AI is an important driver, but the estimate covers data centres overall. It cannot be assigned to educational AI or to an individual university's activities. The report also recognises uncertainty and alternative scenarios. These distinctions matter because environmental criticism should meet the same evidential standards as other scientific claims.

For universities, the practical question is whether a proposed application offers sufficient educational benefit to justify its resource use and expenditure. Procurement should consider available information on efficiency and whether simpler tools can meet the same need. I would avoid unsupported estimates of the footprint of a particular interaction. An institution can still demand greater transparency while acknowledging what it cannot currently measure reliably.

Equity is another part of responsible evaluation. UNESCO identifies inclusion and linguistic and cultural diversity as important concerns in generative AI deployment Miao and Holmes (2023). Students may differ in access to paid services, connectivity, and suitable devices. My proposal is that required educational activities should include fair access and feasible alternatives. Teaching materials and assessment should also keep local ecological knowledge visible. The risk is that institutions confuse technological advantage with academic ability, while their definition of success excludes environmental and social costs.

EDUCATIONAL MATURITY REQUIRES SELECTIVE ADOPTION

Lastly, I would not use the extent of AI integration as a universal measure of educational maturity. Activities within the same institution have different purposes. Automating a routine administrative process may be appropriate, while automating the reasoning required by a foundational assignment may undermine its objective. Ecological interpretation may benefit from analytical assistance while still requiring accountable decisions about the meaning and limitations of observations.

My preferred approach is to proceed step by step. Identify the educational problem, specify the competence students should develop, and test whether the proposed assistance contributes to it. Miao and Holmes (2023) supported evaluating pedagogical suitability and preserving human agency. For my teaching, I would interpret that responsibility through practical checks: can students explain their sampling decisions, recognise an implausible result, and defend a conclusion after the tool is removed or its answer is questioned?

The potential risk of rapid institutional change is that useful practices may be discarded before their contribution is understood. Equally, refusing a beneficial application merely because it is unfamiliar would be an educational failure. Selective adoption requires openness and restraint, each justified by the activity being considered. An institution may reach a sound decision to automate one process, support another, and retain direct human practice in a third. The criteria should be the educational purpose and the available evidence.

IMPLICATIONS FOR TEACHING, RESEARCH, AND INSTITUTIONAL EVALUATION

These reflections suggest a practical assessment approach that follows the work's development. In an ecological assignment, students could provide original observations, a sampling rationale, dated records, calculations, and a brief account of any permitted AI assistance. An oral discussion could then examine how they interpreted an unexpected result and why they rejected an alternative explanation. Such activities should be proportionate to the course and accessible to the learners. They are proposed ways to make understanding visible, rather than a claim that one assessment design will eliminate misconduct.

Research supervision should similarly distinguish assistance with expression from responsibility for evidence. Students need to consult the sources they cite, preserve usable records of data processing, and understand the assumptions of their analyses. Supervisors should examine reasoning as well as the final presentation. Hurlbert (1984)'s idea remained relevant here because weaknesses in replication cannot be corrected simply by producing additional calculations. Liang et al. (2023) likewise cautioned against drawing conclusions about authorship from automated detection alone. Accountability requires examining the work and allowing a fair explanation of how it was produced.

Institutional evaluation should compare learning before and after implementation, assess performance on unfamiliar tasks independently, and measure retention where feasible. It should also document time spent on corrections, access problems, staff workload, and effects on supervision. The distinction between performance and learning identified by Bastani et al. (2025), and between perceived and measured learning demonstrated by Deslauriers et al. (2019), supports using multiple outcomes. Neither satisfaction nor completion speed is sufficient by itself. Decisions should be revisable when educational benefits are absent, or harms emerge.

For practical implementation, I would ask departments to begin with a small number of clearly defined educational outcomes rather than a target percentage of AI adoption. A teaching team could document what students can explain independently, whether assessment remains fair to students with different levels of access, how much lecturer time is consumed by verification, and whether field or laboratory skills are being maintained. These observations could guide a documented decision to retain, modify, or discontinue a particular application. Ajiye and Omokhabi (2025). Such evaluation needs the participation of lecturers, students, and technical staff, because an apparently efficient practice in one part of a university may create additional responsibilities elsewhere.

LIMITATIONS OF THE COMMENTARY

The experiences discussed here reflect my perspective and do not show how all educators or students respond to AI. The literature is selected for relevance to the argument and was not identified through a systematic review protocol. Findings from mathematics, physics, and particular writing detectors require caution when applied to other subjects and newer systems. Similarly, ecological resilience provides an analogy for institutional reflection rather than a validated theory of university transformation. Slonopas et al. (2026). The safeguards proposed here require evaluation in their intended contexts. These limitations permit a clear distinction between evidence, personal interpretation, and recommendations.

The ten reflections are therefore best understood as an interpretive framework for discussion and local testing. Future studies could examine them through student interviews, discipline specific assessments, comparisons of assisted and independent performance, and institutional records of workload and access. Such research should also test for unintended consequences and avoid assuming that a practice effective in ecological field education will transfer unchanged to every academic subject.

CONCLUSION

My reflection returns to the ordinary responsibilities that give academic life meaning. A student must learn to observe carefully and explain a conclusion. A researcher must remain responsible for the evidence. A supervisor must preserve the learner's contribution, and a university must create conditions where questioning remains possible. AI can assist these responsibilities when its use is thoughtfully designed, and its outputs are examined. Its educational value depends on the abilities, relationships, and ethical habits that develop around it.

I remain convinced that basic is still basic Yap (2025), Yap (2026a). The speed of an answer does not remove the need to understand its origin, and technological capability does not relieve us of conscience. I want universities to use the time and opportunities AI creates to strengthen scientific understanding, sustain curiosity, and give educators more room to teach with attention. Progress should leave students more capable of thinking for themselves and more aware of their responsibilities to other people and the living environment. That is the educational purpose through which I would judge transformation.

DECLARATION OF AI ASSISTANCE

ChatGPT assisted with drafting, organisation, language, and locating literature for this reflective commentary. The personal perspective is based on the author's experiences and views. The author has reviewed and approved the final text and references and retains responsibility for the submitted work. No empirical data were generated for this commentary.

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