

Making Learning Visible in a World of Invisible GenAI: A Literature Review

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There has been a growing focus on critical thinking across the Higher Education sector in recent years, reflected through both national and international policy and research (Szenes et al., 2015). Institutions refer to critical thinking in their learning outcomes, grading descriptors and marking criteria, demonstrating its significance to teaching, learning and assessment (OFS, 2022). This reflects a broader societal value associated with critical thinking (Golden, 2023; Essien et al., 2024); key stakeholders increasingly view critical thinking as a necessary skill for futureproofing our education systems and for preparing graduates for their futures (Golden, 2023).

For some commentators, this increased emphasis on critical thinking skills is linked to a contemporary world in flux. Kadwa (2024) highlights the 'dynamic' nature of the challenges of the modern era, in which complex real-world problems require graduates to adopt multiple perspectives to find creative and sustainable solutions. Such uncertain conditions demand graduates possessing a highly-prized skill set encompassing both adaptability and discernment (Spector and Ma, 2019). The dramatic rise of AI and the likelihood that GenAI will become more invisible in our lives (Taylor, 2023) increases these conditions of uncertainty. Kadwa comments that whilst GenAI can do many things, critical thinking, at least for now, remains beyond the capabilities of such tools and sits firmly within the human domain (2024). Students will need to assess confidently the quality, reliability and accuracy of GenAI outputs (Bearman et al, 2024). They will need to understand *how* they are learning in terms of the critical choices they make, the information or knowledge they engage with, and where machine learning ends and theirs begins. Critical thinking skills would seem vital in enabling this (Wu, 2024).

Yet, our review of recent discussions of critical thinking in higher education contexts reveals a central paradox: if critical thinking is widely valued by educators as a core aspect of learning and marker of student attainment, there is no real consensus as to what it is, or why it matters (Thomson, 2011; Szenes et al., 2015). Research indicates that teachers stipulate critical thinking as an intended learning outcome whilst being unsure as to how they should identify and assess this attribute (Thomson, 2011). Clearly, this risks student uncertainty about the skills that they are being asked to develop during their studies, and vagueness amongst teachers as to what they are meant to be teaching. Whilst researchers and commentators often formulate useful baseline definitions of critical thinking, our literature review reveals that it might be better to think about critical thinking not as a single competency or practice, but rather as a heterogenous field of attributes and activities. It is also necessary to understand the subject-specific and applied contexts in which conceptions of critical thinking take shape.

Does a generalised form of critical thinking exist, or is it always to be understood in its local disciplinary contexts: coming into being when solving a maths equation or

when writing an essay on ethics? Essien et al. (2024) identify a shift in university education away from nurturing critical thinking in the context of subject-specific knowledge contexts towards a greater promotion of cross-disciplinary thinking and attention to industry and workplace needs. Spector and Ma reflect on 'generic' aspects of critical thinking whilst pointing to research that 'becoming a highly effective critical thinker in a particular domain of inquiry requires significant domain knowledge' (2019: 6). Is it the case, then, that critical thinking skills provision necessarily requires mapping, and translating between the generic and subject or industry-specific dimensions of critique? If so, this points to the necessity of fostering cross-institutional, cross-disciplinary, and cross-sector thinking as to how this can be best achieved.

There certainly exist commonalities across the diverse definitions of critical thinking that researchers and practitioners put forward; these often foreground interconnected attributes such as intellectual autonomy and agency, self-reflection and bias awareness, capacities of evaluation, synthesis and analysis, rigour and diligence, as well as intellectual curiosity and creativity. A good indication of the capaciousness of the term 'critical thinking' is given in *The Delphi Report*, an influential resource developed in North American higher education in the 1990s and aimed at rigorously mapping the concept in teaching contexts:

The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgements, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances the inquiry permit. (Facione 1990: 2)

This wide-ranging definition suggests how much work this term can do in education. In this context, what kind of work around definitions and assumptions might support teaching and learning?

Despite the lack of agreement on a singular definition of critical thinking, there has been much discussion in the literature as to how best to cultivate it in students. Outlining broad principles, Thompson advocates a broad shift amongst teachers 'from output to process, learning to thinking and subject isolation to subject integration' (2011:1). This approach emphasises the thought processes students engage in and the need to develop them as well-rounded critical thinkers. Relatedly, Szenes et al. argue that we should explicitly teach generic critical thinking skills, as the ability to 'demonstrate mastery of semantic gravity' — that is, shifting from context-specific to general or abstract insights — is what best allows students to demonstrate critical thought (2015: 587). Elsewhere, however, the literature indicates the importance of attending to the cultural and historical contexts in which critical thinking is defined, as well as recognising the value in developing interventions that develop critical thinking competencies by directly responding to inherent cognitive biases (Spector and Ma, 2019; Aston, 2023).

Many of those writing after the release of ChatGPT acknowledge a role for GenAI in fostering critical thinking in students. For example, Walter argues that '[b]y carefully designing prompts, educators can encourage students to approach problems from different perspectives, analyze information critically, and develop solutions creatively' (2024:14), while Bearman et al. argue that interacting with GenAI can help students 'develop their ability to articulate their own evaluative judgement', since any criticism GenAI makes of their work can be freely challenged (2024: 899). Essien et al. conclude that by 'automating tasks such as summarisation and proofreading', GenAI tools can provide a 'cognitive dividend,' freeing mental resources for higher-level thinking and thus acting as a 'cognitive amplifier' (2024: 877). Similarly, Wu argues that AI can be used to tutor students in lower order thinking skills, a kind of 'digital scaffold that supports and enhances learning experiences.' (2024: 7), thus freeing up educators to support higher order thinking skills. This may be true, though how do we define 'lower' and 'higher' order thinking skills if not through labels such as 'critical'?

Whether the advent of GenAI promotes or threatens students' critical faculties, Walter argues convincingly that students should be taught to see 'AI not as their tutor, teacher or ghostwriter, but as their sparring partner' who should not be 'unconditionally trusted' (2024: 5-6). This sentiment accords closely with the core objectives of our QAA Collaborative Enhancement Project: to renew endeavours to cultivate human critical thinking in a world infused with ever more prevalent AI that overthrows traditional assumptions and practices in education and employment.

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