INTELLIGENT TECHNOLOGIES IN EDUCATION

The temptation of the silver platter: Preventing the sidestep and normalising the productive struggle

Hayley Griffin[a], Trixie James[a]

[a] CQUniversity, Australia

Abstract

In an era characterised by rapid technological advancements, educational tools have become integral to academic success. Tools such as Grammarly, Studiosity, assessment exemplars, and more recently, Generative Artificial Intelligence (GenAI) technologies like ChatGPT, offer students unprecedented support. This paper considers the critical role of the productive struggle as part of the journey to meta-learning and meta-cognition and emphasises the risk of educational tools in sidestepping this crucial process. To explore how educators can support students in achieving learning success when tempted by product-oriented educational tools, this paper presents the *Responsible Use of Educational Tools Thinking Framework* which offers a pragmatic approach for assisting educators and students in applying critical thinking when integrating educational tools into the assessment process. This proposed framework, complemented by a teaching model, serves as a guide to help students navigate their path and use critical thinking while using educational tools. To further support this thinking framework, this conceptual paper presents three key practices essential for embedding educational tools into the learning journey. First, students must purposefully engage with educational tools to develop technological competence. Second, they must exercise critical thinking and judgment during the productive struggle of idea generation, and third, students must employ ethical decision-making to ensure the responsible and morally conscious use of these

tools. Aligned with the imperative of cultivating technological competence, exercising critical thinking amidst the productive struggle, and instilling ethical decision-making, the framework functions as a practical solution to ensure that students not only acquire knowledge through the assessment process, but also cultivate essential skills for critical thinking and managing educational success.

Keywords

Generative Artificial Intelligence (GenAI), productive struggle, academic integrity, ChatGPT, digital literacy, assessment, assessment exemplars

Citation

Introduction

Educational learning tools serve as a means to support students in their learning journey and assist them in achieving their educational goals. As prefaced by Feibleman (1967), a tool, in the context of education, functions to enable a student to obtain a desired outcome. In today's context, there is a virtual smorgasbord of educational tools including typing assistants such as Grammarly (Fitria, 2021; Koltovskaia, 2020), writing feedback services including Studiosity (Pike & Aruna, 2022), the provision of assessment exemplars (Grainger et al., 2008) and artificial intelligence language model–based generators such as ChatGPT (McLeod & Richardson, 2023). However, this proliferation of product-oriented tools raises significant concerns about over-reliance and its potential to undermine the development of critical thinking and independent learning. This paper addresses the pressing need to balance the advantages of these tools with the imperative to cultivate higher-order cognitive skills, introducing the *Responsible Use of Educational Tools Thinking Framework* as a central solution. This conceptual paper supports this framework arguing that engagement with technology must be purposeful, serving as a catalyst for enhancing how students think and interact with technology. Additionally, the productive struggle is essential for developing higher order thinking skills, enabling students to exercise critical thinking and sound judgment when generating ideas. Lastly, ethical practice should underpin the decision-making process in the use of educational tools.

The rise of GenAI tools has fundamentally reshaped educational landscapes, offering both opportunities and challenges. On one hand, these technologies enhance accessibility and efficiency in academic tasks. On the other hand, their misuse threatens to normalise shortcuts that bypass the "productive struggle" (Baker et al., 2020; Bullmaster-Day, 2015) essential for deep learning. Productive struggle refers to the process of students engaging in challenging tasks that require effort, problem-solving, and perseverance, which enhances their metacognition by fostering self-awareness, reflection, and strategic thinking about their learning approaches (Baker et al., 2020). Such reliance poses a direct challenge to fostering academic integrity and autonomous skill development, as students may prioritise end-products. A product-focused approach refers to a reliance on tools or shortcuts to generate an end-product, often an 'answer' to an assessment task, which may bypass the necessary learning process. For example, students may use AI tools like ChatGPT to produce a polished response without engaging deeply in the intellectual effort required to develop and refine their own ideas. Similarly, assessment exemplars, which provide students with examples of high-quality work, are intended to guide but can sometimes be misused to mimic or replicate content rather than inspire original thought. This

tension highlights a crucial dilemma for educators: how to leverage the potential of these tools while preserving the integrity of the learning experience.

Educators face mounting challenges in navigating this complex landscape. The integration of product-oriented tools demands a nuanced approach to ensure that students not only achieve academic outcomes but also develop essential lifelong skills such as critical thinking, problem-solving, and ethical decision-making (Essien et al., 2024). The need to strike this balance is exacerbated by the absence of comprehensive frameworks that guide the ethical and responsible use of educational technologies. While existing literature acknowledges the benefits of tools like ChatGPT, it often falls short of addressing their limitations or offering actionable strategies for their effective pedagogical integration (McLeod & Richardson, 2023; Crawford et al., 2023). Moreover, global perspectives on AI ethics emphasise the importance of aligning these tools with broader educational values, yet practical solutions remain sparse.

This paper seeks to fill this gap by presenting the Responsible Use of Educational Tools *Thinking Framework* designed to support educators and students in navigating the complexities of integrating educational tools into the learning process. Situated within the Multifaceted Explicit Teaching Model (James et al., 2023), this framework prioritises the development of technological competence, engagement in the productive struggle, and adherence to ethical decision-making. By providing a structured approach, it aims to mitigate the risks of over-reliance on product-oriented tools and promote a balanced use of technology that enhances, rather than detracts from, the learning journey. This discussion highlights the critical need for actionable frameworks that not only address current gaps in the literature but also equip educators and students with the tools to thrive in an evolving educational landscape.

Literature Review

In the context of Higher Education (HE), desired outcomes are routinely associated with the submission of an assessment response that contributes towards the successful completion of a unit of study. As assessment is considered a process that facilitates judgements on evidence of students' capability to demonstrate designated benchmarks (Boud & Associates, 2010), it is prudent to speculate whether the use of educational tools in HE may result in misrepresentation of a student's knowledge and competence. While the types of assessments themselves are not the focus of this paper, the discussion centres on how students can frame and demonstrate their knowledge effectively and responsibly. Central to this is the productive struggle (Baker et al., 2020), which remains core to the development of their metacognition. By prioritising this

approach, the paper highlights the importance of students engaging deeply with the learning process to foster critical thinking and intellectual autonomy, rather than circumventing these developmental opportunities through over-reliance on educational tools.

All institutions in the Australian HE sector are mandated by the Tertiary Education Quality and Standards Agency Act 2011 (Tertiary Education Quality and Standards Agency Act [TEQSA], 2011), which includes adhering to the national standards set by the Higher Education Standards Framework. According to Standard 1 of the framework, Action 1.4 states that the learning outcomes associated with a HE qualification comprise a combination of discipline-related outcomes and generic outcomes, which includes "skills in independent and critical thinking suitable for life-long learning" (TEQSA, 2011). Further to this, most institutions identify a collection of specific attributes that they consider commensurate with graduate behaviours. Upon completion of their course of study, graduates are expected to exhibit a range of inter and intrapersonal literacies and competencies, thinking techniques and habits of mind (CQUniversity, 2023; University of Queensland, 2023). It is therefore apparent that in the Australian HE context, both systemic and organisational bodies value and associate the development of twenty-first-century skills (Queensland Curriculum & Assessment Authority [QCAA], 2017). However, Lucas (2019) critiques the term twenty-first-century skills as unhelpful and imprecise, advocating instead for a focus on cultivating essential dispositions for learning that are valuable across contexts and throughout life. These dispositions include critical thinking, creativity, and perseverance—traits that extend beyond specific tasks and remain relevant in an evolving world. The World Economic Forum (2016) further elaborates on these qualities by categorising them into foundational literacies (e.g., literacy and numeracy for daily application), higher-level competencies (e.g., critical thinking for complex challenges), and enhanced character qualities (e.g., leadership and adaptability). By emphasising these dispositions, educators can prepare students to approach diverse challenges with resilience and adaptability. This perspective aligns closely with the central argument of this paper: educational tools should be used to enhance, rather than circumvent, the cognitive and reflective processes that underpin meaningful learning and personal growth.
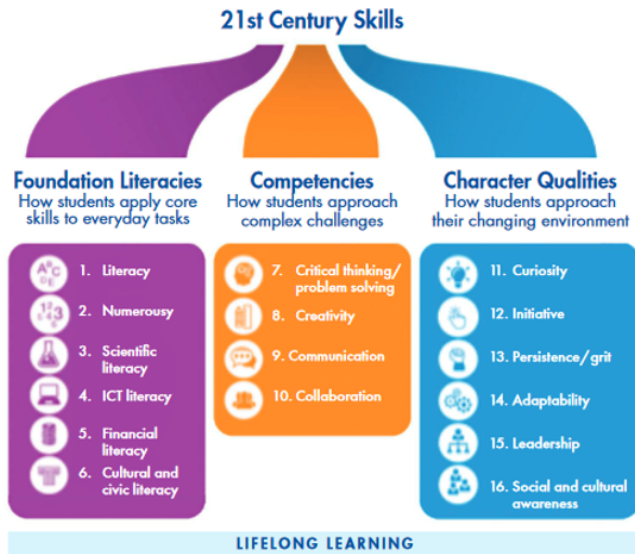
Figure 1

World Economic Forum 21st Century Skills

Therefore, if these skills are cultivated through the learning and assessment process (James et al., 2023), the priority must reside with students using educational tools to *enable* a desired outcome, in preference of students using educational tools to *generate* an outcome. Recently published commentaries, which delve into the current debate on the use of Gen AI share both strengths and weaknesses regarding the use of this educational tool (Nikolopoulou, 2024; Nguyen et al., 2024; Roe et al., 2024). McLeod and Richardson's (2023) research into specific assessment experiences advocates for incorporating Gen AI into teaching and learning in HE, while prefacing the need for intentional instruction of the tool's features. Further to this, Crawford et al. (2023) and Zhai et al. (2021) present avenues and caveats in terms of overall pedagogical considerations when embracing Gen AI. In the midst of the current technological revolution and substantial growth in educational tools, practical applications for teaching and learning are still emerging and this paper seeks to address this gap in the literature.

The widespread availability of product-focused tools, such as ChatGPT and assessment exemplars, is enticing—it appears to present a wealth of options on a silver platter to tempt the student palate. However, relying on these educational tools side-steps the productive struggle of learning. Hence, the productive struggle, contrary to passive learning, demands effortful and continuous dedication to understanding (Bullmaster-Day, 2015). Baker et al. (2020) present the

productive struggle as the challenging and intellectually stimulating process that students engage in as they develop higher-order thinking skills. This fundamental cultivation of deeper learning, achieved through the productive struggle can therefore be inadvertently circumvented when educational tools, such as assessment exemplars and Gen AI, are used without due diligence. For instance, To et al. (2022) and Hawe et al. (2021) caution educators against providing assessment task exemplars prior to students independently engaging in the experience of drafting an initial assessment response. This process of premature exposure removes the opportunity for students to engage in the productive struggle while constructing their response and endorses a product-focussed approach to completing assessment. This pedagogical misapprehension draws parallels to the use of Gen AI to produce assessment by once again avoiding the productive struggle associated with developing an assessment response. Research suggests that work avoidance (Reinhardt et al., 2023), time constraints (Grainger et al., 2008), stress and lack of confidence (Deng et al., 2022), English as a Second Language (Hu & Yu, 2023), and an intolerance to the frustration associated with the productive struggle (Boaler, 2016; Harrington, 2005) are acknowledged as explanations for why students use educational tools to generate outcomes for assessment.

In the HE context, an obsession with product-focused approaches may potentially conflict with the intention of fostering higher-level thinking through engagement in the productive struggle. Therefore, educators need to consider how to intervene in the cycle of over-reliance on educational tools by both reinforcing the value of the productive struggle and engendering an approach that offers students guidance to self-manage the process. Considering the growing popularity and appetite for using tools that generate an end product, while sustaining the principal learning intent of developing autonomous, futures-based skills and critical thinking habits (TEQSA, 2011), it is the authors' belief that educators must remain conscious of a tool's intended purpose. This conceptual paper draws on research findings and empirical knowledge of effective pedagogy to present a practical response to the challenge of supporting students to achieve learning success given the current affinity for product-oriented educational tools. The practical response endorsed herein is supported by a synthesis of perspectives that intends to stretch the current confines of understanding regarding the value of distinct and prominent educational tools. While acknowledging the risks of over-reliance on GenAI, it is essential to recognise its potential to complement traditional learning processes, particularly for equity students or those with disabilities. GenAI tools, such as ChatGPT, can act as scaffolding mechanisms to address unique learning needs offering real-time feedback, simplifying complex concepts, and providing language support for non-native speakers (James & Andrews, 2024). Leveraging these features enables

educators to foster an inclusive environment that promotes both technological competence and equitable access to learning opportunities.

However, the benefits of these tools must be harnessed within the boundaries of guided instruction to ensure they enhance, rather than supplant, critical cognitive processes. Educational tools should extend learners' cognitive abilities, fostering self-regulated and ethical intellectual habits through deliberate and principled application of cognitive skills. These tools should support and refine the outcomes of students' effortful dedication to understanding, ensuring that students retain intellectual ownership of their work while using technology to polish and enhance their final products. Preserving the importance of principled and skilled graduates emphasise the need for educators to teach students how to self-regulate their use of educational tools. According to González-Doğan et al. (2024), integrating principled innovation as a character development framework in education coursework supports educators in teaching students to self-regulate and consider the role of character in their learning processes. A practical approach that scaffolds this behaviour is essential for cultivating successful learning outcomes. Fundamentally, this paper argues that educational tools should serve to augment learners' aptitudes, empowering them to navigate complex learning processes rather than replacing their intellectual effort.

The overarching discussion within this paper contemplates student success by interrogating how educators can support students to self-regulate and use critical thinking in assessment when considering using product-oriented educational tools. To do this, the authors propose a thinking framework that sits within a pedagogical model developed by James et al. (2023). Drawing on the components of the Multifaceted Explicit Teaching Model (METM) (see Figure 2) (James et al., 2023), the authors offer that there is scope to customise this model to respond to the dilemma raised in this paper.
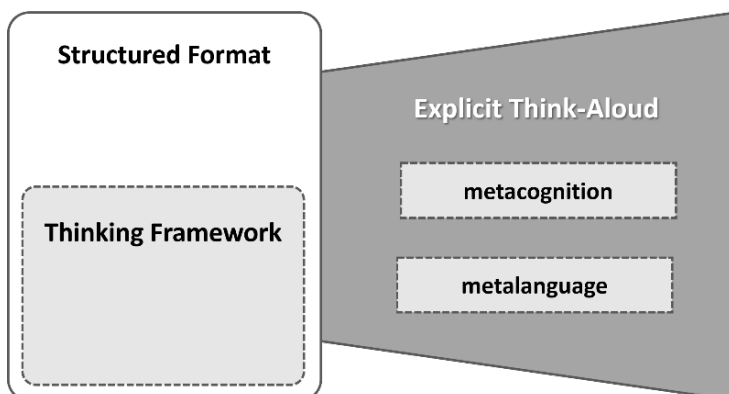
Figure 2

Multifaceted Explicit Teaching Model

The METM suggests that critical thinking and self-regulation can be taught by integrating a thinking framework embedded within a structured format. These constructs are supported with a pedagogical strategy of *explicit think–aloud* that facilitates exposure to the metacognition associated with the productive struggle, which would further develop the metalanguage specific to students' discipline areas (James et al., 2023). The authors emphasise the significance of the thinking framework construct within this model, which serves as an avenue to successful learning by supporting self-regulation and guiding the responsible use of educational tools. In a previous study (James et al., 2023), the METM was applied to the concept of critical thinking, utilising a critical thinking journal as the structured format and the Review, Connect, Extend, Apply model as the thinking framework (see Figure 3). The authors argue that by employing explicit think-aloud strategies, educators can effectively foster students' metacognition and enhance their use of metalanguage.
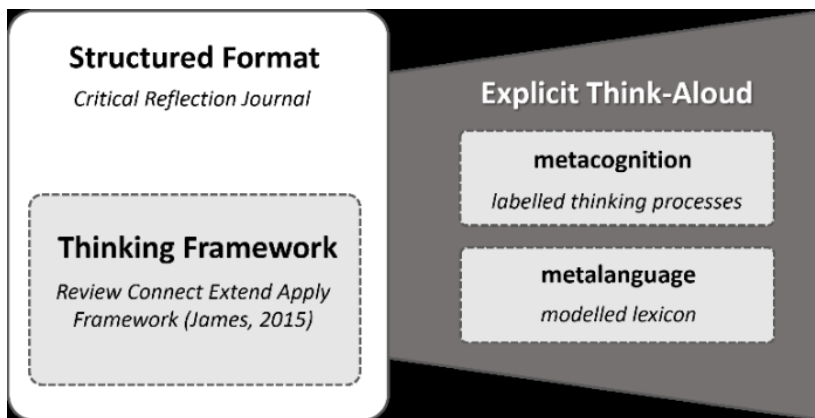

Structured Format
Critical Reflection Journal

Thinking Framework
Review Connect Extend Apply Framework (James, 2015)

Explicit Think-Aloud

metacognition
labelled thinking processes

metalanguage
modelled lexicon

Figure 3

Multifaceted Explicit Teaching Model as applied to the teaching of critical thinking

In adapting the METM for the *Responsible Use of Educational Tools Thinking Framework* when constructing assessment responses, the authors present a context-specific thinking framework, underpinned by three distinct practices of successful students. Firstly, engagement with technology needs to be purposeful and recognised as a catalyst for advancing the way students

think and work *with* technology. Secondly, the productive struggle is required for the development of higher order thinking skills and for students to exercise critical thinking and judgement when generating ideas. Finally, ethical practice needs to be the cornerstone of the decision-making process when using educational tools.

Practice One. Students must engage purposefully with educational tools to develop technological competence for the 21st century.

Technology competence is a crucial, globally relevant skill needed across academic, professional, social, and personal domains (Rodrigues et al., 2021). In basic terms, individuals who can engage with technology, for specific purposes, are better prepared for meeting the demands of the 21st century. Daily activities such as locating information, enjoying entertainment, participating in education or work, and communicating are rudimentary actions that are enabled through intentional use of technology. Furthermore, informed, and purposeful technology practises afford users the potential to optimise and automate actions for the benefits of ease, efficiency, safety and reliability (Rodrigues et al., 2021). Fundamentally, purposeful technology usage offers individuals enhanced participation and empowers cultural, social, and economic experiences, and thus has the capacity to elevate the lifelong experience (Laal, 2013).

As of late 2021, the Australian National Skills Commission reported computing, advanced reasoning alongside higher order thinking, and communication and collaboration as prevalent skills required for engaging with and within workplaces of the future (Australian Government, 2021a). On a global scale, the demand for advanced digital skills, critical thinking, and effective communication is rising. A 2021 report by McKinsey & Company highlights how the COVID-19 pandemic accelerated trends in remote work, e-commerce, and automation, underscoring the need for workers to adapt to new technologies and collaborative tools. Similarly, PwC's (2021) *Future of Work and Skills* Survey emphasises the critical role of digital transformation and the development of leadership capabilities in navigating the evolving workplace landscape. As a consequence of technological advancements, tasks within existing jobs and work roles are constantly evolving and thus the exigency for individuals to maintain technological and digital competencies to fulfill the demands of higher skilled and non-routine work roles is important (Australian Government, 2021a; PwC, 2021).

However, desirability to apply complex and innovative thinking in digital contexts, for purposes including automation, programming and connectivity, presents in contrast to recent Australian research (Lockey et al., 2020; McLeod & Richardson, 2023) that highlights the Australian population's self-reported, low levels of technological competence. International research also

highlights concerns about low levels of technological competence among populations. For example, a report by UNESCO (2016) discusses the global challenges in achieving digital and ICT literacy, noting that many individuals lack the necessary skills to fully participate in a knowledge economy. Additionally, a study by Ainley et al. (2016) found significant gaps in digital literacy across various countries, emphasising the need for better education and training to bridge these gaps. This research highlights that while many people are aware of Gen AI technology, the majority of surveyed populations admit to exhibiting low levels of literacy when it comes to understanding how and when Gen AI can be used. James and Andrews (2024) highlight that GenAI offers potential benefits such as improved language skills and critical thinking, however, they raise concerns about exacerbating the digital divide and the risk of reinforcing existing biases if people are unable to access these forms of technology.

It is a reality that technological competence has become a fundamental skill in this digital society (Bearman & Ajjawi, 2023) and thus an unavoidable feature of an individual's lifelong journey. While technological advancements offer significant benefits, they also raise important concerns and tensions. The Australian Government has addressed issues directly impacting education, such as cyberbullying, through public inquiries like the Inquiry into Social Media and Online Safety (Australian Government, 2021b). Additionally, new laws have been introduced to regulate the purposeful use of technologies like Generative AI, including measures to combat sexually explicit deepfakes (Attorney-General's Portfolio, 2024). While technological advancements have the capacity to empower students, caution is needed. The rise of Generative AI should be viewed as a catalyst for shifting how we think about and interact with technology, particularly in higher education contexts where it may initially be perceived as a threat or taboo (Bearman & Ajjawi, 2023).

Practice Two. Students must exercise critical thinking and judgement when generating ideas as part of the productive struggle.

The productive struggle occurs when students first identify a problem or knowledge gap; then they explore potential solutions and evaluate solutions in terms of efficacy, before applying knowledge to the unfamiliar situation to resolve the issue (Lynch et al., 2022). This process aims to reduce reliance on others for learning, while simultaneously building learner agency (Techawitthayachinda et al., 2022). By extension, this process allows students to experience the discomfort associated with the productive struggle and creates a distinct space for growth to occur. Especially relevant is that when existing within this space of discomfort, students

synthesise and apply complex, discipline content in authentic contexts and consequently manage and self-regulate their learning progress (Techawitthayachinda et al., 2022).

Throughout the duration of a person's study, no matter the level of education being undertaken, there are certainly intervals and contexts where the productive struggle occurs, and the brain is subsequently challenged, allowing synapses to multiply (Boaler, 2016). This generation of new knowledge, occurring in the designated struggle space, facilitates deep understanding of theoretical concepts and the ability to adapt thinking to meet contextual demands (Lynch et al., 2022). Admittedly this formal learning period facilitates the expansion of complex, contextual and disciplinary thinking behaviours, which permits deep level thinking; however, failure to exist and persist in the struggle space in favour of using product-generating educational tools "could negatively impact their critical thinking and problem-solving skills" (Kasneci et al., 2023, p. 5).

In the realm of HE, the incorporation of educational tools like large language model–based generators and assessment exemplars, can undeniably enrich facets of the educational landscape (Carter et al., 2018; Kasneci et al., 2023). Nevertheless, it is salient to remain cognisant that the ultimate outcome in this context is for students to have developed conceptual and practical knowledge in one or more disciplines, providing a foundation for ongoing learning, and autonomous, higher order thinking skills to exercise critical thinking and judgement for generating ideas and solutions in diverse contexts (Australian Qualifications Framework Council, 2013).

Practice Three. Students must employ ethical decision making to cultivate morally conscious and responsible use of educational tools.

In HE, ethical behaviour is pivotal for fostering a learning environment based on moral principles, fairness, and integrity (Susilowati et al., 2021). Floridi et al. (2018) have adapted a collection of ethical principles to the context of artificial intelligence in society, which includes beneficence, non-maleficence, autonomy, justice and explicability. These virtues function as guiding concepts to promote behaviour, and consequently influence decision-making, that encourages the well-being and general goodness of humans, respect for choice as an inherent human condition, and taking actions with informed intentionality, honour and fairness (Floridi et al., 2018). For students, learning how to apply ethical decisions, whilst at university, plays a significant role in moulding their behaviour and preparing them to navigate the ethical dilemmas in their future career paths (Eke, 2023). It establishes a foundation for principled decision-making and integrity, essential for academic and professional success. Furthermore, Susilowati et al. (2021) suggest that the ethical

climate within a HE landscape provides a shared perception of correct behaviour, and shapes how ethical issues are addressed. Accordingly, as students observe and discern what academic integrity entails, it reinforces a commitment to abide by the ethical standards of the university (Eke, 2023; Kolb & Kolb, 2005).

Educators play a pivotal role in guiding students towards the development of self-regulation as a cornerstone of ethical practice. The imperative of cultivating moral character in learners cannot be overstated, as underscored by Crawford et al. (2023) who argue that leadership is needed to ensure ethical practices are followed when students are using various educational tools. By scaffolding processes associated with ethical practice, including clarifying the objective, identifying the facts, considering the consequences and making informed choices (Eke, 2023), educators can mitigate the risk of moral disengagement and the tendency to conveniently 'forget' ethical standards, both of which can foster an environment conducive to academic dishonesty and misconduct. Exposure to honest, dignified, responsible and fair decision-making strategies contributes to the formation of ethical decision-makers (Eke, 2023), who are equipped with a steadfast moral compass.

Responsible use of Educational Tools Thinking Framework

When considering these essential practices, it is imperative that educators consider how to intervene in the cycle of over-reliance on all educational tools. Reinforcing the value of the productive struggle in conjunction with the provision of guidance to support self-regulation cultivates the conscious and responsible use of educational tools, which are essential for learning success. The authors contend that educators can support students to amplify their higher order reasoning competence and refine their capacity to self-manage their thinking, in coexistence with product-oriented educational tools through the *Responsible Use of Educational Tools Thinking Framework*. This framework exists within the METM (James et al., 2023), which establishes the pedagogical solution to how educators can support student learning success with self-regulation and the use of critical thinking in assessment when tempted by product-oriented educational tools. The *Responsible Use of Educational Tools Thinking Framework* (see Figure 4) is embedded within a structured format, being the assessment task. Running parallel to these constructs is the intentional pedagogical strategy of *explicit think–aloud* (James et al., 2023), whereby the educator demonstrates explicit use of the thinking framework questions to critically reflect on their practice. This exposes students to the metacognition and metalanguage associated with their discipline area, which in-turn bestows them the mental processes required to persevere through the productive. Students can then transfer their observations of the educator's *explicit think–aloud*

and apply the *Responsible Use of Educational Tools Thinking Framework* to their own practice. This is accomplished through the development of conscious practices that embrace technological competence, facilitate self-regulated learning and maintain ethical practices, while using digital educational tools appropriately.
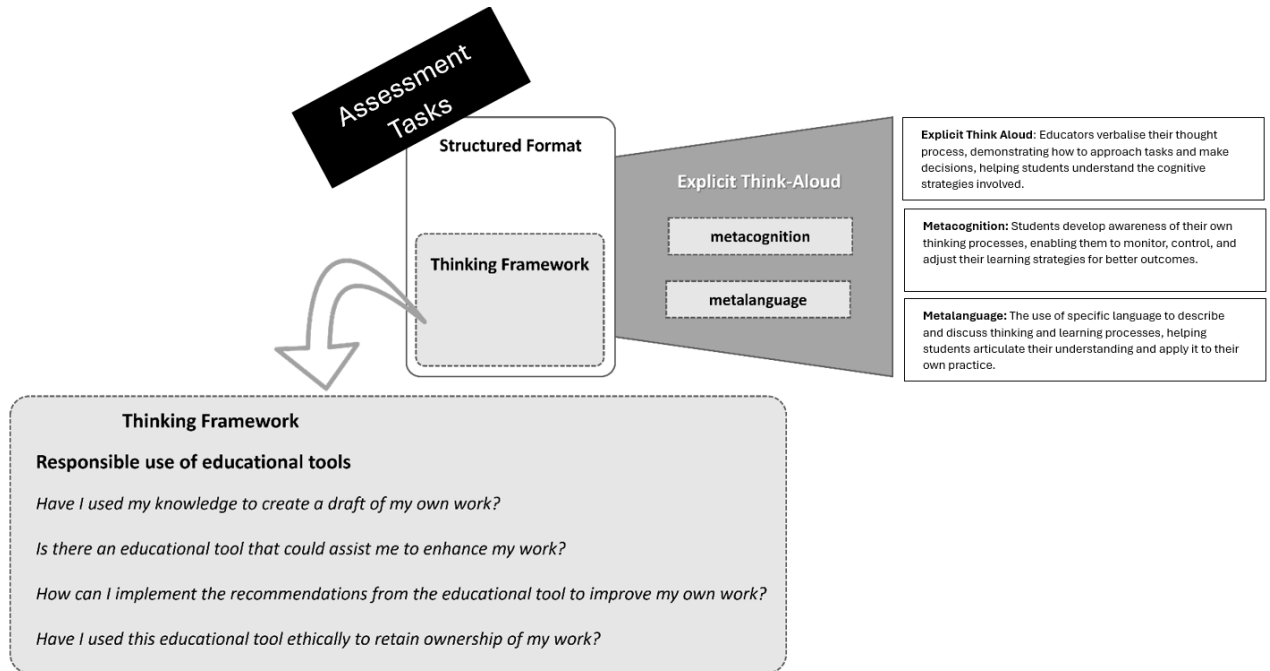

Figure 4

Responsible Use of Educational Tools Framework

This model presents the notion that genuine critical thinking, higher order learning and self-regulation are achievable through the productive struggle. The thinking framework is informed by the aforementioned practices and guides students to learning success via a decision-making process intended to safeguard the development of their intellectual property and the productive struggle space, while supporting appropriate use of educational tools that refine and enhance their work. The thinking framework prompts the user to reflect in first-person point of view to question whether they have used their own personal knowledge to create a draft of their work. The students then consider what educational tools may be available to assist them in this process. The next stage prompts them to critically reflect on the recommendations provided by the educational tool and affords them the opportunity to adapt that feedback and enhance their work. Finally, students reflect on the practice to ensure they can confidently state that they have

exhibited moral character and used the educational tool in an ethical manner to enhance their product.

Model in Practice

The thinking framework consists of four key stages, each designed to promote reflective and ethical use of educational tools (See Figure 5).

Draft Creation Using Personal Knowledge
- Have I used my knowledge to create a draft of my own work?

Tool Selection and Integration
- Is there an educational tool that could assist me to enhance my work?

Critical Reflection on Feedback
- How can I implement the recommendations from the educational tool to improve my own work?

Ethical Evaluation and Finalisation
- Have I used this educational tool ethically to retain ownership of my work?

Figure 5

Practical Progression of the Phases of the Thinking Framework – Reflective Checklist

The first stage encompasses, *Draft Creation Using Personal Knowledge*, students begin by posing the question "Have I used my knowledge to create a draft of my own work?". They begin by drafting their work independently, drawing on their existing knowledge and understanding of the subject matter. For instance, in a written assignment, students create an initial draft without using tools like ChatGPT to ensure their ideas and voice are authentically represented. In the second stage, *Tool Selection and Integration*, students pose the question "Is there an educational tool that could assist me to enhance my work?". This is the point where students should identify and integrate appropriate educational tools to refine and enhance their draft. Tools like Grammarly may be used to improve grammar and clarity, while ChatGPT could assist in brainstorming additional perspectives. The third stage, *Critical Reflection on Feedback*, encourages students to evaluate the feedback or output generated by the tools, deciding which suggestions to incorporate and why. Students pose the question "How can I implement the recommendations from the educational tool to improve my own work?" For example, a student might use ChatGPT to generate alternative explanations for a concept but validate the content against reliable academic

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sources before including it. Finally, in the *Ethical Evaluation and Finalisation* stage, students reflect on the entire process, ensuring their work adheres to academic integrity and ethical standards. Students pose the question "Have I used this educational tool ethically to retain ownership of my work?" This reflective checklist (Figure 5) may assist students to confirm that their final submission represents their own intellectual effort and properly credits any external contributions.

Actionable Guidance for Educators

To effectively implement the *Responsible Use of Educational Tools Thinking Framework* in practice, educators can adopt several practical strategies that foster critical thinking, ethical decision-making, and technological competence. The most important aspect is for educators to explicitly model the thinking framework through the explicit think-aloud strategy. This requires educators to verbalise their thought process during an example task. This helps students understand the reflective and critical thinking required to use educational tools responsibly. For example, an instructor could use a sample essay to demonstrate how to draft an initial response, use Grammarly for feedback, critically evaluate the suggestions, and reflect on the ethical implications of those decisions. This method not only illustrates the application of the framework but also builds students' metacognitive skills.

Another strategy is to embed the framework in assessment design by incorporating reflective components that require students to document and justify their use of educational tools. For instance, an assignment rubric might include a section where students explain how they applied the framework, the tools they used, and the ethical considerations that guided their choices. This encourages deeper engagement with the framework while fostering critical reflection on the impact of these tools on the learning process. Finally, facilitating peer discussions is an important way to enhance students' understanding. By engaging in group activities, such as comparing how they applied the framework to similar tasks, students can share strategies and offer diverse perspectives on ethical tool use. Peer-review sessions where students discuss challenges and provide constructive feedback can further strengthen their critical thinking and ethical decision-making skills. By adopting these strategies, educators can effectively integrate the *Responsible Use of Educational Tools Thinking Framework* into their teaching practices, empowering students to use educational tools in a responsible, reflective, and ethical manner.

Conclusion

In the rapidly evolving landscape of educational tools, this paper has explored the delicate balance between leveraging these technologies to enhance learning and mitigating their potential to undermine critical cognitive processes. The proposed *Responsible Use of Educational Tools Thinking Framework* serves as a guiding mechanism to help educators and students navigate this complex terrain. Following the four phases and referring to the reflective checklist, students can confirm that their work represents their own intellectual effort. By embedding principles of technological competence, the productive struggle, and ethical decision-making, the framework offers a structured approach to integrating tools like Generative AI into the learning process without compromising academic integrity or intellectual growth. To operationalise this framework, actionable strategies for educators include explicitly modelling the framework through think-aloud exercises, integrating reflective components into assessment designs, and fostering peer discussions to cultivate critical thinking and ethical tool use. These practical applications not only enhance student engagement but also align with the broader goal of fostering lifelong learning and adaptability in a digitally connected world.

Future research should explore the longitudinal impact of the framework on student outcomes, particularly in diverse educational and cultural contexts. Investigating its application across disciplines and its effectiveness in fostering higher-order thinking and ethical decision-making would provide valuable insights into its scalability and relevance. Additionally, examining how tools like GenAI can support equity students and those with disabilities would help refine the framework to address inclusivity and accessibility more comprehensively. Ultimately, this paper advocates for a paradigm in which educational tools serve to augment, rather than replace, learner aptitudes. By adopting the proposed framework, educators can ensure that these tools not only enhance learning outcomes but also uphold the essential skills of critical thinking, self-regulation, and ethical judgment, in-turn paving the way for principled, adaptive graduates prepared to navigate the complexities of the modern world.

Conflict of Interest

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