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Breaking the mold of knowledge imposition: reconstruct the digital literacy education model in academic libraries under the Scottish enlightenment

Fan Zhenjia and He Yimei

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Abstract

Introduction. This paper examines a new model of digital literacy education (DLE) in academic libraries. How Scottish Enlightenment ideas provide philosophical reflection and reference for DLE in contemporary academic libraries and break through the traditional knowledge imposition model.

Method. Drawing on Adam Smith's theory of moral sentiments, David Hume's theory of habit, and Adam Ferguson's theory of spontaneous order, the study explores a new model of DLE consisting of three elements: space, resources, and librarians.

Analysis. The model covers how to build the real and virtual digital literacy space, how to develop resources to strengthen students' learning subjectivity, and how librarians need to change traditional teaching methods.

Results. Academic libraries need to create digital literacy learning situation that integrates physics and virtual, develop structured digital literacy training courses, interactive self-learning tools, open education resources, practical digital literacy programs, and other resources. Librarian should become guider, maintainers of order, and evaluators of educational effectiveness.

Conclusions. Academic libraries should integrate educational and psychological theories, consolidate the philosophical foundation of DLE, and reconstruct the construction, integration, and presentation of resources with students as the center

Introduction

In the digital era dominated by algorithms and prioritising data, digital literacy has been hailed as a core proposition in global quality education. However, its development is trapped in profound ethical barrenness and philosophical aphasia. When education is reduced to an assembly line that adapts to technology, and when 'critical thinking' is alienated into code debugging skills, we cannot help but ask: What kind of philosophical foundation is lacking in digital literacy education (DLE)? This question is particularly urgent for DLE in academic libraries. As a knowledge hub and educational arena, academic libraries are not only the frontline where technological rationality exerts its erosion, but also a key fulcrum for reconstructing educational philosophy. However, current practices remain constrained by the dominance of technical rationality, widespread misinformation, and ethical deficiencies.

The philosophical heritage of the 18th-century Scottish Enlightenment can provide a new ideological lens for deconstructing the aforementioned predicaments. Adam Smith's theory of sympathy, David Hume's theory of habit, and Adam Ferguson's theory of spontaneous order collectively subvert the hegemony of rationality, offering crucial insights to address the existing problems in DLE. As key facilitators of DLE, academic libraries can bridge philosophical theory and educational practice. This study reflects on the moral philosophy of the Scottish enlightenment to construct a renewed model of DLE within academic libraries—transforming digital literacy from a tool of technical discipline into a communicative space for knowledge exchange, and enabling libraries to become dynamic sites for the formation of digital citizens in an age of digital transformation.

Literature criticism: the knowledge imposition and philosophical absence in DLE in academic libraries

Since the concept of digital literacy was first proposed in 1994, its connotation and denotation have experienced continuous enrichment and development. *The Statement on Digital Literacy* issued by the International Federation of Library Associations and institutions (IFLA) in 2017 used digital literacy to describe the ability to harness the potential of digital tools, having digital literacy means that individuals can use digital technology (or independently learn how to use digital technology) in the most efficient and effective way to meet the information needs in personal life, civil affairs, and professional fields (IFLA,2017). A *global framework of reference on digital literacy skills for indicator 4.4.2* published by United Nations Education Scientific and Cultural Organisation (UNESCO) further expanded its conception to 'the ability to access, manage, understand, integrate, communicate, evaluate and create information safely and appropriately through digital technologies for employment, decent jobs and entrepreneurship', includes competences that are variously referred to as computer literacy, ICT literacy, information literacy and media literacy (UNESCO,2018). Cyberspace Administration of China (CAC) formulated *action plan for improving digital literacy and skills of the Country* and put forward a more comprehensive definition called 'the collection of a series of qualities and abilities such as digital acquisition, production, use, evaluation, interaction, sharing, innovation, security, ethics and morality that citizens in the digital society should have in their study, work and life'. With the rapid development of artificial intelligence (AI) technology and its deep integration in various fields of society, the European Union updated *the digital competence framework for citizen (Digcomp2.0)* in 2022, emphasised the need to understand the basic principles, application scenarios and ethical impact of AI (Vuorikari,2022). Organisation for Economic Co-operation and Development (OECD) published *the digital education outlook 2023: Towards an effective digital education ecosystem*, pointed out that digital literacy in the future not only includes traditional information and communication technology skills, but also includes critical use of AI systems, evaluation, and human-computer collaboration capabilities (OECD,2023). These definitions reveal that the boundaries and scope of digital literacy are becoming increasingly blurred. AI literacy has been incorporated into its core

cultivation framework and evolved from a mere technical operation capability into a comprehensive concept encompassing technology, cognition, ethics, and social engagement. Compared with information literacy and media literacy, digital literacy also demonstrates greater inclusiveness and breadth, with a growing focus on the mutual enhancement of digital technical proficiency and digital ethical literacy, reflecting distinct interdisciplinary integration features (He,2022).

Carrying out DLE is of considerable significance for academic libraries. From a contemporary needs perspective, the widespread application of digital technologies is reshaping occupational structures and talent demand patterns profoundly. Enhanced digital literacy equips students to better adapt to social development requirements, utilise digital technologies effectively for information access, and improve learning efficiency. Educationally, DLE represents a new domain for libraries to fulfill their educational functions, enhancing the educational role and institutional value of libraries. Socially, it is pivotal to the healthy development of the broader digital society. By cultivating students into competent digital citizens, it can effectively mitigate digital risks, foster standardised responsible digital behaviors, and holds great significance for purifying the online environment and shaping digital social ethics. International organisations have successively put forward guiding recommendations for academic libraries to carry out DLE. Association of College and Research Libraries (ACRL) released *framework for information literacy in higher education*, which provides a forward-looking vision and value orientation, and has become a guiding document for academic libraries to carry out DLE (ACRL,2015); IFLA supported the construction of digital literacy and innovation space in the Statement, helped users not only become consumers, but also producers and creators (IFLA, 2017). Academic libraries have successively formulated and implemented digital literacy frameworks (Johnson,2020), proactively launched self-directed digital literacy learning programs (Zhang,2025), and collaborated with academic departments to establish literacy centers that provide guidance and training on AI usage (Cai et al.,2025). They offered digital literacy courses covering topics such as keyword application in search engines, prompt composition in generative artificial intelligence, and verification of the authenticity of online content (Akakpo,2023), and some of them had organised digital literacy seminars to encourage students to engage in the learning and discussion of digital skills (Breen et al.,2022).

However, in current educational practices, there remains a prevalent tendency toward knowledge indoctrination and a lack of philosophical grounding—issues that severely constrain educational effectiveness. These problems manifest primarily at both macro and micro levels.

At the macro level, the *framework for information literacy for higher education* presented a seemingly comprehensive set of ‘*philosophical ends*’, clearly defining the cognitive and social outcomes that information literacy should be achieved (e.g., critical awareness of information authority, engagement in the information creation process). Nevertheless, the absence of practical philosophy (which called *phronesis*) and educational philosophy made the framework inadequate in constructing the ‘*educational processes*’, which was needed to reach these ends. It lacks systematic recommendations on how to realise such outcomes through curriculum systems, faculty collaboration, and teaching management. This gives rise to an ‘*implementation gap*’ between the macro-level framework and micro-level practice, leaving many institutions facing the dilemma of having a clear direction but vague pathways. This critique in information literacy research (Swanson, 2017) is conceptually sound. However, digital literacy, while rooted in information literacy (Bawden, 2008), faces unique challenges inherent to the algorithmic era: the need to foster ethical agency, adaptive habits, and communal responsibility within digital ecosystems. Addressing these challenges therefore requires a philosophical foundation that moves beyond the epistemological scope of information literacy, which constitutes the core inquiry of this study.

At the micro level, issues in digital literacy education arise in teaching contexts, processes, and content. Many libraries often use introductory workshops, one-time lectures, and informational contests—approaches that lack immersion and hinder the development of integrated knowledge. Instruction typically follows a one-way transmission model from librarians to users, with knowledge asymmetry preventing genuine dialogue (Ma, 2011). Content shows a strong bias toward instrumental skills, such as accessing databases or using software, while overlooking essential soft skills like digital ethics, critical awareness, and reflective cognition (Li et al., 2023). This imbalance may result in reduced vigilance around personal data, increased privacy risks (Luo, 2023), and greater susceptibility to misinformation and unethical influences (Li et al., 2023).

Therefore, as a pivotal front for knowledge dissemination and literacy education, academic libraries urgently need to reflect on current practices and develop a more robust DLE model. Some scholars have argued that in the digital age, educators must integrate self-directed learning theory with knowledge management theory to design innovative models that enhance the digital literacy of adult learners (Silamut, 2020). They propose embedding digital literacy skills into curricula, enabling students to effectively develop the competence to navigate and evaluate digital information environments (Wei, 2024). Other scholars envision that future academic libraries will offer more diverse learning paradigms—no longer confined to classroom instruction and independent study, but instead developing alternative models such as collaborative learning, inquiry-based learning, gamified learning, and project-based learning. These approaches will allow students to engage with learning in ways that align better with their individual needs, thereby improving both learning efficiency and experience (Fan et al., 2024). Additionally, these scholars suggest aggregating human, spatial, and information resources from both inside and outside the library to establish a tripartite interconnected knowledge service system, which could create greater opportunities and value for users.

This study integrates philosophical insights derived from the Scottish Enlightenment into the field of DLE in academic libraries, aiming to propose an innovative model that breaks the one-way transmission of knowledge and fully empowers students to exercise their subjective initiative. This model places priority on cultivating students' critical thinking, ethical awareness, and innovative capacities rather than narrowing its focus to technical operational skills alone. The ultimate goal focus on truly developing responsible digital citizens who can keep pace with the changing needs of digital society, not only take advantage of the convenience that digital technologies bring but also proactively tackle the diverse challenges and risks that are part and parcel of the digital world.

Theoretical inspirations of Scottish enlightenment on DLE in academic libraries

While the ideas of the Scottish Enlightenment were not originally formulated to guide the development of academic libraries or the advancement of library and information science as a discipline, their progressive, human-centered essence offers valuable insights and references for contemporary academic libraries seeking to innovate their DLE initiatives. This study primarily explores the insights that Adam Smith's Theory of Moral Sentiments, David Hume's Theory of Habit and Experience, and Adam Ferguson's Theory of Spontaneous Order offer for DLE in modern academic libraries.

Smith's theory of moral sentiments: establishing the technical ethics and critical thinking of empathy and resonance

Adam Smith made his point clear in *the theory of moral sentiments*: 'However selfish man may be supposed, there are evidently some principles in his nature, which interest him in the fortune of others...' He argued that moral judgment stems from the impartial spectator's ability to put oneself in others' shoes and understand them through imagination and emotional resonance (i.e., empathy) (Smith, 1759). He anchored ethical judgment in the mechanism of 'sympathy'—whereby the subject develops moral awareness by imagining others' situations.

For the current knowledge-indoctrination model in academic libraries' DLE, Smith's emphasis is not on 'teaching less knowledge', but on 'letting knowledge flow anew within a community bound by emotion and imagination'. The fundamental reason why the common 'knowledge indoctrination' in academic libraries fails is that digital skills are treated as external tools: students are only asked to 'learn them', not to 'understand why others need these skills or why they themselves should care'.

Thus, supported by Smith's theory of sympathy, academic libraries can transform 'skills' into 'emotional-cognitive events', and turn 'lecturing' into an 'empathy-reflection cycle'. This provides both an emotional foundation and institutional design ideas for addressing ethical challenges in the digital age.

Truly effective digital literacy is far more than just technical ability. Its core lies in effectively transferring and applying the innate human mechanisms of moral sentiment—namely 'sympathy' and the 'impartial spectator'—to the complex scenarios of the digital world. This philosophical insight reminds academic libraries that when delivering DLE, they should nurture students to become 'appropriate actors' who can manage their own impulses in digital spaces, imagine and respect others' feelings and rights, and examine their own actions against internal standards of impartiality. The goal is to foster more responsible use of digital skills, built on mutual understanding.

The starting point and ultimate aim of DLE should be to cultivate digital citizens who retain and practice basic human moral sentiments even in virtual worlds. To achieve this, libraries must place users in specific contexts, nurturing their 'ethical imagination', helping them understand how the digital divide affects different groups in concrete ways, perceive the lived experiences of individuals in the digital world, and thus reflect on the emotional and ethical consequences of technological use.

Hume's theory of habit: deconstructing indoctrination, embracing habits and associations

David Hume put forward the theory of habit in *a treatise of human nature*, which offered a key correction to rationalist views of knowledge. He argued that human beliefs and behavioral patterns mainly come from repeated connections between sensory experiences and the development of mental habits, not from abstract rational rules or a priori principles (Hume, 1739). This epistemological view provides profound enlightenment for academic libraries to carry out DLE, especially in cultivating students' good and standardised digital behavior habits.

In the digital environment, information is massive, fragmented, and multi-source heterogeneous. Users are often in a state of passive reception and mechanical compliance with rules, which makes it difficult to truly internalise digital literacy requirements such as privacy protection, information authentication, and rational use. Hume reminds us that the essence of digital literacy should not be the mechanical memory of operation guidelines or ethical terms, but the stable 'habitual association' formed through repeated actual operation and situational experience. That is to say, only when users continue to experience the feedback cycle of 'behavior-result' in the real situation (such as privacy risk caused by improper information sharing, standardised retrieval to improve learning efficiency), can they gradually establish a conscious response mode in cognition and behavior, so as to truly grasp the ability to use digital resources responsibly.

Therefore, academic libraries should move beyond one-way indoctrination and rigid doctrinal instruction, and instead design learning scenarios characterised by high interactivity, strong repeatability, and real-time feedback mechanisms. For instance, by simulating copyright disputes in academic contexts, libraries can guide students to engage repeatedly in discussions and practical exercises focused on solution development; by organising long-term collaborative digital projects, they can enable students to internalise data management norms and collaborative ethics through repeated hands-on operations; and by leveraging game-based learning platforms to

design sequential digital tasks, they can help students develop intuition and habits for assessing information authenticity through sustained practice, while establishing behavioral tendencies and cognitive beliefs via repeated experiential learning. Torres Hernández (2023) further notes that authentic digital literacy encompasses not only technical operational competence but also the ability to discern truth from falsehood in complex information environments, engage in critical thinking, and participate responsibly in digital communication.

Academic libraries need to shift from the traditional approach of '*teaching rules*' to '*cultivating habits*'. This shift enables students to develop stable, self-disciplined, and ethically aware digital behavior patterns through continuous practice, ultimately facilitating the transformation of DLE from a model of external regulation to one of internalised consciousness.

Ferguson's theory of spontaneous order: library learning community and participants under spontaneous order

Adam Ferguson put forward the theory of spontaneous order in *an essay on the history of civil society*. He opposed the view of order as a product of rigid rational design—exemplified by Rousseau's social contract theory—and emphasised that a healthy social order should arise from the natural coordination and cooperation formed through individuals' free interactions. Ferguson further warned, in particular, that '*the progress of the arts and sciences... has often been accompanied by a decline in civic spirit*' (Ferguson, 1767). This warning points to a key concern: over-reliance on technical rationality and specialised division of labor may lead to the atomisation of individuals and the erosion of community spirit.

For academic libraries, this insight provides a profound theoretical foundation for building an open, dynamic DLE ecosystem that embodies vibrant community vitality. Academic libraries shouldn't stick with the traditional DLE model, where librarians take the lead and users stay passive, stuck in one-way indoctrination. Instead, they should focus on building an educational ecology, where users take initiative to participate, organise themselves, and keep evolving on their own. Digital technology does not inherently foster connection or mutual understanding. While social media can increase access to information, it may also reinforce informational cocoons and amplify group polarisation. Moreover, the prioritisation of algorithmic efficiency can erode communal foundations based on trust, sharing, and face-to-face interaction. To counter this, academic libraries should intentionally create decentralised learning spaces—such as user-led knowledge-sharing hubs and interdisciplinary seminar zones—that encourage diverse, non-hierarchical interaction. These environments enable students to transition from passive recipients to active co-creators of knowledge. Through bottom-up participation, they negotiate shared norms, develop adaptable digital behaviors, and cultivate what Ferguson termed '*the free association of free people*'—an organic order emerging not from external design, but from collaborative engagement.

This points to a key insight: academic libraries can draw on Ferguson's idea of spontaneous order to move away from the '*designed paradigm*' and truly shift toward an '*ecological paradigm*', which is dynamic, adaptive, and community-driven, in order to nurture digital citizens with collaborative skills, ethical awareness, and adaptability.

Construction and analysis of DLE model in academic libraries

Based on the Scottish Enlightenment, this study constructs a DLE model composed of three elements: space, resources, and librarians (Figure 1.). These elements enable academic libraries to develop a digital literacy cultivation pathway consisting of four key stages: triggering emotional ethics, developing learning interests and habits, forming spontaneous learning order, and conducting evaluation and feedback on cultivation outcomes. This transformation allows academic libraries to move beyond '*teaching*' digital literacy; instead, it facilitates the spontaneous growth,

self-correction, and self-sustainment of knowledge, skills, and values among students. By thoroughly deconstructing the one-way indoctrination paradigm, this approach leverages empathy and ethical reflection, the reinforcement of habits and interests, and community self-organisation as its underlying mechanisms to build an evolvable DLE ecosystem within academic libraries.

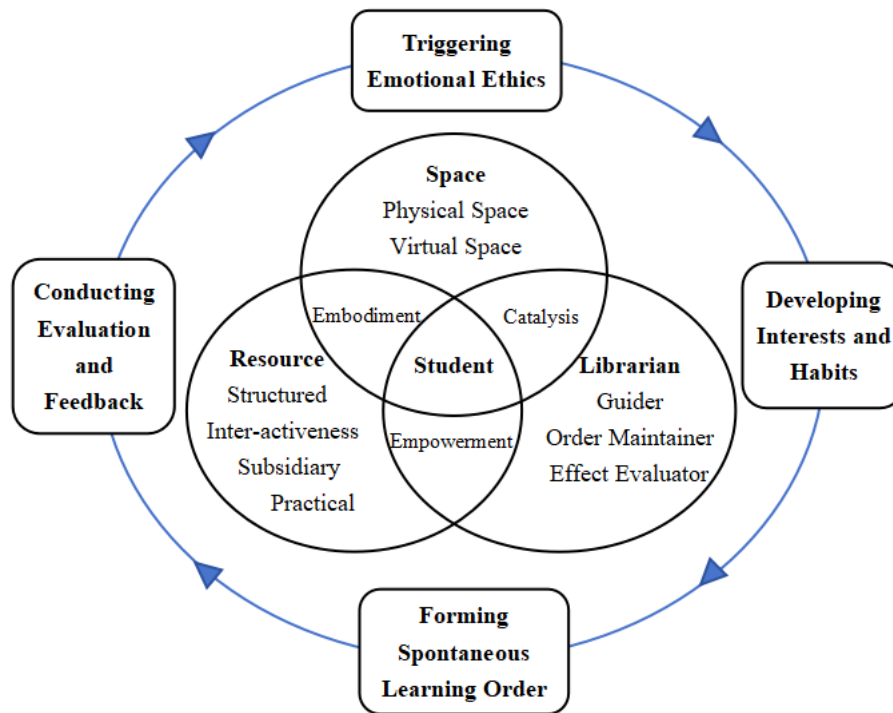


Figure 1. Digital literacy education model in academic libraries.

Space dimension: creating a digital literacy learning situation with the combination of virtual and real

In the space dimension, academic libraries should go beyond its traditional role as a static container and devote itself to building an '*experience venue*' that can stimulate body perception and interaction and support situational practice. Academic libraries need to create a digital literacy learning situation that integrates physics and virtual, stimulate users' interests in exploring the digital world in depth, and focus on cultivating users' empathy and ethics ability.

At the physical space dimension, academic libraries need to gradually transform into '*digital literacy learning and sharing spaces*' that integrate technological experience and collaborative practice. These spaces should be equipped with facilities such as VR/AR devices, touch-interactive large screens, data visualisation tools, and group discussion areas, thereby constructing practical scenarios for users to apply digital skills in authentic research contexts. By engaging multi-sensory experiences, these spaces enable users to naturally generate inspiration in the process of learning, reflecting, and communicating (Fan et al.,2024). Within such spaces, real-world research and academic scenarios can be simulated. Students may utilise visualisation tools to manipulate datasets, grasp abstract structures through 3D modeling, or conduct exchanges and real-time demonstrations in open discussion zones. This setup supports students in completing project tasks through embodied engagement and multi-person collaboration, which in turn deepens their understanding and application of digital tools in a '*learning-by-doing*' process. Furthermore, these spaces should not be limited to providing equipment support. Instead, through deliberate

environmental design and layout planning, they ought to encourage students' exploratory behaviors, facilitate the development of cognitive habits, and enhance students' cooperative capabilities. Ultimately, this enables the internalisation of digital literacy into a conscious behavioral pattern.

At the virtual space dimension, academic libraries should develop modular online learning communities and smart platforms to break temporal-spatial barriers, expanding DLE's reach and accessibility. These communities incorporate open educational resources (OER), digital collections, micro-lectures, and academic tool guides, offering comprehensive support throughout the research process—from information retrieval and data management to scholarly communication. Platforms that blend learning with interactive challenges, hands-on simulations, and gamification enhance student engagement and promote self-directed learning. Virtual environments also support contextualised instruction in digital ethics: by simulating scenarios such as privacy breaches or intellectual property disputes, they help students critically examine ethical issues and develop a sense of digital responsibility. Librarians use behavioral data to create personalised learning paths and form interdisciplinary groups through community-matching, increasing instructional relevance.

It is noteworthy that the effective operation of both physical and virtual learning spaces relies on systematic resource support and instructional design. Physical spaces emphasise embodied cognition and sensory engagement, fostering hands-on collaboration and practical skills through real-world interaction. Virtual spaces, on the other hand, leverage platform functionalities and data-driven approaches to enable personalised learning pathways and scalable ethics education. Together, they form an integrated learning ecosystem that not only provides opportunities for technical exposure and skill development but also cultivates digital responsibility, collaborative awareness, and ethical judgment through contextualised experiences and reflective guidance.

This approach recognises learner diversity by providing open-ended learning environments with personalised and varied methods that encourage active exploration and innovation. Such an environment helps boost motivation and cultivate a genuine passion for learning, establishing a foundation for lifelong learning (Peng et al., 2024). It aims to create a resource-rich, responsive, and sustainable digital literacy environment, enabling students to engage with technological practices while developing as ethical and critically-minded digital citizens.

Resource dimension: increasing students' participation in resource development

In the resource dimension, academic libraries should prioritise users' educational needs, developing, allocating, and optimising DLE resources in response to both their universal and specific demands. These resources encompass structured digital literacy training courses, interactive self-directed learning tools, supplementary educational materials, and hands-on digital literacy programs. Instead of functioning as passive resource repositories, libraries must actively leverage these resources to deepen users' understanding of digital literacy, shifting them transition from their traditional role to becoming proactive facilitators, collaborators, and enablers. The ultimate goal here is not merely to teach students how to operate a specific database, but to cultivate digital mindsets and habits with long-term utility for their academic and professional lives.

Among these resources, structured digital literacy courses serve as the core driver of students' digital literacy development. Unlike traditional one-way instruction led exclusively by librarians, these courses should prioritise addressing students' knowledge and skill needs while enhancing their engagement and cultivating an awareness of digital literacy's value. Academic libraries may offer experiential orientation courses for freshmen, such as *digital literacy and academic research*, *accessing digital collections*, and *using the library's digital spaces*, etc. These courses systematically cover information retrieval, evaluation, management, application, and data ethics,

laying the groundwork for students to build a foundational knowledge framework. Furthermore, libraries should collaborate with faculty across disciplines to develop customised digital literacy modules, including subject specific database training and introductory software workshops, embedded into regular curricula. By designing contextualised resource packages or digital task cards closely aligned with course content, libraries enable students to engage with database searches, data analysis tools, and reference management software within authentic research scenarios. This hands-on approach encourages students to integrate physical and cognitive engagement. For students pursuing advanced training, libraries can organise short-term online and offline workshops focused on cutting-edge tools and emerging topics. Incorporating open datasets, open-source software, and API interfaces requiring manual configuration enables students to learn through hands-on practice, like debugging, executing, and modifying processes. This transforms learning from passive reception into active, embodied inquiry, fostering robust and sustainable digital behaviors.

Academic libraries should also develop interactive, self-directed digital literacy learning tools to deepen understanding through simulation and engagement. For example, digital literacy spaces (e.g., labs or VR zones) can host immersive technology stations where students interact with AI, experience VR scenarios, and analyse large datasets. Dedicated librarians may facilitate critical discussions on ethics, algorithmic bias, and information credibility, guiding students to reflect deeply and develop habits of critical and responsible digital tools use. Additionally, libraries can establish a dedicated digital literacy resource portal on their official website, with links to an online learning community. This platform may integrate multimedia elements including videos, documents, hyperlinks, and surveys, alongside open data analysis tools. Gamified learning modules, which reward students with badges or points for completing search tasks or solving puzzles, can stimulate interest and reinforce mastery of digital resources. In this way, libraries will support human-machine collaborative learning while emphasising human agency, ensuring learning remains autonomous, in-depth, and free from over-reliance on technology (Zhai,2024).

Academic libraries should develop concise DLE resources—such as micro-lectures and short video tutorials—and host them on library platforms. These resources, focusing on practical digital skills and kept under five minutes, suit fragmented learning schedules. Establishing dedicated social media accounts for digital literacy with Q&A sections can provide timely student support. A '*digital literacy learning toolkit*' containing reference management tools, data visualisation templates, ethics guidelines, and database manuals should also be offered. To address diverse cognitive backgrounds, contextual aids like a bilingual glossary can help bridge disciplinary terminology gaps. Additionally, self-assessment checklists and contest-based exercises enable students to evaluate their progress and identify areas for improvement. These also offer librarians feedback to refine DLE continuously.

Moreover, academic libraries should organise hands-on digital literacy projects—turning students from passive consumers into active creators by letting them build and share in practical settings. With cross-faculty collaboration, they can design interdisciplinary training, like using AI tools or visualisation platforms across fields. Guiding students through full processes (problem-finding, data collection, presentation)—such as historical archive digitisation—helps them grasp digital preservation's cultural value and cultivate imaginative empathy. This builds technical skills, fosters cultural responsibility, and sparks emotional resonance that drives sustained learning.

Librarian dimension: changing the traditional role of the knowledge inculcator

In the librarian dimension, academic libraries staff must undergo a role transformation, evolving from traditional knowledge transmitters to guider of digital literacy learning, order maintainers and evaluators of educational outcomes.

As the guider supporting students in mastering digital literacy skills, academic librarians should focus on fostering users' autonomous and sustainable digital learning capabilities and habits. Current DLE frequently relies on a traditional model rooted in the subject-object epistemological duality that frames knowledge as a commodity transmitted only in a unidirectional way from librarians to users. This approach positions users as passive recipients, overlooking the inter-subjective and interactive nature of knowledge construction.

In reality, the formation of knowledge depends not only on abstract logical reasoning, but more importantly on repeated practical experience and cognitive internalisation. For instance, through trial and error during multiple information retrieval attempts, users gradually build experiential connections between 'keyword selection' and 'relevance of results'. This process is not merely about following operational instructions mechanistically; rather, it cultivates keen judgment and understanding through practice. Therefore, librarians should go beyond teaching procedural skills and instead emphasise fostering students' self-directed learning abilities (Feola, 2016). They ought to encourage users to actively identify contextual relationships within information, and to treat digital literacy as a dynamic knowledge network evolving through practice, not as static dogma to be passively acquired. Librarians must shift from being 'transmitters of knowledge' to 'enablers of learning processes', by designing contextualised and interactive learning experiences that help users form solid digital consciousness and practical habits through real-world problem-solving.

As maintainers of learning order, librarians are required not only to possess solid information technology skills but also to commit to upholding the order and effectiveness of the digital learning environment within the library. They should proactively coordinate and supervise, guide students to comply with norms of digital resource use, promote information ethics and principles of fair use, and prevent misconduct that could disrupt the learning atmosphere. It is also crucial to remain vigilant about technology's potential intrusion into emotional privacy. By implementing privacy gradients and human-machine collaboration, librarians can uphold ethical legitimacy and maintain a healthy interactive order within virtual digital literacy learning spaces.

Through contextualised teaching, librarians can engage students in discussing case studies involving academic misconduct risks and ethical challenges in digital-intelligent environments. When necessary, they should appropriately guide students in ethical reflection, cultivate impartial judgment, and strengthen their critical thinking capabilities. This empowers students to assess the potential consequences of technology applications from an ethical perspective when confronting issues brought by digital technology. Additionally, by organising structured activities such as group study and training sessions, librarians can promote orderly collaboration and communication among students, enhancing their self-discipline and cooperative skills in digital environments. Furthermore, librarians should offer personalised guidance based on students' learning characteristics and needs, helping them systematically improve their ability to apply digital technology. Ultimately, these efforts contribute to building a standardised, efficient, and supportive digital literacy learning environment within the library.

Librarians should also assess users' digital literacy learning. Current evaluation methods in academic libraries often lack follow-up feedback, and learning outcomes are difficult to quantify. But only in this way can we refine the education methods and contents. Regular and systematic assessments are essential for refining educational approaches and ensuring program effectiveness. It is recommended to employ immediate, short-term, and medium-term evaluations through questionnaires, observations, and interviews. For instance, feedback can be gathered after each activity, usage data analysed to track engagement, and sampled interviews conducted to determine practical application of skills. Encouraging self-assessment and reflection can also provide deeper insight into learning behaviors and motivations. By integrating interdisciplinary theories and user feedback, librarians can continuously improve both pedagogy and service design.

Discussion

Scottish Enlightenment thought provides a crucial complementary space for DLE in academic libraries, effectively breaking through the constraints of current paradigms in this field. Specifically, Smith's theory of moral sentiments transforms the teaching of critical thinking into empathy training suitable for the technological era, shifting ethics education from mere rule-following to emotional internalisation; Hume's Theory of Habit establishes learners' habits and associations, turning digital literacy skill acquisition into learners' routines and interests, thereby dissolving the binary relationship of 'librarian-user'; Ferguson's theory of spontaneous order encourages the cultivation of communal digital literacy intelligence, providing a foundation for bottom-up generation of educational rules. Although this study attempts to construct a novel model of DLE, several practical constraints remain that limit its effective implementation.

Firstly, in terms of physical and virtual space development, there are significant disparities in funding support across academic libraries, leading to an uneven development of DLE environments. Some libraries lack sufficient funds to introduce advanced VR/AR equipment, visualisation tools, or high-performance virtual platforms, making it difficult to create highly contextualised and immersive digital literacy practice environments. Moreover, even when such facilities are established, continuous investment is essential for maintenance and updates—key to sustaining educational quality and user experience. Secondly, in terms of course resources and implementation mechanisms, despite this study advocating for a student-centered, exploratory teaching approach, there are still real challenges related to students' lack of motivation to participate. If the learning mode is entirely voluntary, some students may perceive digital literacy courses as an added burden due to academic pressure or cognitive biases, leading to passive learning, low engagement, and other issues. How to design an incentive mechanism that balances attraction and constraints, while balancing autonomy and regulation, remains an issue to be addressed in future course design. Finally, in terms of librarian role transformation, the transition of librarians from knowledge transmitters to learning facilitators requires enhanced digital and pedagogical competencies. Many lack sufficient proficiency with digital tools, instructional design, or situational guidance skills, leading them to revert to traditional lecturing. Without ongoing training and practical support, this gap may hinder the transformation of educational models. As Molly (2022) emphasised, librarians must not only promote new technologies but also exemplify critical engagement in all academic services.

The DLE model proposed in this study still faces multiple practical constraints at the operational level, including those related to resource allocation, institutional design, and human resources. Essentially, these dilemmas, to some extent, reflect a philosophical vacuum within DLE. Influenced by Cartesian subject-object dualism, libraries tend to be perceived as authoritative knowledge sources, while readers are regarded as passive recipients to be filled with information. This has also caused library science's philosophical theories to oscillate between scientism and humanism for an extended period. Scientism frames educational goals around technological adaptability, emphasising the cultivation of skilled talents who can meet the demands of data-driven research paradigms. In contrast, humanism advocates that DLE should foster critical information citizens, with its core objective being to safeguard knowledge equity and ethical consciousness in the digital environment. However, this paradigm is prone to degenerating into moral preaching in practice, making it difficult to form an operable educational framework. To transcend the subject-object dichotomy, Habermas's theory of communicative rationality has been introduced into library science. Nevertheless, when educators themselves are trapped in cognitive echo chambers, the cultivation of critical thinking undergoes structural breakdown. Therefore, to fundamentally resolve the issue of knowledge indoctrination in DLE, future efforts must strengthen research on the fundamental philosophical theories of library science in the digital age. Furthermore, in practical implementation, these challenges should be systematically addressed through

differentiated construction strategies, curriculum mechanism innovation, and the enhancement of librarians' professional capacities.

Conclusion

The 18th-century Scottish enlightenment left a profound intellectual legacy that offers a robust philosophical foundation for DLE in academic libraries. Thinkers such as Adam Smith, David Hume, and Adam Ferguson emphasised human agency and the evolution of social order, inspiring student-centered approaches that foster initiative and participation. By integrating spatial resources, professional expertise, and collections, libraries serve as embodied, catalytic, and enabling spaces to support DLE. This model prioritises the development of ethical awareness, embodied practice, and normative digital behaviors, forming a constructive learning order through continuous feedback and reinforcement. The enduring relevance of enlightenment thought lies not only in its theoretical propositions but also in its prudent, inclusive, and pragmatic mode of thinking—laying groundwork for a more just and sustainable digital society.

Centering on students, academic libraries should address integrated needs such as cognitive enhancement, security awareness, collaboration, and innovation. The goal is not to produce efficient 'human computers', but to cultivate digital gentlefolk who uphold human values within technological environments. Such citizens will combine technical capabilities—such as metadata architecture and algorithmic critique—with Smith's empathy, Hume's habitual ethics, and Ferguson's evolutionary insight, thereby rehumanising the digital world. Ultimately, under the influence of Scottish Enlightenment thinking, DLE in academic libraries can transition from 'technical training' to 'humanistic liberation'.

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About the authors

Fan Zhenjia is Professor in School of Information and Communication, Nankai University, Tianjin, China. He received his PhD from Peking University, and his research interests are mainly in Community Informatics and Data Governance, can be contacted at fanzhenjia@nankai.edu.cn

He Yimei is PhD candidate in Department of Information Resources Management, Business School, Nankai University, Tianjin, China. She received her master's degree of Information Science from Shanghai University. Her research interests are mainly in community informatics, digital literacy, and digital inclusion. She can be contacted at 1120251752@mail.nankai.edu.cn

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