Reducing Extraneous Cognitive Load for Neurodivergent Learners in Higher Education Digital Environments: A Systematic Literature Review

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Abstract

Researchers are beginning to explore how neurodivergent learners experience cognitive load in higher education and online learning. Their studies show that neurodivergent learners have difficulty managing cognitive load and often encounter digital learning environments that unnecessarily increase it, producing additional stress, hidden effort, and barriers to participation. Drawing on Cognitive Load Theory and the neurodiversity paradigm, this review combines empirical and theoretical research on cognitive load, instructional design in digital environments, and neurodivergent learners in higher education. It focuses on extraneous cognitive load, outlines five ways instructional design can add to it, and suggests seven evidence-based strategies to reduce it. The discussion considers implications for future research, teaching, and policies aimed at creating inclusive, neurodiversity-friendly digital learning environments.

Keywords: cognitive load theory, extraneous cognitive load, neurodiversity, neurodivergent learners, digital learning environments, instructional design, higher education, Autism (ASD), attention-deficit/hyperactivity disorder (ADHD), inclusive instructional design

Applying Cognitive Load Theory to Digital Instructional Design for Neurodivergent Learners in Higher Education

Over the past few years, there has been a surge in technological advances that enable convenient, self-paced learning, provide immediate knowledge for specific tasks or problems, and suggest a promising pathway for personalized education for everyone. Simultaneously, universities are increasingly relying on online and hybrid learning, a trend intensified by the COVID-19 pandemic and the growth of learning management systems (LMSs), virtual classrooms, and multimedia content (Ng & Ong, 2018; Mayer, 2018; Lockman & Schrimer, 2020). For many learners, digital formats offer flexibility in timing, location, and pace. However, these environments can also introduce complex interfaces, fragmented information, and nonstop notifications that tax limited working memory resources (Skulmowski & Xu, 2021; Le Cunff, 2024; Wheeler, 2024).

As a result, some learners struggle in higher education, many of whom are neurodivergent (Hamilton & Petty, 2023; Le Cunff et al., 2024a; Dwyer et al., 2023). Because their challenges are not fully understood, considered, or accommodated in digital learning environments (Green & Rabiner, 2012; Friedman & Nash-Luckenbach, 2024), and are rarely acknowledged by the institutions, instructors, and instructional designers responsible for creating their learning environments, many neurodiverse learners feel overwhelmed, under-supported, and left to navigate the significant obstacles they often encounter during their studies, despite the latest educational and technological advances (Azuka et al., 2024; Burgstahler, 2018; Hamilton & Petty, 2023; Kelly, 2024). Consequently, neurodivergent learners may experience "equal outcomes at unequal cost", meaning that they may achieve similar grades as their peers but only

through much greater effort and increased stress and burnout (Bertilsdotter Rosqvist et al., 2023; Le Cunff, 2024).

Because many learners pursue postsecondary education, these design features are especially crucial for neurodivergent learners whose cognition differs from social norms, including those diagnosed with attention deficit/hyperactivity disorder (ADHD), autism spectrum disorder (ASD), dyslexia, and related learning differences (Ayano et al., 2023; Clouder et al., 2020; Dwyer, 2022; Bertilsdotter Rosqvist et al., 2023; Goldberg, 2023; Hand, 2023; Harrison et al., 2024; Le Cunff, 2024; Pagespetit, 2025). Although data from the Cooperative Institutional Research Program (CIRP) Freshman Survey from 2012-2019 reports that approximately 5.6% of first-year, full-time learners at four-year colleges have ADHD (Hotez et al., 2022), there may be a larger, hidden group of learners with undisclosed ADHD, as some reports suggest that closer to 21-30% of the population could meet the diagnostic criteria (Pagespetit et al., 2025). Regarding neurodivergent learners with autism, recent CIRP Freshman Survey data from 2024 indicate that 2.7% of males and 1.5% of females are on the autism spectrum (Soler & Stolzenberg, 2025).

Adding Perspective: Exploring Cognitive Load

Cognitive Load Theory (CLT) offers a helpful perspective for understanding why digital learning can be so mentally exhausting and cognitively “expensive”. The CLT distinguishes between intrinsic load (the inherent difficulty of the material), extraneous load (the burden caused by how information is presented), and germane load (resources used to develop and automate schemas) (Sweller, 1988; Sweller et al., 1998; Ginns & Leppink, 2019). When course interfaces are cluttered, instructions are unclear, or media are poorly coordinated, extraneous load competes with learners' limited working memory, leaving fewer resources for meaningful learning (Sweller et al., 1998; Mayer, 2018).

In 2024, Le Cunff, Giampietro, and Dommett published a systematic review examining key questions about the relationship between cognitive load in online learning and neurodivergence. While noting that this topic is not entirely new, the authors identified a significant research gap: out of 90 studies conducted across 21 countries, 92% did not consider neurodiversity as a potential factor affecting cognitive load in online learning (Le Cunff et al., 2024). Their findings were complemented by emerging evidence indicating that individuals diagnosed with neurodivergence might exhibit unique patterns of cognitive load when using digital learning platforms (Le Cunff et al., 2024).

Le Cunff (2024) provides further insight into her examination of the studies by noting that studies involving neurodivergent learners mainly relied on subjective testing to assess their cognitive load. This choice of assessment implies that no objective test currently exists to measure cognitive load in neurodiverse individuals. As a result, because neurodivergent traits have historically been underrepresented in cognitive load research, there is a limited understanding of how cognitive load manifests for neurodiverse individuals, how eLearning experiences affect learners with neurodivergent traits, the influence of neurodivergent traits on cognitive load, and how to adapt instructional design to provide appropriate scaffolding and support (Le Cunff et al., 2024).

Le Cunff et al. are not the only ones asking neurodiverse-centered questions. Friedman and Nash-Lukenback (2023) also highlight a significant gap in learning theories and models for post-secondary neurodivergent learners, as well as the limited understanding of the adult neurodivergent experience. They further their analysis by emphasizing the critical issue that instructional design in higher education may not incorporate neurodivergent intelligences or culturally relevant methods. While Hamilton and Petty (2023) explore pedagogy for

neurodiverse learners in higher education, Kelly (2024) and Doo et al. (2020) advocate for improved accessibility, accommodations, and learner-centered scaffolding.

Research has established a connection between cognitive load, well-being, and academic success (Asma & Dallel, 2020; Atiomo, 2020; Banu et al., 2021; Hamilton & Petty, 2023; Le Cunff et al., 2024; Taylor, 2023; Yu et al., 2018; Wheeler, 2024). Additionally, researchers have also identified the relationship between cognitive load and executive function management (Figueroa et al., 2017; Grosvenor, 2022; Jones et al., 2016; Meijs, 2021; Southon, 2022), self-regulation (Meijs et al., 2021; Ng et al., 2024), self-determination (Alamri et al., 2020; Oga-Baldwin, 2015), and self-directed learning (Adlinda & Mohib, 2020; Al Mamun et al., 2020). Building on what the research already knows and extending it to neurodivergent learners in higher education, those with neurodiverse traits face greater difficulties, demonstrate lower motivation to study, and are at greater risk of academic challenges (DuPaul et al., 2019).

The limited research on cognitive load management and neurodiversity emphasizes the need to interpret data carefully. Because it reveals a lack of research on cognitive load for neurodiverse learners, an absence of objective assessments that include neurodiverse learning as a variable, gaps in neurodiversity-focused teaching methods, and shortcomings in instructional design theories that account for neurodiverse learners, neurodiverse learners often face cognitive load challenges.

Statement of Purpose and Guiding Questions

It is widely acknowledged that a strong, measurable link exists between cognitive load, self-regulated learning, executive function management, and self-determination (Figueroa et al., 2017; Le Cunff et al., 2024; Meijs et al., 2021; Ng et al., 2023). However, because individuals with these traits have historically been underrepresented in cognitive load studies (Le Cunff et

al., 2024), the impact of neurodivergent traits on these relationships has not been as well documented. Adding to this challenge is emerging evidence indicating that neurodivergent learners may display unique cognitive load patterns, especially in online learning environments (Le Cunff et al., 2024).

To design effective instructional strategies for managing cognitive load, it is essential to gain a deeper understanding of this issue. Therefore, this literature review primarily aims to explore extraneous cognitive load in digital higher education settings experienced by neurodivergent learners. Its specific goal is to identify practical instructional design approaches to reduce unnecessary cognitive demands and encourage more equitable participation and learning. Since CLT is fundamentally an instructional design theory, the review argues that because all new information must go through a limited working memory capacity, instructional materials should be crafted to minimize extraneous processing and facilitate schema development and automation. A recent synthesis emphasizes that two decades of research have refined principles such as worked examples, goal-free problems, and split-attention reduction into reliable design guidelines across various fields (Sweller et al., 2019).

Building on recent systematic reviews of cognitive load in online learning (Le Cuff et al., 2024b) and on neurodiversity in higher education and online education (Clouder et al., 2020; Doyle, 2020; Le Cuff et al., 2024b), this work also responds to calls from neurodiversity scholars to move beyond deficit-based accommodations toward proactive, neurodiversity-affirming design (Dwyer, 2022; Dwyer et al., 2023; Hamilton & Petty, 2023; Le Cuff, 2024). By synthesizing theoretical and empirical work at the intersection of cognitive load theory (CLT), neurodiversity, and digital instructional design in higher education, this review explicitly asks: What specific instructional design strategies can reduce extraneous cognitive load in digital

learning environments for neurodivergent learners in higher education? How do these strategies align with or extend core Cognitive Load Theory principles? What evidence exists regarding their effectiveness for neurodivergent profiles such as ADHD, autism, and dyslexia?

Parameters Used for Literature Search and Review

This collection includes systematic and scoping reviews on cognitive load in online learning, neurophysiological measures, and neurodiversity in digital education. It also features empirical studies on digital instructional design and cognitive load in higher education, as well as qualitative research on neurodivergent learners' experiences in online learning and higher education. Additionally, it covers conceptual and methodological papers on CLT, UDL, and inclusive digital pedagogy.

Search Terms

Search terms included combinations of cognitive load, cognitive load theory, extraneous load, online learning, digital learning, digital learning environments, higher education, college, university, neurodiversity, neurodiverse, neurodivergent, attention deficit hyperactivity disorder (ADHD), autism, autism spectrum disorder (ASD), universal design for learning (UDL), and instructional design. Searches were conducted in primary education and psychology databases (e.g., ERIC, PsycINFO, Education Database). Additionally, these searches were supplemented through snowballing from key reviews and literature already in my library.

Because there is little overlap among the CLT, neurodiversity, and instructional design literature, extrapolations were occasionally made from neurotypical samples or from K-12 research when they appeared applicable to instructional design for adults or higher education, and these limitations are noted in Section III.

Inclusion and Exclusion Criteria

The inclusion criteria focused on the following: (a) higher education or adult learners; (b) digital or computer-mediated instruction; and (c) studies that either specifically used CLT or could be interpreted through CLT concepts. Additionally, research on neurodivergent learners' experiences with digital learning was included. Generally, studies focused solely on K–12 or clinical interventions without instructional design were excluded unless they offered valuable insights into cognitive or sensory processing relevant to higher education environments.

Organization of the Paper

Following the assignment guidelines, the remainder of this paper is organized into two major sections: Section II - Discussion of the Review of Literature, and Section III - Limitations, Conclusions, and Implications.

In Section II - Discussion of the Review of Literature, key concepts and theoretical foundations are outlined. Then, it synthesizes research on (a) distinct sources of extraneous load for neurodivergent learners in digital higher education, and (b) evidence-based instructional design strategies that mitigate these sources.

Section III - Limitations, Conclusions, and Implications: critically examines the limitations of existing research and of this review, and then discusses implications for instructors, instructional designers, institutional leaders, and future research.

This structure aligns with the assignment's expectation for a clear introduction/overview, a thematically organized discussion of the literature, and a final section on limitations, conclusions, and implications.

Review of Literature

Key Concepts and Theoretical Foundations

Cognitive Load Theory in Digital Learning Contexts

Cognitive Load Theory (CLT) is grounded in a model of human cognitive architecture in which a capacity-limited working memory interacts with a virtually unlimited long-term memory (Sweller, 1988; Sweller et al., 1998; Ginns & Leppink, 2019). Comprised of intrinsic, extraneous, and germane components, CLT posits that instructional design should manage total cognitive load so that working memory resources are available to support schema construction and automation (Sweller et al., 1998; Ginns & Leppink, 2019). A recent 20-year retrospective of CLT emphasizes this architecture—capacity-limited working memory, unlimited long-term memory, and their interaction—as the central rationale for load-based design principles, summarizing extensive empirical work since the original 1998 review (Sweller et al., 2019)

Intrinsic load depends on the number of interconnected information elements in the material and the learner's prior knowledge (Sweller et al., 1998; Sweller, 2010). Extraneous load results from how information is presented, such as dividing attention across multiple sources, using redundant text and narration, including unnecessary decorative details, and having disorganized interfaces—all of which add to cognitive load without aiding learning (Sweller et al., 1998). Germane load relates to the mental effort allocated to schema development; recent views consider germane load as the part of intrinsic load that is genuinely dedicated to learning, rather than treating it as a separate category (Sweller et al., 1998; Ginns & Leppink, 2019).

Digital learning environments, including recorded lectures, hypermedia textbooks, LMS course shells, and interactive simulations, offer both opportunities and challenges for managing cognitive load. Research on multimedia learning has demonstrated that principles such as coherence (excluding irrelevant material), signaling (highlighting essential information), spatial and temporal contiguity (integrating related text and images), segmenting (breaking content into learner-paced chunks), and modality (using visual and auditory channels together) can

significantly enhance transfer and decrease extraneous load (Sweller et al., 1988; Mayer, 2019). Conversely, poorly designed multimedia—such as dense on-screen text read aloud verbatim, overcrowded layouts, or simultaneous visual and auditory streams—can overload working memory and hinder learning (Sweller et al., 1988; Mayer, 2019).

Neurodiversity and Cognitive Profiles

The neurodiversity paradigm views neurodevelopmental differences like autism, ADHD, dyslexia, dyspraxia, and Tourette syndrome as natural human variations rather than simply disorders to be fixed (Clouder et al., 2020; Dwyer, 2022; Bertilsdotter Rosqvist et al., 2023; Friedman & Nash-Luckenback, 2023; Kelly, 2024; Le Cunff, 2024; Hamilton & Petty, 2023). In this perspective, many challenges faced by neurodivergent individuals result from mismatches between their cognitive profiles and environments built for an implicitly "neurotypical" learner (Le Cunff, 2024; Harrison et al. 2024). Although neurodiversity encompasses many profiles, three are particularly central to this review: ADHD, autism, and dyslexia.

ADHD. Adults with ADHD often struggle with sustained attention, working memory, inhibitory control, and time management. These differences in executive function can make it difficult to stay focused during long lectures, follow multi-step instructions, or handle multiple deadlines at once—all of which can become more challenging in digital courses. (Bertilsdotter Rosqvist et al., 2023; Pagespetit, 2024; Sgro et al., 2025). Longitudinal research tracking college students over several years shows that those with ADHD, on average, obtain lower GPAs, experience more academic impairment, and are more likely to follow less favorable educational trajectories than their non-ADHD peers, even after accounting for prior achievement and demographic factors (DuPaul et al., 2018).

Autism. Autistic learners often report sensory sensitivities (e.g., to noise or visual clutter), a strong preference for predictability, and difficulties with unstructured social interactions and implicit expectations. Sensory processing differences can lead to auditory filtering challenges and overload in noisy, busy, or visually complex environments (Le Cunff, 2024; Sgro et al., 2025).

Dyslexia and related specific learning differences. Dyslexic learners often struggle with phonological processing, decoding, and reading fluency, frequently having reduced verbal working memory capacity. In text-heavy digital environments lacking appropriate supports, these challenges can create high cognitive demands just to decode the material before understanding can happen. (Hamilton & Petty, 2023; Le Cuff, 2024)

These cognitive and sensory profiles do not align neatly with CLT's categories, but they clearly influence how intrinsic and extraneous loads are experienced. For instance, a long text passage might impose a moderate intrinsic load on a neurotypical reader but create a high intrinsic plus extraneous load for a dyslexic student if fonts, spacing, or the lack of multimodal support make decoding unusually effortful (Hamilton & Petty, 2023; Le Cunff, 2024). Likewise, a visually cluttered LMS page might be mildly distracting for some learners but cause severe sensory overload and attentional fragmentation for autistic learners (Ashburner et al., 2008; Le Cunff et al., 2024).

Digital Learning Environments and Neurodivergent Learners

Although the voices of neurodivergent learners in higher education are increasingly being recognized, digital learning environments often center around an LMS supported by tools like video conferencing, discussion boards, automated quizzes, and third-party applications (Ng & Ong, 2018). Over time, course shells can gather numerous menu links, nested folders, and

announcements, often prioritizing instructor convenience over learner understanding (Ng & Ong, 2018; Harilal et al., 2024).

Le Cunff's (2024) mixed-methods program provides one of the most comprehensive neurodiversity-informed investigations of cognitive load in online learning to date. A systematic review of 80 studies on cognitive load in online learning showed that most did not consider neurodiversity, and concepts like attention, working memory, and sensory processing were rarely examined from a neurodiversity perspective. Follow-up empirical studies that combined surveys, EEG, and eye-tracking found that neurodivergent learners consistently experienced higher overall cognitive load, particularly extraneous load, during online learning tasks compared to neurotypical peers, despite having similar working memory capacity and learning performance (Le Cunff, 2024; Le Cunff et al., 2024a).

Additional qualitative research through focus groups with both neurotypical and neurodivergent learners revealed common and unique difficulties (Le Cunff et al., 2024a). While all learners faced issues such as vague instructions, poorly organized course platforms, and exam anxiety, neurodivergent learners more often reported sensory overload from lengthy video lectures, problems with inaccurate captions and inaccessible content, and challenges concentrating amid constant digital interruptions (Le Cunff et al., 2024a; Le Cunff et al., 2024b; Le Cunff et al., 2024c). These results highlight the need to consider neurodiversity when implementing CLT in digital design.

Finally, emphasizing digital inclusion and universal design for learning (UDL) in educational settings highlights both the opportunities and challenges technology presents for neurodivergent learners (Evmenova, 2018; Harrison et al., 2024; Yang et al., 2024). Since UDL guidelines recommend multiple means of engagement, representation, and action and expression,

such practices can reduce extraneous load and better align learning environments with diverse cognitive needs when implemented thoughtfully. (Rao et al. 2015; CAST, 2018).

Equally, while inclusive technology can facilitate participation and lower barriers, inconsistent UDL implementation and poorly designed interactive activities might inadvertently increase cognitive load and anxiety (Harrison et al., 2024; Durgungoz & Durgungoz, 2025).

Distinct Sources and Patterns of Extraneous Load for Neurodivergent Learners

Analyzing CLT research, neurodiversity studies, and qualitative accounts of online learning reveals common sources of extraneous cognitive load in digital higher education. Although these affect all students, neurodivergent learners are often more impacted due to variations in attention, sensory processing, and executive functioning. (Clouder et al., 2020; Le Cunff et al., 2024b). A naturalistic video-game and fMRI study directly supports this. Increasing cognitive load worsened performance, increased reaction time variability, and reduced brain network efficiency in participants with ADHD relative to controls, whereas increasing perceptual load *improved* performance and reduced variability, in some cases allowing the ADHD group to outperform non-ADHD peers (Fisher et al., 2023).

Five themes emerged from this synthesis: interface and navigation barriers; content presentation and information density; instructional communication and task clarity; assessment design, feedback, and time pressure; and sensory, social, and emotional overload.

Theme 1: Design, Interface, and Navigation Barriers

Learning management systems (LMS) and digital learning environments (DLE) interfaces often cause unnecessary cognitive load. Complex navigation menus, deeply nested folders, and inconsistent naming conventions force learners to spend time searching for and recalling where materials are stored instead of engaging with the content (Ng & Ong, 2018;

Skulmowski & Xu, 2022; Harilal et al., 2024). Research has consistently shown that disorientation and search tasks are typical forms of extraneous load, which use up working memory resources without aiding in schema development (Sweller et al., 1998; Ng & Ong, 2018).

Focus group research shows these issues are especially severe for learners with ADHD and autistic learners (Le Cunff et al., 2024a). Participants reported feeling "lost" in courses with multiple navigation options, struggling to find key resources, and feeling that simply figuring out "where to click" was as challenging as understanding the course material (Le Cunff et al., 2024a). Similar trends are seen in broader surveys of autistic and dyslexic learners, who also report confusion when navigating institutional systems and course websites (Gelbar et al., 2015; Hamilton & Petty, 2023).

Research on digital textbooks indicates that frustration in online learning is primarily caused by how content and tools are designed and integrated, rather than the difficulty of the material itself. A large study involving undergraduate biology students using e-texts found that extraneous cognitive load was the main factor predicting frustration with interactions, technology, and curriculum integration, whereas intrinsic load did not predict frustration. Motivation, however, was the strongest negative predictor across all three frustration areas (Novak et al., 2023). This implies that poorly designed digital environments impose an emotional burden that can be mitigated through improved usability, alignment, and scaffolding.

From a CLT perspective, poorly organized interfaces lead to divided attention across menus, content areas, and external tools, increasing unnecessary cognitive load (Swell et al., 1998). For learners with attentional differences or executive function impairments, this design

flaw can significantly raise the difficulty or "cost" of engaging with learning opportunities (Bertilsdotter Rosqvist et al., 2024; Sgro et al., 2025).

Theme 2: Content Presentation and Information Density

Extraneous load also comes from how content is presented. Long, unsegmented video lectures, dense text blocks, and slides packed with text and images require sustained attention and working memory to follow the flow of information (Mayer, 2002; Mayer, 2019; Harilal et al., 2024). Meta-analyses of multimedia learning and video length indicate that shorter, well-segmented instructional videos lead to better retention and reduce cognitive load (Mayer, 2019; Ruamba et al., 2025).

Neurodivergent learners echo these findings. Focus groups revealed that many feel overwhelmed by hour-long recorded lectures, with attention waning and understanding decreasing as videos go on without clear breaks (Le Cunff et al., 2024a). Learners with dyslexia and other print-related challenges highlighted how difficult it is to read large blocks of unformatted text in online courses, especially when PDFs lack tagging, fonts are small, or line spacing is tight (Hamilton & Petty, 2023; de Morais et al., 2025). For these learners, dense text without alternative formats or structural cues can greatly increase both intrinsic and extraneous cognitive load.

Sensory features of how content is presented are also important. Studies on sensory processing in autistic children reveal that challenges with auditory filtering and sensory-seeking behaviors are linked to decreased attention and lower academic achievement (Asburne et al., 2008). In digital higher education settings, excessive auditory and visual clutter (e.g. background noise, notification sounds, or busy graphics) can similarly hinder autistic learners' capacity to focus on key instructional cues (Le Cunff et al., 2024b).

Theme 3: Instructional Communication and Task Clarity

Another major source of extraneous load is confusion about what learners are supposed to do. When instructions are spread across LMS pages, email announcements, and synchronous sessions, or when deadlines and grading criteria are not clearly defined, learners have to use a lot of mental effort to figure out the requirements (de Araujo Guerra Grangeia et al., 2016; Lockman & Schrimer, 2020). CLT work stresses that unclear problem statements cause learners to search without guidance, which increases extraneous load and leaves fewer resources for understanding the main content (Sweller, 1988; Sweller et al., 1998).

Research on cognitive load has long shown that vague problem statements and missing details lead learners to inefficient search strategies, increasing extraneous load (Sweller, 1988). This issue is even more significant in digital courses, where learners often have to open multiple tabs and documents just to find out what is due, when, and how it will be graded (Burris, 2025a). Qualitative feedback from autistic and ADHD learners in higher education frequently underscores the anxiety and cognitive effort linked to "hidden curricula" and changing expectations (Hamilton & Petty, 2023; Le Cunff et al., 2024a; Burris, 2025a; Sgro et al., 2025).

For neurodivergent learners, the mental effort required to interpret expectations detracts from the processing of course content. Since they rely on predictability and clear structure to handle executive function challenges, unclear communication can be a major obstacle to engagement and often results in missed deadlines, incomplete work, or withdrawal (Bertilsdotter Rosqvist et al, 2023; Le Cunff et al., 2024a; Burris, 2025a; Sgro et al., 2025).

Theme 4: Assessment Design, Feedback, and Time Pressure

Assessment practices in online courses can also increase extraneous load. Complex, multi-step assignments with unclear rubrics, time-pressured quizzes, and limited feedback

mechanisms force learners to manage multiple demands at once, stretching working memory and self-regulation (de Araujo Guerra Grangeia et al., 2016; Costley & Lange, 2017). For learners with ADHD or anxiety, time-limited tests in particular can trigger stress responses that hinder retrieval and reasoning, regardless of content difficulty (Pagespetit et al., 2024; Sgro et al., 2025).

Moreover, delayed, generic, or unclear feedback interfaces can hinder learners' ability to understand how to adjust their strategies. This may lead to repeated mistakes and increased cognitive and emotional load (Clouder et al., 2020; Young et al., 2021; Dwyer et al., 2023). Neurodivergent learners, according to survey and interview data, often find it difficult to interpret feedback and are uncertain about how to improve, especially when instructions and criteria are not clearly provided from the start (Gelbar et al., 2015; Skulmowski & Xu, 2022; Hamilton & Petty, 2023).

From a cognitive load perspective, interactive e-learning is most efficient when interactivity is used for just-in-time feedback and adaptive guidance aligned to learners' prior knowledge, rather than for gratuitous choice or exploration (Kalyuga, 2007). Kalyuga argued that instructional efficiency depends on minimizing extraneous interactions while using feedback and adaptive fading of guidance to optimize the balance between external support and schema-based self-regulation.

Theme 5: Sensory, Social, and Emotional Overload

Finally, digital environments can stimulate learners' sensory and socio-emotional systems in ways that compete with cognitive processing. During synchronous online sessions, various communication channels (e.g. slides, chat, video thumbnails, audio, and polls) may all demand attention simultaneously (Ng & Ong, 2018). For autistic learners and others with sensory

sensitivities, this barrage of visual and auditory stimuli, along with constant notifications, can be overwhelming and lead to shutdown or disengagement (Ashburner et al., 2008; Dwyer et al., 2023; Le Cunff et al., 2024a).

Group work and participation expectations can also add to social cognitive load. Autistic and socially anxious learners often face increased stress when asked to respond quickly in discussions, interpret multiple social cues, or navigate unstructured breakout rooms (Clouder et al., 2020; Dwyer, 2022; Dwyer et al., 2023; Hamilton & Petty, 2023; Friedman & Nash-Lukenbach, 2023; Le Cunff et al., 2024a). Although emotional and social load is rarely considered within CLT, recent extensions of the theory emphasize that motivation, emotion, and cognitive load are interconnected: effort spent managing anxiety and impression management reduces the effort available for learning (Ginns & Leppink, 2019).

Evidence-Based Instructional Design Strategies to Reduce Extraneous Load

Against this backdrop of challenges, the literature identifies a set of design strategies that appear to reduce extraneous load for all learners and are especially helpful for neurodivergent learners. Many are derived directly from CLT and multimedia learning, while others emerge from UDL and neurodiversity-affirming pedagogy.

Strategy 1: Clear and Predictable Course Structure

Providing a consistent, predictable structure at both course and module levels reduces disorientation and search (Harilal et al., 2024). Common strategies include:

- Using a standard weekly module template (e.g., overview, materials, activities, assessments).
- Creating a clearly marked “Start Here” or “How This Course Works” page.
- Centralizing announcements and key links in a single, easily located area.

Research on online course quality consistently shows that clear organization and consistent navigation strongly influence perceived learning, satisfaction, and lower confusion (Costley & Lange, 2017; Lockman & Schirmer, 2020). In CLT terms, arranging materials this way decreases extraneous load by reducing split attention and unnecessary searching, especially at the start of each learning session (Sweller et al., 1998).

For neurodivergent learners, predictable structure serves an additional function: it reduces uncertainty and supports planning. Autistic learners and those with ADHD report that consistent routines and stable placement of materials make it easier to orient, allocate attention, and initiate tasks (Clouder et al., 2020; Dwyer et al., 2023; Friedman & Nash-Lukenbach, 2023; Le Cunff et al., 2024a). Design and inclusion reports similarly recommend predictable templates and routines as part of a neurodiversity-affirming learning environment (CAST, 2018; Harrison et al., 2024).

Strategy 2: Segmentation and Chunking of Content and Tasks

Segmenting complex information into smaller, coherent units is one of the most robust CLT strategies for managing total load (Mayer, 2019). In digital contexts, segmentation can be implemented by:

- Breaking long lectures into shorter videos with clear topic boundaries.
- Chunking readings into sub-sections with headings.
- Dividing large assignments into staged deliverables.

Research in multimedia shows that segmented videos enhance learning and reduce perceived cognitive load compared to long, continuous presentations (Mayer, 2019; Ruamba et al., 2025). Similarly, studies on adaptive learning and simulation suggest that gradually increasing task difficulty, rather than presenting all elements at once, helps build schemas without overloading working memory (Khasawneh & Khasawneh, 2024; Gkintoin et al., 2025).

Neurodivergent learners clearly benefit from chunking strategies. Focus group participants described using pauses and replays to self-segment lengthy recordings, noting that courses offering natural "break points" were easier to process mentally and emotionally (Le Cunff et al. 2024b). For learners with ADHD and dyslexia, breaking down content and tasks reduces the sustained attention required and the working memory span needed at one time (Hamilton & Petty, 2023; Pagespetit et al., 2024).

Strategy 3: Interface Simplicity and Sensory-Aware Visual Design

Designing for simplicity instead of maximum feature density can significantly lower extraneous load (Harilal et al., 2024). CLT's coherence principle advises excluding unnecessary information (Lange et al., 2017). In digital environments, this means reducing decorative graphics, animations, and nonessential notifications that compete with core content for learners' attention (Sweller et al., 1998; Mayer, 2019; Skulmowski & Xu, 2022). Empirical research in higher education modules shows that cluttered screens and repetitive information can overwhelm learners, while simpler layouts and well-spaced materials are seen as more manageable (Harilal et al., 2024).

Sensory processing studies suggest that autistic learners particularly benefit from environments that reduce unpredictable visual and auditory stimuli (Ashburner, 2008). Recommended strategies include:

- Using clean layouts with sufficient white space and consistent fonts.
- Avoiding autoplay videos and sounds.
- Offering a "focus mode" that hides navigation menus and distractions during content viewing.
- Grouping related information together spatially to reduce split attention.

These approaches not only reduce extraneous load for all learners but also help prevent sensory overload for neurodivergent learners (Ashburner et al., 2013.)

Strategy 4: High-Quality Multimodal Materials

Providing multiple representations of content can lower barriers, but poorly coordinated multimodality can increase extraneous load. CLT's modality principle suggests that presenting complementary information across visual and auditory channels can reduce load, whereas the redundancy principle warns that presenting the same information in multiple forms simultaneously (e.g., reading text verbatim from slides) can be detrimental (Sweller et al., 1998; Mayer, 2019).

For neurodivergent learners, accessible multimodality is crucial. Captioned videos, transcripts, text-to-speech, and audio versions of readings can reduce decoding effort for dyslexic learners and support different attention styles for those with ADHD (Evmenova, 2018; Hamilton & Petty, 2023; Yang et al., 2024). Meanwhile, inaccurate captions, poorly synchronized audio, or text-heavy slides read aloud word-for-word can increase extraneous load (Rao et al., 2015; Harilal et al., 2024; LeCunff, 2024).

The literature on UDL emphasizes providing multiple means of representation while ensuring that each mode is usable. For example, digital documents should be tagged and navigable, videos should include accurate captions and transcripts, and images should include alternative text (CAST, 2018; Evmenova, 2018; Yang et al., 2024). Evidence from lecture capture and accessibility studies indicates that such supports help not only disabled and neurodivergent learners but the wider student body (Doyle, 2020; Le Cunff et al., 2024a; Yang et al., 2024) .

Strategy 5: Explicit Instructions, Signposting, and Advance Organizers

Explicitness is a frequent theme in both CLT and neurodiversity research. Providing clear, step-by-step instructions, concrete examples, checklists, and advance organizers helps learners dedicate cognitive resources to content rather than to understanding expectations (Sweller et al., 1998; de Araujo Guerra Grangeia, 2016). In online courses, this can include:

- Overview pages that specify learning objectives, required and optional activities, and estimated time on task.
- Detailed assignment sheets with criteria and examples of strong work.
- Checklists for complex multi-step tasks.
- Visual timelines and calendars.

Studies of online learning show that such design choices correlate with higher student engagement and perceived learning (Costley & Lange, 2017; Lockman & Schirmer, 2020). For neurodivergent learners, explicitness also reduces anxiety linked to the "hidden curriculum" and decreases the executive function load of planning and monitoring (Matthews, 2009; Clouder et al., 2020; Dwyer et al., 2023; Hamilton & Petty, 2023; Le Cunff et al., 2024a; Sgro et al., 2025).

Strategy 6: Supports for Executive Function and Self-Regulation

Because many neurodivergent learners face executive function challenges, embedding support for planning, monitoring, and reflection into course design can help reduce unnecessary cognitive and emotional burden (Pagespetit et al., 2024; Sgro et al., 2025). Research on self-regulated learning and digital tools shows that prompts, progress indicators, and low-stakes quizzes can support metacognitive processes without overwhelming learners (Wong et al., 2012; Ng et al., 2024; Wang, 2024). Qualitative work on personalized online courses shows that when students set personal goals, choose among task options, and reflect on their progress, they report

stronger feelings of autonomy and competence and higher intrinsic motivation (Alamri et al., 2020). Examples include:

- Visual progress bars and checklists within modules.
- Automated reminders for upcoming deadlines.
- Low-stakes self-checks that provide immediate feedback.
- Guided reflection prompts at the end of units.

These structures can lessen the burden on learners to remember multiple deadlines and requirements, freeing up working memory for learning (de Araujo Guerra Grangeia, 2016). Evidence from coaching and intervention studies involving university students with ADHD indicates that executive-function supports can enhance academic performance and decrease stress (Pagespetit et al., 2024; Sgro et al., 2025).

Strategy 7: Flexible Pathways, Agency, and Psychological Safety

Finally, offering flexible pathways and choices aligns with both UDL and emerging neurodiversity-affirming pedagogies (CAST, 2018; Evmenova, 2018; Hamilton & Petty, 2023; Yang et al., 2024). Instead of assuming a single "right" way to engage or demonstrate learning, instructors can provide options. By providing written or video reflections, synchronous or asynchronous participation, and individual or small-group projects, instructors can create opportunities for students to engage in ways that suit their strengths.

From a CLT perspective, allowing learners to choose modalities and formats that match their strengths may decrease extraneous load by removing unnecessary processing tasks (for example, public speaking for someone with severe social anxiety) (Evmenova, 2018; Sweller et al., 1998; Yang et al., 2024). Neurodiversity research emphasizes that such flexibility can also

lessen stigma and boost a sense of autonomy and belonging (Clouder et al., 2020; Friedman & Nash-Luckenbach, 2023; Hamilton & Petty, 2023; Harrison et al., 2024).

Qualitative research on neurodivergent learners underscore the significance of psychological safety, the feeling that their differences won't be penalized or seen as disorders, in promoting engagement (Bertilsdotter Rosqvist et al., 2023; Friedman & Nash-Lukenbach, 2023; Hamilton & Petty, 2023). Digital tools that allow anonymous participation, such as online polls and text-based discussion forums, help learners engage without the cognitive or social pressure of speaking in front of the whole class (Dwyer et al., 2023; Durgungoz & Durgungoz, 2024).

Implementation Barriers, Facilitators, and Methodological Considerations

Even when effective design strategies are understood, implementing them in actual courses is challenging. Studies of instructional designers and faculty suggest that CLT is only partially integrated into routine practice; designers often apply CLT-consistent strategies intuitively and emphasize institutional quality rubrics and templates over explicit cognitive-load reasoning when developing online courses (Ng & On, 2018; Caskurlu et al., 2021Harilal et al, 2024; Skulmowski & Xu, 2022). Faculty frequently report time constraints, limited support, and lack of training as key barriers to redesigning digital courses (Lockman & Schirmer, 2020; Harrison et al., 2024; Yang et al., 2024).

Institutional and structural factors also influence accessibility. Policies focused on compliance may emphasize checklists, such as captions and alt text, but overlook broader cognitive aspects like interface simplicity or consistent course layouts (CAST, 2018; Harrison et al., 2024; Yang et al., 2024). Platform constraints—such as LMS templates that promote deep folder nesting or cluttered dashboards—may also limit instructors' capacity to create low-load designs without technical assistance (Harrison et al., 2024; Yang et al., 2024).

Methodologically, much of the existing research on cognitive load in online learning relies on single-item self-report measures given after tasks (Le Cunff, 2024; Le Cunff et al., 2024b; Yang et al., 2024). While these are helpful, such tools only capture overall impressions and may not effectively distinguish between intrinsic and extraneous load (Leppink et al., 2013; Klepsch et al., 2017). Recent studies have validated multi-item scales and combined subjective ratings with physiological measures (e.g., EEG, heart rate variability, eye-tracking) to better observe dynamic changes in load (Young et al., 2021; Leppink et al., 2013; Feldon et al., 2024; Le Cunff et al., 2024c). However, very few studies have used these tools with neurodivergent participants (Le Cunff et al., 2024a, 2024c).

The absence of measurement approaches sensitive to neurodiversity poses a notable challenge. For instance, autistic individuals might interpret Likert-scale anchors differently, and fluctuations in attention related to ADHD could lead to misleading average load ratings (Dwyer, 2022; Le Cunff, 2024; Sgro et al., 2025). Growing efforts toward more inclusive methods, such as co-designing instruments with neurodivergent researchers and learners, are beginning to develop and show promise in filling these gaps (Dwyer et al., 2023; Hamilton & Petty, 2023; Le Cunff, 2024).

Limitations, Conclusions, and Implications

Limitations of the Current Literature

Across the bodies of work on cognitive load, digital learning, and neurodiversity, several limitations constrain how confidently we can generalize to neurodivergent learners in higher education.

First, most CLT research assumes neurotypical samples. Given that neurodiversity is rarely measured or analyzed, most CLT research in digital learning has been conducted with

samples that are assumed to be neurotypical (Sweller et al. 1998; Mayer, 2001, 2019; Le Cunff, 2024; Le Cunff et al, 2024b). This makes it difficult to know whether design strategies genuinely reduce load for neurodivergent learners or whether benefits are unevenly distributed (Le Cunff et al., 2024a).

Second, neurodivergent groups are unevenly represented. Where higher-education research does address neurodivergence, it tends to focus more on ADHD and dyslexia than on autism, dyspraxia, or Tourette syndrome, and often collapses diverse diagnoses into a single "neurodivergent" or "disabled" category (Clouder et al., 2020; Dwyer et al., 2023). This obscures important within-group differences in attention, sensory processing, and language. Few studies disaggregate results by specific diagnoses or by those who self-identify as neurodivergent without a formal label, despite evidence that late-diagnosed and self-identified students may face distinct barriers (Dwyer, 2022).

Third, intersectionality is rarely examined. Most studies include limited information about participants' race, gender identity, or socioeconomic status, and even fewer analyze how these identities intersect with neurodivergence in relation to digital learning and cognitive load (Clouder et al., 2020; Dwyer et al., 2023; Hamilton & Petty, 2023; Le Cunff et al., 2024a; Pagespetit et al., 2024). This is significant because experiences related to cognitive load and access to accommodations are influenced not only by systemic inequities but also by individual cognitive differences (Gelbar et al., 2015; Dwyer, 2022; Sgro et al., 2025).

Fourth, methodological limitations are common in cognitive load research. Many studies rely on small, self-selected samples or single-institution case studies, which reduce generalizability (de Araujo Guerra Grangeia, 2016; Ng & Ong, 2018; Skulmowski & Xu, 2022; Harilal et al., 2024). Cognitive load is often assessed with single-item scales, and designs

frequently confound extraneous and intrinsic load (Leppink et al., 2013; Young et al., 2021; Feldon et al., 2024). Although more detailed multi-item instruments have been validated (Leppink et al., 2013; Klepsch et al., 2017), they remain underused, and only a few studies combine subjective ratings with neurophysiological measures such as EEG or eye-tracking (Le Cunff et al., 2024d).

Fifth, ecological validity is somewhat inconsistent. Much of the CLT research relies on short, highly controlled laboratory tasks rather than examining entire courses in actual higher-education environments (Mayer, 2019; Skulmowski & Xu, 2022). Although these studies are valuable for understanding specific mechanisms, they may not fully capture the overall cognitive load experienced during a full semester of online learning, which involves managing multiple platforms and navigating assessment and feedback cycles. Neurodivergent students explicitly report these as overwhelming challenges (Clouder et al., 2020; Le Cunff et al., 2024b).

Few studies explicitly involve participatory or co-designed methods with neurodivergent individuals. Most research on neurodivergent students in higher education is conducted about them rather than in collaboration with them (Clouder et al., 2020; Le Cunff et al., 2024d, 2024e). Recent scholarship in neurodiversity emphasizes that co-design and participatory techniques are vital for accurately capturing lived experiences and preventing deficit-focused narratives (Dwyer, 2022; Le Cunff, 2024; Le Cunff et al., 2024d, 2024e). Currently, these approaches are rare, including in studies that reference CLT.

Limitations of this Review

This review also has several limitations that I want to acknowledge explicitly.

Scope and inclusion decisions. I focused on higher-education digital learning environments and on neurodivergent learners, particularly those with ADHD, autism, and

dyslexia. As a result, I drew selectively from K–12 and clinical literatures only when mechanisms appeared plausibly transferable (e.g., sensory processing in autism, phonological processing in dyslexia). Important findings from other domains, such as workplace training or child clinical interventions, may therefore be underrepresented (Ashburner et al., 2013).

Gaps between literature. Since CLT and neurodiversity seldom directly overlap, many of the connections made in this paper are inferential. Consequently, I analyze neurodivergent students' experiences with digital learning through a CLT perspective or extend general CLT findings to neurodivergent groups. Although I have tried to clearly indicate where evidence is direct versus inferred, these interpretive steps add a degree of uncertainty (Skulmowski & Xu, 2022; Le Cunff et al., 2024a).

Non-systematic synthesis. Although I drew on systematic reviews and used structured search terms in major databases, this paper is not a full systematic review with a preregistered protocol or exhaustive screening. Instead, it is a targeted, integrative literature review (Le Cunff et al., 2024a). Therefore, I may have missed relevant studies, especially those published in non-education journals or in languages other than English.

Emphasis on design strategies over implementation detail. Due to space limitations and time constraints, I examined broad categories of instructional design strategies and synthesized key evidence for each. I do not aim to catalog all variants or offer detailed implementation guides for specific LMS platforms. Likewise, I focus on learner-facing design aspects rather than institutional frameworks like procurement policies or faculty workload models, which also influence cognitive accessibility.

Overall, these limitations suggest that the conclusions should be considered as evidence-informed but provisional. More targeted, neurodiversity-sensitive empirical research is necessary to refine, challenge, or expand upon the claims presented here.

Conclusions

Despite these limitations, several conclusions emerge from the literature.

First, digital design choices can significantly influence extraneous cognitive load—especially for neurodivergent students, where the impact is greater. Interface complexity, dense and unsegmented content, ambiguous instructions, poorly designed assessments, and sensory or social overload all compete with learners' limited working memory resources. This often forces neurodivergent learners to exert excessive effort just to keep up (Harilal et al, 2024; Le Cunff, 2024; Le Cunff et al., 2024a). Neurodiversity-informed work indicates that these features often place disproportionate burdens on neurodivergent learners, who may already be managing attentional variability, sensory sensitivities, or executive-function challenges (Clouder et al., 2020; Dwyer et al., 2023; Le Cunff et al., 2024b).

Second, strategies based on CLT (Cognitive Load Theory) closely match neurodiversity-affirming design principles. These include clear, predictable course structures; segmented content; interfaces that are minimalist and sensory-aware; high-quality multimodal materials; explicit instructions and signposting; embedded supports for executive functioning; and flexible pathways. Such measures decrease unnecessary cognitive load while respecting diverse cognitive profiles (Sweller et al., 1998; Rao et al., 2015; CAST, 2018; Evmenova, 2018; Mayer, 2019; Yang et al., 2024). Evidence shows these strategies benefit all students, not just those with formal diagnoses (Clouder et al., 2020; Le Cunff et al., 2024a). They also align with UDL guidelines and neurodiversity scholarship that emphasize predictability, accessibility, and

autonomy (Clouder et al., 2020; Hamilton & Petty, 2023). Importantly, these designs support the learning of all students, including those without diagnosed conditions.

Third, neurodiversity exposes blind spots in traditional CLT. Assuming that learners are broadly similar, classical CLT primarily emphasizes cognitive traits such as working memory, interrelated tasks, and prior knowledge (Sweller et al., 1998). However, neurodiversity illuminates aspects often overlooked by CLT, such as sensory processing differences, social and emotional burdens, the cumulative "tax" from navigating mismatched systems, and issues like masking and stigma (Ashburner et al., 2013; Dwyer, 2022; Bertilsdotter Rosqvist et al., 2023; Hamilton & Petty, 2023). Including these factors in CLT research encourages us to look beyond task and material structure to the larger learning environment, including institutional policies and norms.

Fourth, reducing extraneous load is both a pedagogical and an equity imperative. Pedagogically, lowering unnecessary cognitive demands should improve learning efficiency and depth for all (Mayer, 2001). From an equity perspective, minimizing avoidable cognitive load is a matter of fairness: neurodivergent students should not need to exert significantly more cognitive and emotional effort than their peers just to access the same material and demonstrate their understanding (Clouder et al., 2020; Hamilton & Petty, 2023). Therefore, designing digital environments with cognitive accessibility in mind is not just about "optimization"; it is essential for establishing an inclusive environment where diverse learners can participate fully and sustainably.

Implications for Research, Practice, and Policy

Future Research

First, researchers should clearly recruit and identify neurodivergent participants. Studies on CLT and online learning need to move beyond the assumption of neurotypicality by measuring neurodivergence through self-identification, screening tools, and, when suitable, clinical documentation (Dwyer, 2022; Le Cunff et al., 2024a). Analyses should investigate whether design changes influence cognitive load and performance differently among various neurotypes, and if strategies that benefit most users might inadvertently create disadvantages for certain groups.

Next, researchers should combine strict CLT methodologies with real digital learning settings. There is a gap in studies that experimentally compare lower-load and higher-load versions of actual online course elements, such as differently structured LMS modules, segmented versus unsegmented lecture videos, and explicit versus minimal assignment instructions involving both neurodivergent and neurotypical students in real courses (Lockman & Schirmer, 2020; Skulmowski & Xu, 2022). This approach can ensure experimental control while reflecting the complexity of authentic higher education environments.

Additionally, researchers should create and employ neurodiversity-aware methods to assess cognitive load. This involves using multi-item tools that distinguish between intrinsic, extraneous, and germane load (Klepsch et al., 2017; Leppink et al., 2013), and combining these with process data such as log files and clickstream analysis, as well as neurophysiological measures like EEG and eye-tracking when feasible (Ng & Ong, 2018; Le Cunff et al., 2024d; Mayer, 2024; Yeo et al., 2024). These tools might also need to be adapted or co-developed with neurodivergent individuals to ensure that scale anchors and item wording are relevant and accessible (Dwyer et al., 2023; Le Cunff et al., 2024e).

Moreover, researchers should implement participatory and co-design methods. Including neurodivergent students as active partners in identifying issues, developing solutions, and analyzing results (Dwyer, 2022; Le Cunff et al., 2024e) can be beneficial. Co-design helps create interventions that genuinely affirm neurodiversity and reveals subtle extraneous loads not easily seen by instructors or researchers, like the mental effort involved in masking during video calls or the anxiety caused by unforeseen platform changes.

Finally, researchers should consider intersectionality and structural factors by exploring how neurodivergence overlaps with race, gender, class, and disability status in influencing access to digital resources and reactions to design strategies (Clouder et al., 2020; Hamilton & Petty, 2023). This involves examining how institutional policies, such as documentation requirements for accommodations and technology access programs, interact with cognitive load and learning outcomes.

Instructional Practice

For instructors and instructional designers, a practical takeaway is that small, concrete changes can reduce extraneous cognitive load and improve accessibility, even without a complete course redesign. Examples include:

- Paying attention to the structure and navigation.
- Adopting a consistent weekly module template.
- Streamlining interfaces and navigation.
- Ensuring alignment between digital materials and course activities.
- Debugging and stabilize platforms.
- Breaking long lectures into shorter segments and clearly labelling them.
- Segmenting large amounts of content into smaller chunks with headings and

summaries.

- Dividing complex assignments into staged milestones.
- Presenting explicit guidance and scaffolds.
- Providing detailed assignment sheets with examples and checklists.
- Simplifying LMS navigation and hiding unused tools.
- Ensuring that videos are captioned accurately and that documents are accessible.
- Embedding progress indicators and reminders.
- Offering flexibility and choice for participation and assessments where possible.

These practices are aligned with both CLT and UDL and can be implemented incrementally. They also shift the focus from individualized accommodations, which require learners to disclose diagnoses and navigate bureaucracy, to proactive design that minimizes barriers for everyone.

Institutional and Policy Implications

At the institutional level, the literature suggests that supporting neurodiversity-affirming, CLT-aligned design requires changes beyond individual instructors' efforts (Ng & Ong, 2018; Le Cunff, 2024; Harrison et al., 2024; Le Cunff et al., 2024e; Yang et al., 2024). Here, support for CLT and neurodiversity-informed design should be integrated into teaching and learning centers, faculty development initiatives, and course approval procedures. Using templates and quality standards that naturally include low-load design principles will make cognitively accessible choices the simplest option for busy instructors.

Policy frameworks supporting disabled and neurodivergent learners should go beyond basic accessibility checks, like captioning, to include cognitive accessibility. This involves designing systems and courses that acknowledge human cognitive limits and diversity (Harrison

et al., 2024; Yang et al., 2024). Such a shift aligns with the growing emphasis on compassionate and inclusive teaching practices in higher education (Friedman & Nash-Luckenbach, 2023; Hamilton & Petty, 2023; Le Cunff, 2024).

In summary, combining Cognitive Load Theory with neurodiversity perspectives creates a strong framework for rethinking digital higher education. By viewing extraneous cognitive load as an equity issue, rather than just an efficiency concern, we can develop digital learning environments where neurodivergent students are not required to bear an “extra cognitive tax” just to engage. Instead, they can focus their efforts on the deep, meaningful learning that brought them to higher education.

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