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The Cognitive Load Audit: A Framework for Evaluating Instructional Demands in Special Education

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Abstract

Special education teachers adapt tasks and materials every day, but cognitive load theory (CLT) gives them principles for doing so, not a procedure for examining what a given task asks of a given learner. This paper proposes the Cognitive Load Audit (CLA), a structured and theoretically derived procedure for examining the cognitive demands built into an instructional task, material, activity, or environment. The framework has six audit domains (content demand, representation and presentation, processing and attention demand, learner-demand interaction, support and scaffolding, and evidence of strain and learning), an eight-stage cycle (define, map, identify, classify, prioritize, modify, implement, and re-audit), and a set of decision rules that lead from analysis to a change in instruction. Its central claim is that instructional demand is relational: whether a demand helps or harms depends on the match between task and learner, and disability changes that match in ways that vary within and across categories. The paper illustrates the audit with four theoretical examples (dyslexia, ADHD, intellectual disability, and hearing impairment), states six propositions, and sets out a validation pathway. The framework has not been empirically validated, and it is not a diagnostic or measurement instrument.

Keywords: cognitive load theory, special education, instructional design, learner-demand interaction, audit framework, working memory

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1. Introduction

A lesson can be hard for two different reasons. The concept may be difficult, or the way the lesson asks the learner to deal with the concept may be difficult. In special education the second reason is common and easy to miss. A student who fails a ratio problem may understand ratios. The trouble may lie in the reading load of the word problem, the layout of the page, the pace of the teacher's instructions, or the number of steps the student must hold in mind before writing anything. The teacher sees the failure but not always which part of the task produced it.

Cognitive load theory (CLT) offers a way to think about this. Its starting point is that working memory can handle only a few novel elements at once, while long-term memory holds organized knowledge with no known practical limit (Cowan, 2010; Sweller, 2011). Instruction that asks learners to process more than working memory can hold slows or stops learning (Sweller, 1988). Over three decades, CLT researchers have turned this idea into a set of instructional effects, including split attention, modality, redundancy, worked examples, and expertise reversal (Sweller et al., 2019). Special education researchers took up the theory because many learners with disabilities have reduced or differently organized processing capacity, and because ordinary classroom tasks can exceed what those learners can absorb (Kennedy & Romig, 2021).

What CLT does not supply is a way to inspect a particular task. Its principles tell a designer what tends to help, such as integrating text with a diagram or removing decorative images. They do not tell a teacher how to go through a lesson that already exists, find the demands it contains, decide which of them the learning objective requires, and judge which of the rest will land hard on the learners in the room. A review of CLT in computing education found that studies often cite the theory as background for a design choice without applying its principles (Duran et al., 2022). Teachers who adapt materials every day are in a similar position: they need the principles, but the principles do not tell them where to look.

Special education widens this gap. Learners in one room can differ in language, sensory access, attention, memory, motor control, and prior knowledge, and the same demand can be heavy for one of them and trivial for another. Disability labels do not settle the question. Learners who share a label can differ in what they find demanding, and in some categories the useful question is not how to reduce load but how to manage perceptual input or avoid leaving the learner under-challenged (Forster et al., 2013; Remington et al., 2012). A framework for special education

therefore cannot assume that all load is harmful or that a label predicts which demand will matter.

Earlier work by the author addressed part of the problem. A phase-based instructional design framework for learners with learning disabilities placed an audit checkpoint at the end of each of three design phases (Hussain, 2025b). Two later frameworks applied similar logic to Urdu literacy (Hussain, 2026a; Hussain, n.d.). All three were built for learning disabilities, and in each of them the audit was one component of a larger design model. The present paper differs in two ways. It makes the audit the main object of theoretical development, and it widens the target from learning disabilities to special education as a whole.

The purpose of this paper is to propose the Cognitive Load Audit (CLA) as a standalone, theory-based procedure for examining the demands that instructional tasks, materials, activities, and environments place on learners with disabilities. It has four objectives: to define the audit and state what it is and is not; to specify six audit domains, each with a guiding question and a theoretical basis; to describe an eight-stage procedure and decision rules that lead from analysis to a change in instruction; and to state testable propositions and a validation pathway. The framework is theoretical. It is not an empirical intervention study, a diagnostic instrument, or a measure of cognitive load.

2. Theoretical Foundations

2.1. Cognitive Architecture and Element Interactivity

CLT rests on a contrast between two memory systems. Working memory holds and manipulates the information currently in use, and its capacity for novel information is small (Cowan, 2010). Baddeley (2003) described it as a system with separate stores for verbal and visual material, run under attentional control. Long-term memory has no known practical limit once information is organized into schemas, which let a learner treat many elements as one (Sweller, 2011). In this account, learning is the construction and automation of schemas, and instruction works when it lets working memory do that job without being swamped.

Element interactivity is the property of a task that most directly sets how heavy it is. Sweller (2010) proposed that both intrinsic and extraneous load can be traced to the number of elements that must be processed at the same time and how tightly they interact. Chen et al. (2023) developed this into an account of task complexity that does not depend on how hard a task feels to the person doing it. Two points follow for an audit. Complexity cannot be read off the topic,

because one sentence can hold many interacting elements for a novice and few for an expert. And complexity belongs to the pairing of task and learner, because what counts as an element depends on the schemas the learner already holds (Sweller, 2024).

2.2. Load Types and Their Current Status

Intrinsic load comes from the complexity of the material relative to what the learner knows. Extraneous load comes from how the material is presented or from what the learner is asked to do beyond the learning goal. Germane load is the effort of building schemas (Klepsch & Seufert, 2020; Sweller, 1994). The status of the third type is disputed. Kalyuga (2011) asked whether three types are needed, since germane load is hard to separate empirically from intrinsic load, and more recent accounts treat it as the working memory resources a learner directs to schema construction, not as a separate load (Greenberg & Zheng, 2023).

The audit does not depend on how this dispute ends. It uses the intrinsic and extraneous distinction as a working classification, asks whether each demand is necessary for the learning objective, and treats the effort that builds understanding as something to protect. This fits Schnotz and Kürschner's (2007) argument that reducing load is not always the aim, since added difficulty can support learning. A demand is not unnecessary because it is hard. It is unnecessary when it does not contribute to the objective.

2.3. Expertise and the Learner Side of the Task

Whether a demand is necessary, and whether it is heavy, both depend on what the learner knows. The expertise reversal effect shows that supports which help novices can hinder learners with more knowledge, because the supports add processing the learner no longer needs (Kalyuga, 2009; Kalyuga et al., 2012). A recent meta-analysis treats the effect as a dependable finding for adaptive instruction (Tetzlaff et al., 2025), and Chen et al. (2017) traced it to element interactivity. Prior knowledge does not always lower load, either; Endres et al. (2023) described cases in which higher prior knowledge raised intrinsic load. In special education the same logic applies within a disability group, where students can differ widely in what they know, and across the school year, because a support that fits in October may need to go by March. An audit therefore has to record the learner's current knowledge as an input and has to be repeated.

2.4. Instructional Principles behind the Audit Criteria

The audit domains draw on a limited set of CLT and multimedia learning principles, and only those are reviewed here. Segmenting, signaling, removing irrelevant material, and aligning

words with pictures are among the nine ways of reducing load in multimedia learning listed by Mayer and Moreno (2003), and Castro-Alonso et al. (2021) grouped related strategies by the problem in the material that each one addresses. Split attention arises when learners must integrate separate sources of information, and physically integrating them reduces the effort (Chandler & Sweller, 1992). Spreading information across visual and auditory channels can lighten load (Ginns, 2005), whereas presenting the same information twice can add to it (Kalyuga & Sweller, 2014). Worked examples help novices learn procedures (Atkinson et al., 2000; Ward & Sweller, 1990), and fading them as competence grows supports the move to independent problem solving (Renkl & Atkinson, 2010). Paas and van Merriënboer (2020) reviewed methods for managing working memory load when learners work on complex tasks.

Scaffolding belongs to a different tradition, which grew out of developmental research on temporary support from a more knowledgeable other (van de Pol et al., 2010). It overlaps with CLT in practice but asks different questions, and the audit treats it as a source of supports to be examined, not as a synonym for load management (Hussain, 2026b). Table 1 shows how each principle is used in the audit and what it implies for special education settings.

Table 1

Cognitive Load Theory Principles Used in the Audit and Their Implications

CLT principle	Audit implication	Special education implication
Element interactivity (Chen et al., 2023; Sweller, 2010)	Count the elements a learner must process together to meet the objective, not the elements in the topic.	The same task can have different interactivity for learners who differ in prior knowledge or in access to the language of the task.
Split attention (Chandler & Sweller, 1992)	Check whether related text, diagrams, and steps can be read together without searching.	Searching across a page may cost more for learners with attention, visual, or motor-access difficulties. The audit tests this for each learner and does not assume it.
Redundancy and modality (Ginns, 2005; Kalyuga & Sweller, 2014)	Check whether channels carry complementary or duplicate information, and whether each channel is accessible.	A partly inaccessible channel, such as speech in a noisy room for a learner with hearing loss, changes what the other channel must carry.

CLT principle	Audit implication	Special education implication
Segmenting, signaling, and removing irrelevant material (Mayer & Moreno, 2003)	Check whether material is divided at natural points, whether attention is directed to what matters, and whether irrelevant material is present.	Learners who struggle to sustain attention or hold sequences may need shorter segments. Segment size should come from the task analysis, not from the label.
Worked examples and fading (Atkinson et al., 2000; Renkl & Atkinson, 2010)	Check whether novices see complete solutions and whether support is withdrawn as competence grows.	Fading points should be set from observed performance, since too much support can become an added load.
Expertise reversal (Kalyuga et al., 2012; Tetzlaff et al., 2025)	Check whether supports still match current knowledge.	Learners in one disability group can differ widely in knowledge, so supports cannot be assigned by category.

3. Why Special Education Requires an Audit

Three features of special education make an audit more necessary than it is in most general classrooms. The first is the range of differences among learners. The second is that the direction of effect is not the same across groups. The third is that teachers adapt constantly and usually without a way to check the adaptation.

3.1. Learner Heterogeneity

The learner characteristics that bear on instructional demand are numerous. Language access matters because most instruction is delivered in language. Sensory access matters because a channel that is partly closed changes what the remaining channels must carry. Listening is itself effortful for people with hearing loss, and the effort depends on the severity of the loss, background noise, and the listener's motivation (Pichora-Fuller et al., 2016). Pupil-response data showed that age and hearing loss both raised cognitive load during speech perception in noise (Zekveld et al., 2011), and variation in auditory experience is associated with differences in language and executive function skills in children who are hard of hearing (McCreery & Walker, 2022). Visual impairment brings its own load; Veldman et al. (2024) examined cognitive overload, concentration, and fatigue in adults with visual impairment. Attention, memory, and executive functions such as inhibition and flexibility (Diamond, 2013) affect how well a learner can run a multistep task. Motor demands, communication needs, and the use of assistive technology add further conditions. A communication device that lets a student answer may also

require the student to move through menus while holding the answer in mind, and an audit should ask about that.

Heterogeneity also runs inside categories. Doroh et al. (2026) found that the effects of cognitive load on working memory differed between students with linguistic and with perceptual forms of dyslexia. The label "dyslexia" does not say which demand will matter most for a given student.

3.2. Direction of Effect

The CLT literature in special education does not support a single rule of simplification. Forster et al. (2013) found that raising perceptual load reduced distraction in adults with ADHD, and Fisher et al. (2023) reported that cognitive load and perceptual load had opposite effects on brain network efficiency in people with ADHD. Remington et al. (2012) found that autistic adults could process more information at once than typical adults in some tasks. These studies used adults and laboratory tasks, so they cannot be carried directly into classrooms. Their value for the present argument is narrower: they show that reducing every demand for every learner with a given label is not a safe default.

3.3. Adaptation without Verification

Teachers in special education routinely simplify, shorten, enlarge, break up, and support. These adaptations are usually reasonable. What is missing is a structured way to ask whether an adaptation lowered an unnecessary demand, left a necessary one intact, or introduced a new demand of its own. Kennedy and Romig (2021) gave special educators a vocabulary for describing why a reasonable-looking activity can overwhelm a learner. The audit adds a procedure for using that vocabulary on a specific task.

The principle that organizes the audit is that instructional cognitive demand is relational. A demand has a task-side description, such as the number of interacting elements, the channel, the pace, and the response mode. It also has a learner-side condition, such as prior knowledge, access, memory, and attention. Its functional weight comes from the two together. Spoken instructions at a normal pace are a light demand for most listeners and a heavy one for a learner with hearing loss in a noisy room. The framework identifies potential learner-demand interactions of this kind. It does not diagnose cognitive deficits, and it draws on what teachers already have, including assessment reports, individualized education plans, and classroom observation.

4. What Is a Cognitive Load Audit?

The paper defines the CLA as follows.

> *A Cognitive Load Audit is a structured, theoretically guided examination of the cognitive demands embedded within an instructional task, material, activity, or learning environment, conducted in relation to learner characteristics, instructional goals, and available supports, with the purpose of identifying unnecessary demands, potential overload risks, and opportunities for cognitive-load optimization.*

Each part of the definition does work. "Structured" means that the examination follows a set order and produces a record. "Theoretically guided" means that its categories come from CLT constructs and not from general good practice. "Embedded demands" means that the unit of analysis is the task or material, not the learner. "In relation to learner characteristics, goals, and supports" states the relational principle: a demand is judged against what the learner brings, what the lesson is for, and what help is already in place. "Cognitive-load optimization" is deliberately wider than reduction, because some demands should stay and some learners need more challenge.

The audit has eight characteristics. It is systematic, in that every task goes through the same domains and stages. It is task-specific, so the same learner can have different audit results for different tasks. It is learner-sensitive, because its judgments depend on what is known about the learner. It is instructional, since its output is a change in teaching and not a score. It is iterative, because learner responses and growing expertise change what the next audit finds. It is theoretically grounded, non-diagnostic, and adaptable, meaning that domain-specific content, such as script features in Urdu literacy, can be added without changing the procedure.

Three things the audit is not need stating, because each is a likely misreading. It is not a measure of cognitive load. Measurement relies on rating scales, physiological indicators, and performance data (Klepsch et al., 2017; Paas et al., 2003), and the audit does not produce a load score. It is not a generic checklist for simplifying worksheets. A checklist asks whether features are present, whereas the audit asks what a given demand does for a given learner and objective, and its output is a classified record of demands with decisions attached. And it does not replace CLT. It is a procedure for applying the theory.

5. The Cognitive Load Audit Framework

The framework has six domains. They are not six stages. Each is a lens that the auditor holds against the task, and the procedure in the next section sets the order in which the lenses are used.

Figure 1 shows how the domains relate, and Table 2 summarizes each one with its guiding question, the risk it is meant to detect, and the kind of response it usually leads to.

Figure 1

The Six Domains of the Cognitive Load Audit

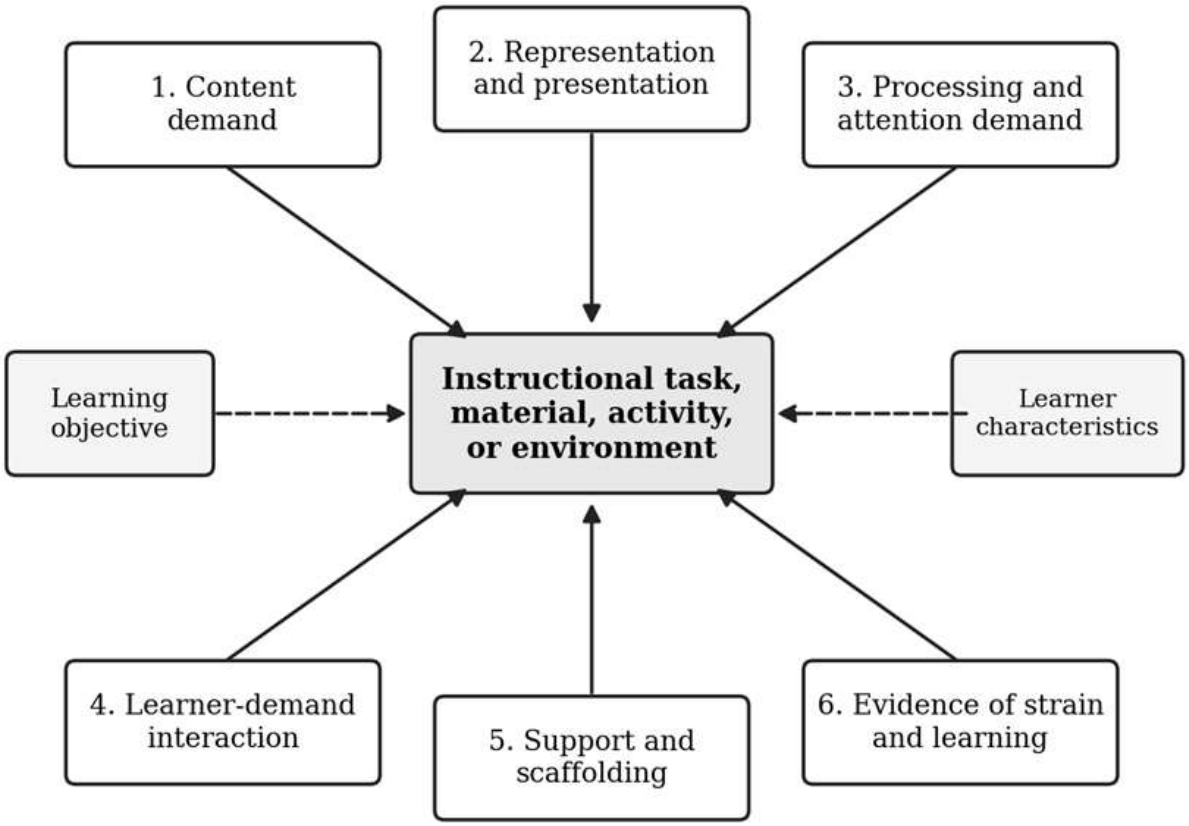


Table 2

The Six Audit Domains

Domain	Guiding question	Risk to detect	Usual response
1. Content demand	How many elements must the learner process together to meet the objective?	Interactivity exceeds what the learner can hold given current knowledge.	Sequence content, pre-teach components, use part-task practice.
2. Representation and presentation	Does the form of the material add demands unrelated to the objective?	Split attention, redundancy, irrelevant material, or an inaccessible channel.	Integrate, remove, restructure, or change the channel.

Domain	Guiding question	Risk to detect	Usual response
3. Processing and attention demand	What language, attention, motor, and executive processing does the task require, and at what pace?	Concurrent demands from reading, writing, switching, or time pressure compete with the learning goal.	Separate components, change the response mode, slow the pace.
4. Learner-demand interaction	For this learner, which demands are likely to be heavier or lighter than assumed?	Overload where access or knowledge is limited; underload where capacity goes unused.	Adjust the demand to the learner; keep or raise challenge where load is low.
5. Support and scaffolding	Does each support lower an unnecessary demand, and does it add one?	Supports that duplicate information, need learning themselves, or outlast the need.	Simplify, fade, or replace the support.
6. Evidence of strain and learning	What do the learner's responses suggest about demand and learning?	Misreading behavior or relying on a single indicator.	Combine indicators and re-audit.

5.1. Content Demand

The guiding question is how many elements the learner must process together to meet the objective. This domain is the intrinsic side of the task. It requires the auditor to separate what the objective requires from what the task happens to contain. A multi-step word problem aimed at teaching a procedure for fractions contains fraction elements, but it also contains reading, unit conversion, and a story. Only the first belongs to the objective. The auditor lists the elements and notes which interact, following the element interactivity account (Chen et al., 2023; Sweller, 2010). The domain asks the auditor to judge complexity against the learner's current knowledge, because the same task has different interactivity for a novice and for a learner with a well-formed schema (Sweller, 2024). Typical responses are sequencing, teaching components before the whole task, and part-task practice.

5.2. Representation and Presentation

The guiding question is whether the form of the material adds demands unrelated to the objective. This is the extraneous side of the task. The auditor checks for split attention (Chandler & Sweller, 1992), duplicated information across channels (Kalyuga & Sweller, 2014), irrelevant

material, missing signals for what matters, and segments that cut across natural units (Mayer & Moreno, 2003). The special education addition is access. A well-integrated page is still a heavy demand if the learner cannot see it comfortably, and a well-narrated video is still a heavy demand if the learner cannot hear it clearly. The domain therefore asks both whether the presentation is well designed and whether the learner can reach the channel it uses.

5.3. Processing and Attention Demand

The guiding question is what the task requires the learner to do while learning, and at what pace. A task can carry a light content load and still ask for fast reading, handwriting, switching between sources, inhibiting a distraction, planning several steps, or answering under time pressure. These processes compete for the same limited resources as the learning goal. A learner who must spend effort forming letters has less left for deciding what to write. The domain draws attention to language demands, motor output, executive demands, transient information such as spoken instructions that disappear once said, and the speed at which the task proceeds. Typical responses are separating components, changing the response mode, and slowing the pace.

5.4. Learner-Demand Interaction

The guiding question is which demands are likely to be heavier or lighter for this learner than the task designer assumed. This domain carries the special education contribution. The auditor draws on available information about the learner's knowledge, language, sensory access, attention, memory, motor control, communication, and use of assistive technology, and asks where a demand and a learner characteristic are likely to meet. The question runs in two directions. A demand may be heavier than assumed, for example when a learner's reading speed leaves little capacity for comprehension. It may also be lighter than assumed, in which case the task may leave capacity unused and the learner under-challenged. Because the evidence on perceptual load in ADHD and autism does not point one way (Forster et al., 2013; Remington et al., 2012), the domain records interactions as hypotheses to be checked against learner responses, not as conclusions. The domain does not infer a deficit from a label.

5.5. Support and Scaffolding

The guiding question is whether each support lowers an unnecessary demand, and whether it adds one. Supports are part of the task. A graphic organizer, a picture schedule, a sentence frame, an assistive device, and a teacher prompt all need to be perceived, understood, and used, and each draws on working memory. A support can duplicate information already on the page,

require learning before it helps, or stay in place after the learner no longer needs it, in which case expertise reversal applies (Kalyuga et al., 2012; Tetzlaff et al., 2025). The domain asks the auditor to treat supports as demands to be classified like any others, and to set a plan for fading where fading is appropriate (Renkl & Atkinson, 2010; van de Pol et al., 2010).

5.6 Evidence of Strain and Learning

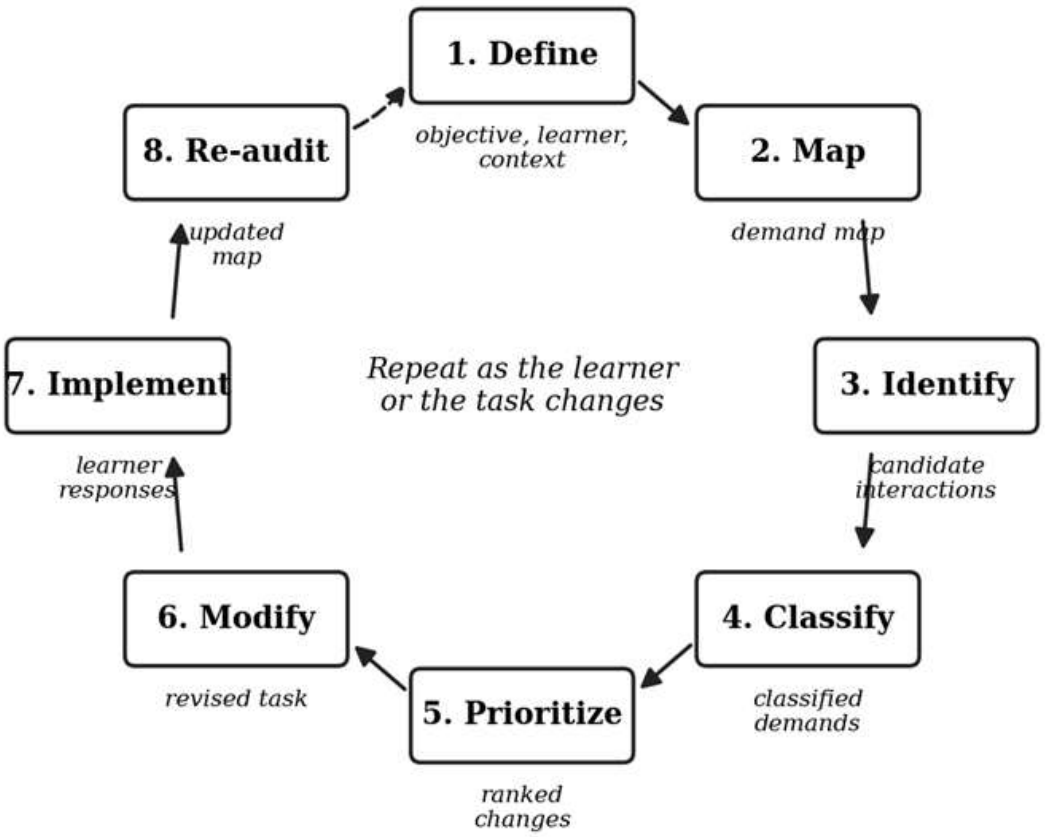
The guiding question is what the learner's responses suggest about whether the demands were manageable and productive. The auditor looks at accuracy, errors, time taken, requests for help, breakdowns at particular steps, avoidance, and the learner's own report where the learner can give one. Rating instruments exist that separate intrinsic, extraneous, and germane load (Klepsch et al., 2017; Leppink et al., 2013), and a meta-analysis found that subjective load questionnaires generally show acceptable reliability in multimedia learning research (Krieglstein et al., 2022). Behavior cannot be translated into load in a one-to-one way, however; Paas et al. (2003) made the case that load must be measured with care because it is not directly observable. The domain therefore asks the auditor to combine several indicators, to treat them as evidence about the audit's hypotheses, and to resist a conclusion from any one sign. Its output feeds the re-audit.

6. The Audit Procedure

The procedure has eight stages, shown in Figure 2: define, map, identify, classify, prioritize, modify, implement, and re-audit. Each stage produces a specific piece of information, so the audit leaves a record that another teacher or a researcher could read.

Figure 2

The Eight-Stage Audit Cycle



The first stage, define, fixes the objective, the learner or learner group, the setting, and the criterion for success. Everything later depends on it, because whether a demand is necessary is set by the objective. A passage read aloud to teach comprehension and the same passage read silently to teach fluency have different audit results. The output is a short statement of objective, learner information, and context.

The second stage, map, lists every demand the task contains. The auditor walks through the task as the learner would, step by step, and records elements, language, channels, response modes, pace, and supports. The output is a demand map. It is intentionally wide at this point and does not yet judge any item.

The third stage, identify, flags the demands that may interact with learner characteristics, using the six domains as prompts. The output is a list of candidate interactions, each stated as a

hypothesis, such as "the glossary at the end of the passage may force this learner to search while holding the sentence in mind."

The fourth stage, classify, sorts each demand against the objective. A demand is necessary when the objective cannot be met without it, and incidental or imposed when it comes from the way the task was built. Supports are classified too, as lowering a demand, adding one, or both. The output is a classified demand map.

The fifth stage, prioritize, ranks flagged demands by the likely size of their effect on the learner, how often the learner meets them, and how easily they can be changed. A teacher cannot redesign everything, and a short ranked list is more usable than a long exhaustive one. The output is an ordered list of changes to consider.

The sixth stage, modify, applies the decision rules described in the next section to each prioritized demand. Options include removing, relocating, integrating, segmenting, resequencing, changing the channel or response mode, pre-teaching a component, adding or fading a support, and, where load is too low, retaining or raising the challenge. The output is a revised task with a note of what was changed and why.

The seventh stage, implement, puts the revised task in front of learners. The auditor sets in advance what to watch for, drawing on the sixth domain, so that the response can be read against the hypotheses.

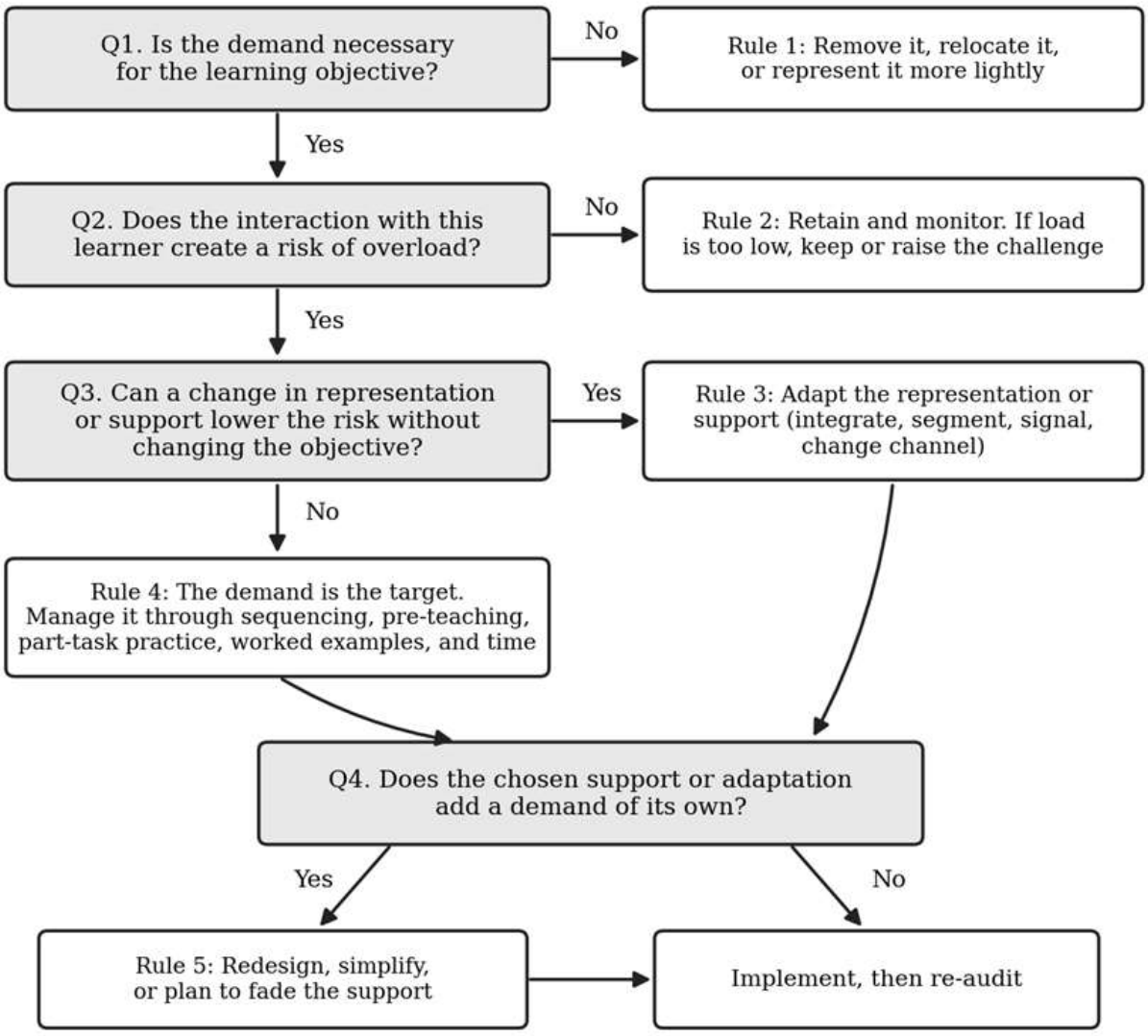
The eighth stage, re-audit, returns to the map with the learner's responses in hand. Strain at a step may show that a demand was misclassified, that a support has become a burden, or that the learner now knows enough to need less help. Re-audit is what makes the procedure a cycle. A teacher who completes the first seven stages once has a reasoned adaptation. A teacher who repeats the audit has a way to keep the adaptation matched to a learner who is changing.

7. Decision Rules

Analysis does not change instruction until it leads to a decision. The framework uses a short set of rules that connect the classification of a demand to an action. Figure 3 shows the pathway.

Figure 3

Decision Pathway for a Single Demand



The first question is whether the demand is necessary for the objective. If it is not, the first rule applies: remove it, or move it out of the task. Where it cannot be removed, as when a math problem must be written in words, the demand should be represented in a lighter form, for example by simplifying the language or by providing the text in an accessible format.

If the demand is necessary, the second question is whether its interaction with the learner's characteristics creates a risk of overload. If no risk is found, the second rule applies: retain the demand and monitor it. The auditor also checks here for the opposite problem. If the learner has

spare capacity and the task is easy, the demand should be retained or increased so that the learner stays challenged.

If a necessary demand does create risk, the third question is whether a change in representation or support can reduce the risk without altering the objective. When it can, the third rule applies: adapt the representation or support, for example by integrating sources, segmenting, signaling, or changing the channel. When it cannot, because the demand is the learning target itself, the fourth rule applies: manage the demand through sequencing, pre-teaching, part-task practice, worked examples, and more time, and consider whether the objective is set at the right size for the learner at this point. The target is not removed, since removing it would remove the lesson.

Before any support is adopted, the fifth rule asks whether the support adds a demand of its own. If it does, the support is redesigned, simplified, or planned for fading. This rule exists because supports are the most common source of unexamined load in adapted lessons.

The rules do not produce answers mechanically. The classification of a demand as necessary or incidental depends on a judgment about the objective, and the judgment about risk depends on what the teacher knows about the learner. The rules make those judgments explicit and in a fixed order, so that they can be reviewed, disagreed with, and revised at the next audit.

8. Illustrative Applications across Disabilities

The four examples below are theoretical illustrations. They show how the same audit logic can lead to different findings in different learner contexts, and they are not empirical evidence that the audit works. The cited studies bear on the demands discussed in each example, not on the audit itself. Table 3 summarizes the four.

8.1. Dyslexia

A teacher gives a student a 600-word social studies passage followed by short written answers, with a glossary at the end. The objective is to explain the causes of a historical event. In the audit, decoding is not part of the objective, yet it consumes working memory, and text presentation can raise or lower decoding demands depending on sentence structure, layout, and the amount of information to be processed at once (Tricot et al., 2020). The glossary at the end creates a search task. Written answers add a motor and spelling demand. Whether decoding is classified as incidental depends on the objective: if the lesson is about comprehension, it may be treated as incidental and the learner's access to the content can be supported through, for example, segmenting the passage and placing definitions next to the terms. If the lesson includes

decoding practice, it stays as a necessary demand. Since the effects of load can differ between linguistic and perceptual forms of dyslexia (Doroh et al., 2026), the auditor records which kind of difficulty the learner actually shows before choosing a response.

8.2. ADHD

A student works through an online fractions worksheet with animated characters, sound effects, and a countdown timer. The objective is to add fractions with unlike denominators. Neurodivergent students, and particularly those with ADHD, have reported higher perceived extraneous load in online learning (Le Cunff et al., 2024), which suggests that the timer and animations are candidates for removal. The laboratory findings complicate a simple answer, since raising perceptual load reduced distraction in adults with ADHD (Forster et al., 2013) and cognitive and perceptual load had opposite effects on brain network efficiency (Fisher et al., 2023). The audit therefore separates decorative stimulation, which has no link to the objective, from task-relevant visual structure, which may help the learner stay on task. It removes the timer and the decorative animation first, keeps the structured layout, and uses the re-audit to see whether attention improved.

8.3. Intellectual Disability

A teacher runs an open-ended inquiry activity in which students plan a test of which objects float, carry it out, and report. Lee and So (2015) examined inquiry learning with students with intellectual disability and emphasized the teacher's role in actively managing cognitive load, since unmanaged inquiry can generate more element interactivity than students can process. In the audit, the number of variables is the main content demand, planning and recording are processing demands, and picture cards are a support whose own demands need checking. The audit retains the inquiry, because it is the objective, and modifies the way it is carried out: one variable at a time, a worked example of one trial, and fading of the example as students take over. The cards are checked to see whether students can use them without a prompt.

8.4. Hearing Impairment

A class watches a narrated video about the water cycle with captions off, then holds a group discussion. The objective is to describe the stages of the cycle. The audit notes that listening takes effort when hearing is reduced (Pichora-Fuller et al., 2016; Zekveld et al., 2011), so for a learner with hearing loss the narration may use capacity that the content needs. The discussion adds fast turn-taking and transient spoken information. Responses include integrating captions or

a script with the visuals, controlling background noise, allowing the video to be paused, and giving a written summary of discussion points. Captions can duplicate narration for a learner with good access (Kalyuga & Sweller, 2014), so the auditor checks each learner's access before deciding. Differences in auditory experience also relate to language skills (McCreery & Walker, 2022), which is a reason to treat each learner's access as an individual question.

Table 3

Illustrative Applications of the Audit

Disability context	Instructional demand	Potential risk	Audit response
Dyslexia	A 600-word passage, a glossary at the end, and written answers.	Decoding and searching use capacity the comprehension objective needs.	Segment the passage, place definitions beside terms, classify decoding by the objective, and record the type of difficulty shown.
ADHD	An online fractions worksheet with animation, sound, and a timer.	Decorative stimulation and time pressure add extraneous load; the effect of perceptual load may differ by learner.	Remove the timer and decorative animation, keep task-relevant structure, and check attention at re-audit.
Intellectual disability	An open-ended inquiry on floating and sinking.	Many variables and open planning may exceed processing capacity.	Vary one variable at a time, use a worked example of one trial and then fade it, and check the picture cards.
Hearing impairment	A narrated video with captions off, then a group discussion.	Listening effort uses capacity the content needs; speech is transient.	Integrate captions or a script, control noise, allow pausing, give a written summary, and check each learner’s access.

9. Theoretical Propositions

Six propositions follow from the framework. They are statements to be tested, not findings. Table 4 gives the rationale and expected implication of each.

Proposition 1 states that instructional tasks contain multiple cognitive demands, and not all of them are necessary for the intended learning objective. Proposition 2 states that the functional

cognitive burden of a demand varies with learner characteristics and prior knowledge. Proposition 3 extends the second to disability: disability-related characteristics may alter the cognitive consequences of otherwise equivalent instructional demands. Proposition 4 states that demands unrelated to the objective should be minimized when they use limited cognitive resources unnecessarily. Proposition 5 states that scaffolding should be calibrated to reduce unnecessary demands while preserving the processing that learning requires. Proposition 6 states that auditing should be iterative, because learner performance and instructional conditions change what later instructional decisions should be.

Propositions 1, 2, and 4 follow directly from the CLT constructs described earlier. Proposition 3 is the one most specific to special education and the one with the least direct evidence, since the available studies are mostly from single categories and use different measures. Proposition 5 draws on the expertise reversal literature and on the distinction between scaffolding and load management. Proposition 6 follows from the relational principle: if demand depends on the pairing of task and learner, and the learner changes, the audit must be repeated.

Table 4

Theoretical Propositions of the Cognitive Load Audit

Proposition	**Rationale**	**Expected implication**
1. Instructional tasks contain multiple cognitive demands, and not all are necessary for the intended learning objective.	Separating what the objective requires from what the task design adds follows from the intrinsic and extraneous distinction (Sweller, 2010).	Auditors should find incidental demands in most tasks.
2. The functional burden of a demand varies with learner characteristics and prior knowledge.	What counts as an element depends on learner schemas (Kalyuga et al., 2012; Sweller, 2024).	The same task should yield different audit results for different learners.
3. Disability-related characteristics may alter the cognitive consequences of otherwise equivalent demands.	Differences in access, processing, and attention change how a demand is experienced (Pichora-Fuller et al., 2016; Tricot et al., 2020).	Audit findings should differ across disability contexts. This proposition has the least direct evidence.

Proposition	Rationale	Expected implication
4. Demands unrelated to the objective should be minimized when they use limited resources unnecessarily.	Extraneous load does not contribute to learning (Klepsch & Seufert, 2020).	Removing incidental demands should lower rated extraneous load.
5. Scaffolding should be calibrated to reduce unnecessary demands while preserving the processing that learning requires.	Supports can add load or become unnecessary as expertise grows (Kalyuga et al., 2012; Tetzlaff et al., 2025).	Calibrated and faded support should do better than fixed support.
6. Auditing should be iterative, because learner performance and conditions change later decisions.	Demand depends on the pairing of task and learner, and learners change.	Repeated audits should keep adaptations matched to the learner better than a one-time adaptation.

10. Relationship to Existing Frameworks

Several frameworks already guide instruction for learners with disabilities. This section distinguishes the CLA from five of them, and from the author's earlier frameworks, and then considers earlier uses of the term "cognitive load audit." The distinction is the same in each case. The established frameworks mainly provide principles for how instruction should be provided. The CLA provides a procedure for examining the cognitive demands embedded in that provision. Universal Design for Learning (UDL) asks designers to offer multiple means of engagement, representation, and action and expression (CAST, 2018). A meta-analysis of UDL studies is available (Capp, 2017), and a systematic review has identified challenges in implementing it (Zhang et al., 2024). UDL does not say how to check whether a particular option adds or removes cognitive demand. Offering several formats at once can add to redundancy and split attention, so the CLA can be used to check UDL options. Explicit instruction, with its modeling, guided practice, and gradual release of responsibility (Archer & Hughes, 2011; Hughes et al., 2017), describes how to teach. The CLA examines the demands inside each of those teaching moves. Differentiated instruction adjusts content, process, and product to learner readiness (Ouyang & Ye, 2023); the CLA asks what each adjustment does to cognitive demand. Response to intervention and multi-tiered systems of support (Fuchs & Fuchs, 2017) decide which learners receive which intensity of instruction, and the CLA can be applied to the instruction delivered at any tier. Scaffolding, as noted, comes from a separate tradition (Puntambekar, 2021; van de Pol

et al., 2010), and a teacher can scaffold a task without changing its element interactivity (Hussain, 2026b).

The author's earlier frameworks differ in scope. The phase-based framework (Hussain, 2025b) is a design model for learning disabilities with an audit checkpoint inside each of three phases. The Script Complexity Load framework (Hussain, 2026a) describes how features of the Urdu script add load to literacy instruction, and the Compounded Cognitive Vulnerability framework (Hussain, n.d.) describes how script-related load and a learning-disability-related processing weakness can draw on the same working memory resource. The CLA is not a revision of any of these. It treats the audit as a standalone procedure and applies across special education. The earlier frameworks can be read as domain-specific content for it: script load as a source of content and processing demand in Urdu literacy tasks, and compounded vulnerability as one pattern of learner-demand interaction.

The phrase "cognitive load audit" has been used before in other contexts. A targeted search found it in practitioner settings and in one evaluation process in higher education. A conference presentation on autistic learners described a five-lens cognitive load audit for mapping invisible demands in the learning environment (Lee, 2026), and a preparatory-materials evaluation process in medical education combined brief load ratings with iterative revision of materials (Ahmad et al., 2026). These uses show that the idea has appeal. As far as the targeted search showed, none derives its dimensions from CLT constructs for special education as a whole, states decision rules, or sets out a validation pathway. The search was targeted and not systematic, so this statement is limited accordingly.

11. Research Agenda and Validation

The CLA is theoretically proposed and has not been empirically validated. Calling it a validated audit tool would require evidence at five levels, and the order below is deliberate, since each level depends on the one before it.

The first level is content validation. Panels of special educators, educational psychologists, and CLT researchers would rate the six domains, guiding questions, and decision rules for relevance, clarity, and completeness. The panels should also ask whether the domains do more than restate general instructional-design principles, which is the main threat to the framework's claim to a separate contribution.

The second level is inter-rater reliability. Independent raters would audit the same tasks for the same learners, and agreement would be examined at each stage that depends on judgment, mainly demand identification, classification, and prioritization. Low agreement at the classification stage would show that "necessary" needs a more precise operational definition.

The third level is usability. Teachers would use the audit on their own materials, and researchers would record time cost, training needed, and the points where teachers abandon or distort the procedure. Because CLT is often applied only as background justification (Duran et al., 2022), usability work should check whether teachers apply the constructs or only borrow the vocabulary.

The fourth level is experimental validation. Audit-guided modification of tasks would be compared with usual adaptation, with outcomes that include learning, transfer, and ratings of intrinsic, extraneous, and germane load (Klepsch et al., 2017; Leppink et al., 2013). Randomized pre-post comparisons of the kind used in earlier work on cognitive load management with students with learning disabilities (Hussain, 2025a) are one possible design. A study would also need to test whether the learner-demand interaction domain adds anything beyond the other five.

The fifth level is disability-specific validation. The audit's classification rules and the instruments used to evaluate it may need adjustment for each category, since most load questionnaires were developed in general-education samples (Krieglstein et al., 2022). Categories with thinner CLT evidence, and categories where load tolerance matters more than load reduction, should be treated with extra caution.

12. Limitations

The framework is theoretical and invalidated, and its propositions are untested. The audit also depends on a judgment that cannot be fully checked: cognitive load cannot be read directly from classroom behavior, so the sixth domain supports inference and not measurement (Paas et al., 2003). Teachers' judgments are likely to vary, particularly in classifying a demand as necessary, and the amount of variation is unknown. Learner heterogeneity limits how far any audit result for one learner can be carried to another, and domain-specific adaptation, as in Urdu literacy or mathematics, will be needed. Several illustrations rest on studies of adults or of single categories, so they show the logic of the audit and do not support claims about school-age populations. The six domains also overlap with established instructional-design principles, and the case for the framework rests on the procedure, the decision rules, and the learner-demand domain, not on the

principles themselves. Finally, effective use probably requires some familiarity with CLT, and teachers without it will need training that the paper does not specify.

13. Conclusion

Special education involves adapting instruction, and it also requires checking the demands that an adapted lesson creates. This paper proposed the Cognitive Load Audit as a way to do that checking: six domains for examining a task, an eight-stage cycle from definition to re-audit, and five decision rules that connect the classification of a demand to a change in instruction. The framework rests on the claim that cognitive demand is relational, so that a demand's effect depends on the pairing of task and learner, and on the related claim that not all load should be reduced. Its value now depends on whether content validation, reliability testing, and classroom studies bear out the propositions. Until they do, it should be read as a structured hypothesis about how teachers can examine the lessons they already teach.

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