Lesson Planning for Evidence-Based Teaching: Bridging Learning Theory and Instructional Design

Luke Odiemo

Department of Psychology, University of Nairobi, Kenya

**Corresponding author: luke.odiemo@uonbi.ac.ke*

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Abstract

Effective lesson planning is a core professional practice in teaching, yet many educators struggle to move beyond procedural completion of templates toward evidence-based alignment of learning outcomes, activities, and assessments. This paper synthesises insights from the philosophy of education, instructional design theory, cognitive psychology, and formative assessment research to propose a principled framework for lesson planning. Drawing on the concept of teaching as purposeful interaction and the distinction between visible instructional structures and deep learning processes, the paper argues that alignment must operate at multiple levels: outcome-ability congruence using contemporary cognitive taxonomies, outcome-activity correspondence grounded in cognitive load theory and multimodal learning principles, and outcome-assessment consistency through embedded formative practices. The paper refines earlier oversimplifications regarding sensory modality use, drawing on multisensory learning research to advocate strategic alternation rather than rigid exclusion of modalities. Implications for teacher education include the need to develop deep pedagogical reasoning rather than procedural compliance, while future research should investigate how novice teachers acquire alignment competence across different subject areas and digital learning environments. The paper concludes that when lesson planning is treated as a testable hypothesis rather than a fixed script, it becomes a powerful vehicle for cumulative professional growth.

Keywords: Lesson Planning, Instructional Design, Constructive Alignment, Cognitive Load Theory, Multimodal Learning, Formative Assessment, Teacher Education, Bloom's Taxonomy

Introduction

Effective lesson planning enables teachers to engage learners systematically in experiences that promote meaningful learning. A well-crafted lesson plan ensures that students learn effectively by outlining clear objectives, selecting appropriate teaching methods, gathering resources, and planning assessments. Although these components may seem straightforward theoretically, their actualisation in practice remains challenging for many teachers. This observation prompted Gudmundsdóttir and Shulman (1987) to argue that a teacher could claim to have 30 years of experience yet merely possess one year of experience repeated 30 times. This paper aims to simplify the lesson planning process to help teachers achieve necessary professional growth. It explains the psychological learning principles underlying the construction of various components of the lesson plan, drawing on evidence-based teaching frameworks.

The Nature of Teaching

Teaching as a Purposeful Activity

Drawing on the concept-analytical approach of post-war Anglo-Saxon philosophy of education (Fenstermacher, 1986; Hirst, 1971, 1997), teaching, like other human activities, is a purposeful activity. Its defining purpose is the promotion of learning. Learning may be broadly defined as gaining a capability, power (such as knowledge), or disposition as a result of action or experience (Tomlinson, 2014). In formal or explicit education, teaching involves engaging learners in a process—activities and experiences over time—intended to result in their gaining particular capabilities or dispositions.

This analysis shows that teaching is a purposeful interaction involving the following components: (a) a teacher, (b) one or more learners, (c) an intended learning outcome, (d) an interactive learning/teaching process or activity, (e) a context, and (f) resources utilised. Because these elements interact, each can influence outcomes, alone or in combination (Ko & Sammons, 2016). For example, the adaptive teaching movement stemming from the 1970s emphasised that learners vary in qualities relevant to learning, so different teaching strategies may be required to adapt to their needs (Corno & Snow, 1986; Cronbach & Snow, 1977; Glaser, 1977; Hunt & Sullivan, 1974). Contemporary research on adaptive teaching has extended this principle through digital learning environments that use real-time data to personalise instruction (Aleven et al., 2017; Walkington & Bernacki, 2020).

Pedagogical Content Knowledge

Similarly, Shulman (1986) and Gudmundsdóttir and Shulman (1987) pointed out that learning goals always involve particular content—teaching is always "teaching someone something"—so teachers need not only general insights into how learners learn but also into the nature of the content and specific issues involved in its acquisition, termed *pedagogical content knowledge* (PCK). Since Shulman's original formulation, PCK has been elaborated and empirically investigated across multiple subject domains. For instance, Park and Oliver (2008) proposed a pentagonal model of PCK comprising five components: orientation to teaching science, knowledge of curriculum, knowledge of students' understanding of science, knowledge of assessment, and knowledge of instructional strategies. More recently, Carlson et al. (2019) have refined PCK as a knowledge base that integrates content and pedagogy uniquely for each topic, emphasising that expert teachers possess not just more knowledge but qualitatively different, more connected knowledge structures.

This interactive and specific nature of teaching has been further emphasised by the situated learning perspective (Brown et al., 1989). Situated learning theory posits that knowledge is not a static entity to be transmitted but emerges from authentic activity, context, and culture (Lave & Wenger, 1991). Lesson planning is an example of a skill that can be effectively acquired through situated learning when novices engage in collaborative planning with mentors within authentic school contexts (Darling-Hammond et al., 2017).

Teaching as a Wicked Problem

Beyond these foundational analyses, contemporary scholars have characterised teaching as a "wicked problem" (Rittel & Webber, 1973, as cited in Kennedy, 2016)—a complex, ill-structured problem with no definitive solution and multiple competing values. Unlike well-defined problems in engineering or medicine, teaching problems resist simple algorithmic solutions because each classroom situation involves unique constellations of learner characteristics, content demands, institutional constraints, and temporal pressures (Biesta, 2015). This framing has profound implications for lesson planning: rather than seeking a single optimal plan, teachers must develop adaptive expertise—the ability to flexibly apply principles across varied contexts while continuously learning from experience (Hatano & Inagaki, 1986; Schwarz et al., 2017).

Instructional Design Theory

Historical Emergency and Core Definitions

Ideas linking theory and research to practical teaching often remained at the level of assumptions or emerged in response to reflective issues within meta-theoretical debates (Lowyck & Elen, 1996). However, in the post-Second World War period, a more systematic, scientific approach to theory-informed practice emerged as a coherent movement under the label of instructional design (Gagné et al., 1988; Merrill, 1976, 1980; Reigeluth, 1996; Scandura, 1973). Richey (1986) defined instructional design as:

…the science of creating detailed specifications for the development, evaluation and maintenance of situations to facilitate the learning of both large and small units of subject matter (p. 9).

The instructional design approach conceptualises education as an applied science—specifically a decision-oriented or prescriptive engineering science—whose main purpose is to achieve practical educational ends efficiently. Thus, a systematic, goal-oriented, and pragmatic approach is advocated (Richey, 1986). The approach makes considerable use of systems theory, recognising that education comprises many interacting elements, with each element's effect depending largely on other elements of the system (Reigeluth, 1996).

System Levels in Instructional Design

For instance, Banathy (1991) recognised multiple levels in educational systems: (a) the learning-experience level, (b) the instructional system implementing those experiences, (c) the administrative system supporting instruction, and (d) the government system that owns, rules, and funds the enterprise. More recent systemsoriented models, such as the *Integrated Model of Instructional Design* (Smith & Ragan, 2005), distinguish between analysis, strategy, and evaluation phases, each containing multiple iterative sub-processes. Writers in this tradition use different expressions for decision-oriented activities at different system layers. The present writer's interest lies in what Reigeluth (1986) called the instructional level, specifically instructional design theory, which addresses decisions about how to teach chosen educational content.

Briggs (1977) described instructional design as the entire process of analysing learning needs and goals, developing a delivery system (including instructional materials and activities), trying them out, and revising materials and assessment activities. The writer's specific interest here is the use of learning theory within instructional and instructional design theory levels. Contemporary instructional design models, such as the *Understanding by Design* framework (Wiggins & McTighe, 2005), explicitly prioritise "backward design"—starting with desired learning outcomes before planning activities or assessments—a principle directly relevant to lesson planning.

Issues Concerning Instructional Design Ideas

Behaviourist Legacy

Modern proponents of instructional design, such as Reigeluth (1996), explicitly deny that descriptive (learning) theory must precede prescriptive (instructional design) theory but acknowledge that instructional design theory "is closely related to learning theory" (p. 716). Reigeluth contended that this movement is open to varying perspectives, including constructivism. However, Lowyck and Elen (1996) noted that the instructional design movement emerged during behaviourism's heyday, originally associated with radical behaviourism (Skinner, 1968) and subsequently with neo-behaviourist theories (Gagné, 1965). Both stressed the analysis of learning and instruction into basic components as grounds for the rational construction of learning behaviour sequences.

The positivist assumptions (Phillips & Burbules, 2000) of this approach, together with its pragmatic orientation, attracted it to technology, initially Skinnerian teaching machines and later computers. Contemporary behaviourist influences persist in competency-based education, mastery learning models, and the widespread use of learning objectives framed as observable behaviours (Guskey, 2018). However, critics argue that such approaches risk reducing teaching to technical delivery rather than professional judgement (Biesta, 2015).

The Cognitive Shift and Its Consequences

Lowyck and Elen (1996) also pointed out that behaviourist learning research already amounted virtually to research on instruction, given that its paradigm comprised externally observable elements. The subsequent cognitive shift raised doubts about such clearcutness and efficacy, even for simple learning, revealing the importance of learners' interpretations and the relative lack of insight into complex forms of learning such as expertise acquisition. Cognitive load theory (Sweller, 1988, 2016), emerging from this cognitive revolution, has become one of the most influential frameworks for instructional design, providing specific, empirically testable principles for managing the limited capacity of working memory during learning (Sweller et al., 2019).

Reigeluth (1996) recognised that behaviourist theories were adequate only for simpler learning types but contended that instructional design researchers have progressed to a more holistic, synthesising approach open to non-behaviourist ideas such as constructivism. Nevertheless, Lowyck and Elen (1996) held that instructional design still does not solve the description–prescription problem, and the cognitive-constructivist shift has loosened the relationship between educational psychology and instructional design. More recently, scholars have proposed *design-based research* as a methodology that integrates theory development with practical design, potentially bridging this gap (McKenney & Reeves, 2019).

Choreographies of Teaching

Oser and Baeriswyl (2001) offered a particularly relevant perspective. They welcomed the precision and inclusiveness of instructional design, especially Reigeluth's distinction between instructional design theory and learning theory, as well as the focus on sequencing and synthesising instruction. However, they argued that adequate didactics requires understanding not only the distinction between learning and teaching but also how these are linked. At the core of Oser and Baeriswyl's (2001) model of *choreographies of teaching* is the distinction between the visible "sight-structure" of teaching activities and the inner learning processes or mental operations of the learner—what Tomlinson (2014) called the *deep structure* of teaching.

The persistent challenge in lesson planning is how to design plans in which the visible structure is informed by knowledge of inner learning processes. Oser and Baeriswyl identified several prototypical choreographies (e.g., the lecturing choreography, the problem-solving choreography, the project-based choreography), each with different patterns of visible activities and corresponding demands on learners' cognitive processes. Effective lesson planning, on this view, requires not merely selecting activities but choreographing them in sequences that align with how learners actually construct understanding.

Contemporary Extensions and Debates

Cognitive Load Theory and Lesson Planning

Since Oser and Baeriswyl's (2001) contribution, cognitive load theory (CLT) has provided increasingly specific guidance for lesson planning. CLT distinguishes between three types of cognitive load: intrinsic (inherent to the content's complexity), extraneous (caused by poor instructional design), and germane (devoted to schema construction and automation) (Sweller et al., 2019). Lesson planning informed by CLT would therefore: (a) sequence content from simple to complex elements to manage intrinsic load; (b) eliminate unnecessary information, redundant formats, and split-attention effects to reduce extraneous load; and (c) include worked examples, completion tasks, and practice opportunities to promote germane load (Clark et al., 2012).

Recent meta-analyses have confirmed that CLT-aligned instructional designs produce moderate to large effects on learning outcomes, particularly for novice learners and complex content (Sweller et al., 2019). However, critics note that CLT has been developed primarily in well-structured domains (e.g., mathematics, science) and may require adaptation for ill-structured domains such as history or literary interpretation (Kalyuga, 2015).

Constructivist and Sociocultural Alternatives

Constructivist perspectives, emphasising learners' active construction of knowledge through authentic tasks, have offered alternative design principles. Jonassen (1999) proposed that constructivist learning environments should provide: (a) problem or project space, (b) related cases, (c) information resources, (d) cognitive tools, (e) conversation and collaboration tools, and (f) social and contextual support. While constructivist designs often de-emphasise pre-specified objectives in favour of emergent outcomes, recent integrations have sought to reconcile constructivist, and direct instruction approaches through the concept of *guided* discovery (Mayer, 2021) or productive failure (Kapur, 2016).

Sociocultural theories, rooted in Vygotsky's (1978) work, emphasise the role of social interaction, cultural tools, and the zone of proximal development (ZPD) in learning. From this perspective, lesson planning involves designing not just individual cognitive tasks but social structures (e.g., pair work, small groups, whole-class discussion) that enable more capable peers or teachers to scaffold learning within learners' ZPD (Daniels, 2016). The challenge for lesson planning is to anticipate where different learners' ZPDs lie and to design flexible scaffolds that can be adjusted during the lesson—a demand that favours adaptive expertise over rigid scripted plans.

Alignment as a Core Principle

Across these theoretical perspectives, the principle of *alignment* has emerged as a central concern in lesson planning. Biggs (1996, 2014) articulated the concept of *constructive alignment*, which integrates constructivist theories of learning with aligned curriculum design. In constructive alignment, teachers first specify intended learning outcomes using verbs that denote appropriate levels of cognitive operation (e.g., from Anderson & Krathwohl's [2001] revised taxonomy). They then design teaching activities that directly engage learners in those cognitive operations, and finally design assessment tasks that require learners to demonstrate those same operations. Misalignment—for instance, teaching through memorisation but assessing through analysis—undermines both learning and valid assessment.

Empirical research supports alignment's importance. Studies of curriculum mapping and assessment design consistently find that alignment between objectives, instruction, and assessment predicts student achievement (Kurz et al., 2010; Polikoff, 2015). However, achieving alignment in practice remains difficult due to constraints such as standardised testing, pacing pressures, and limited planning time (Wiliam, 2018).

Summary of the Literature

In summary, the literature on lesson planning for evidence-based teaching draws on multiple, partially overlapping traditions. The philosophy of education establishes teaching as a purposeful activity aimed at promoting learning, involving interacting components of teacher, learner, outcome, process, context, and resources. Instructional design theory provides systematic, prescriptive frameworks for designing effective learning experiences, though it has been critiqued for behaviourist origins and for the gap between descriptive learning theories and prescriptive design principles. Cognitive load theory, constructivism, and sociocultural theory offer different but potentially complementary lenses for understanding how learners process information, construct knowledge, and develop through social interaction. Across these traditions, alignment—particularly constructive alignment between outcomes, activities, and assessment—emerges as a core principle for effective lesson planning. The persistent challenge remains how to translate these principles into practical lesson plans that respect both the visible structure of teaching activities and the deep structure of learners' cognitive and social processes.

Teaching Activities in Selection and Alignment of Learning Outcomes

The Central Role of Learning Outcomes

A learning outcome constitutes the backbone of the entire teaching process. It defines what a student should be able to do by the end of a lesson and at what level of cognitive operation. Unlike traditional instructional objectives that often focused on teacher intentions (e.g., "The teacher will present..."), learning outcomes are student-centred, specifying demonstrable achievements (Kennedy, 2016). This shift from teaching-centred to learning-centred language reflects a broader movement in educational theory toward constructivist and student-active pedagogies (Biggs & Tang, 2011).

A misalignment between the intended outcome and the expected ability leads to a fundamental problem: the teacher may achieve the stated lesson objective without enabling learners to acquire the desired skills. For example, if a teacher desires learners to develop analytical skills but phrases the outcome in terms of stating or listing facts, learners will not become analytical by the lesson's end (Biggs & Tang, 2011). This phenomenon, sometimes called the *alignment trap*, occurs when surface compliance with outcome statements masks deep failures in learning design (Wiliam, 2018).

Learning is fundamentally a cognitive information-processing activity, whereas teaching involves facilitating learners' engagement in activities that trigger the intended cognitive processing (Mayer, 2021). Contemporary cognitive science has refined this understanding by distinguishing between *automatic* and *controlled* processing, as well as between *shallow* and *deep* processing (Craik & Lockhart, 1972; Schneider & Chein, 2016). Deep processing—involving elaboration, organisation, and connection to prior knowledge—produces more durable and transferable learning than shallow processing focused on surface features or rote repetition (Willoughby et al., 2020). Consequently, teachers have a duty to frame learning outcomes that not only match desired cognitive processing capabilities but also explicitly signal the depth of processing required.

Empirical research supports the importance of well-framed outcomes. A meta-analysis by Hattie (2012) found that providing clear learning intentions and success criteria has an effect size of $d = 0.68$, well above the average for educational interventions. More recent studies have confirmed that outcome specificity matters: overly broad outcomes (e.g., "understand the water cycle") produce less learning gain than outcomes specifying the cognitive operation and content (e.g., "explain the four stages of the water cycle using a diagram") (Marzano, 2017; Fisher & Frey, 2021).

Contemporary Frameworks for Cognitive Alignment

Bloom's original taxonomy of cognitive objectives (Bloom et al., 1956) has long guided the selection of appropriate cognitive verbs. However, a revised version by Anderson and Krathwohl (2001) offers a more dynamic, two-dimensional framework that distinguishes between *cognitive process dimensions* (remember, understand, apply, analyse, evaluate, create) and *knowledge dimensions* (factual, conceptual, procedural, metacognitive). This revision aligns more closely with contemporary understandings of learning as an active, constructive process (Krathwohl, 2002).

The two-dimensional structure of the revised taxonomy provides several advantages for lesson planning. First, it acknowledges that different types of knowledge require different instructional approaches. Factual knowledge (e.g., vocabulary, dates) may be adequately assessed through recall, whereas procedural knowledge (e.g., experimenting) requires demonstration, and metacognitive knowledge (e.g., selecting appropriate problem-solving strategies) requires reflection and justification (Anderson et al., 2014). Second, the taxonomy's matrix form allows teachers to plot outcomes at intersections of process and knowledge dimensions, creating more precise instructional targets (Marzano & Kendall, 2007).

Student-teachers during teaching practice frequently struggle to match outcomes with intended abilities. Drawing upon the revised taxonomy, however, it becomes easier to identify higher-order cognitive process verbs—such as *deconstruct*, *appraise*, *design*, or *critique*—that generate abilities like application, analysis, evaluation, and creation (Armstrong, 2016). Research on teacher education has found that explicit instruction in taxonomic frameworks significantly improves pre-service teachers' ability to write aligned outcomes (Krathwohl, 2016; Ulker, 2017). Nevertheless, even when teachers successfully align outcomes with intended abilities, they often experience difficulty selecting appropriate activities, which leads to the next consideration.

Beyond Bloom-based frameworks, other taxonomies offer complementary perspectives. The *SOLO taxonomy* (Structure of Observed Learning Outcomes; Biggs & Collis, 1982) distinguishes between *unistructural*, *multistructural*, *relational*, and *extended abstract* levels of understanding. Unlike Bloom's taxonomy, which classifies intended outcomes, SOLO focuses on observed responses, making it particularly useful for formative assessment and feedback (Hook & Mills, 2011). Similarly, Wiggins and McTighe's (2005) *six facets of understanding* (explanation, interpretation, application, perspective, empathy, self-knowledge) provide an alternative framework for designing outcomes that emphasise deep understanding rather than mere recall.

Influencing Learning: Alignment of Outcomes and Learning Activities

Teaching facilitates learners' engagement in activities that enable the development of intended cognitive processing skills. Two key principles guide the selection and alignment of activities. First, each learning outcome should be served by at least one corresponding learning activity within a lesson; thus, the number of outcomes partially determines the number of activities. Second, selected activities must *operationalise* the cognitive verb embedded in the outcome. If an outcome states that learners will be able to *analyse* something, yet the activity only requires listing facts, learners cannot acquire analytical capabilities (Hattie, 2012).

The principle of operationalisation has been elaborated in the *constructive alignment* framework (Biggs, 2014). Constructive alignment requires that teaching activities and assessment tasks be *directly derived from* the intended learning outcomes, such that the outcome verbs appear in both the activity design and the assessment criteria. For example, if an outcome requires learners to *evaluate* competing historical interpretations, the activity must involve learners engaging in evaluation (e.g., comparing sources, weighing evidence, justifying judgments), and the assessment must require demonstration of evaluation, not merely description or summary.

Empirical studies of constructive alignment have found positive effects on student learning outcomes, particularly in higher education settings (Wang et al., 2013; Lam & Tsui, 2016). However, implementation challenges are significant. Teachers report difficulty in designing activities that authentically embody higher-order cognitive verbs, especially for complex outcomes such as *create* or *critique* (Loughlin et al., 2021). This difficulty may stem from limited pedagogical content knowledge (Shulman, 1986) or from curriculum constraints that prioritise content coverage over cognitive depth (Wiliam, 2018).

Recent advances in learning sciences have identified specific design principles for activity–outcome alignment. For analysis outcomes, activities should involve *decomposition* (breaking material into constituent parts), *comparison* (identifying similarities and differences), and *relationship identification* (detecting causal or logical connections) (Pellegrino & Hilton, 2013). For evaluation outcomes, activities should involve *criteria specification*, *evidence weighing*, and *judgment justification* (Kuhn, 2016). For creation outcomes, activities should involve *idea generation*, *planning*, *production*, and *revision* (Beghetto & Kaufman, 2014). These design principles provide concrete guidance for teachers moving from outcome statements to activity selection.

Multimodality and Cognitive Load in Activity Selection

Multimodal learning theory, grounded in Mayer's (2021) cognitive theory of multimedia learning, posits that humans process information through separate auditory and visual channels. Each channel has a limited capacity at any given time. Learning is an active process in which learners select, organise, and integrate information from each channel to construct coherent mental representations (Mayer, 2017). This theory extends beyond traditional audio-visual media to encompass multiple sensory modalities, including tactile, kinesthetic, and even olfactory channels, though research on non-visual/auditory modalities remains less developed (Schneider et al., 2018).

To ensure effective cognitive processing, teachers should apply the following evidence-based principles (Mayer, 2021):

- *Coherence Principle:* Include only essential information; avoid extraneous material that causes cognitive overload. Research shows that extraneous graphics, sounds, or text reduce learning by consuming limited cognitive resources (Mayer & Fiorella, 2014).
- *Signalling Principle*: Highlight key points explicitly through cues such as headings, boldface, or vocal emphasis. Signalling reduces the learner's need to search for important information, freeing capacity for deeper processing (Schneider et al., 2018).
- *Redundancy Principle*: Avoid presenting identical information in multiple formats simultaneously (e.g., narration with on-screen text that duplicates speech). Redundant presentation can overwhelm the visual channel and cause split attention (Mayer, 2021). However, note that this principle applies to *identical* information; complementary information across modalities (e.g., diagram + narration) is beneficial (Kalyuga, 2015).

- *Spatial Contiguity Principle*: Present related words and pictures close together on the page or screen. Separating related information forces learners to search and mentally integrate, increasing extraneous load (Mayer, 2017).
- *Temporal Contiguity Principle*: Present corresponding words and pictures simultaneously rather than sequentially. Temporal separation requires learners to hold one representation in memory while processing the other, again increasing load (Mayer & Pilegard, 2014).
- *Personalisation Principle*: Use conversational language and intonation that resonate with learners to foster social presence and engagement. Personalisation promotes deeper processing by activating social responses that support meaning-making (Mayer, 2021).
- *Voice Principle*: Use a human voice rather than a machine voice for narration. Human voice enhances social presence and improves retention and transfer (Mayer, 2017).
- *Embodiment Principle:* Use on-screen agents that display human-like gestures, eye gaze, and facial expressions. Embodied pedagogical agents increase engagement and learning, particularly for younger learners (Fiorella & Mayer, 2016).

In essence, multimodal learning demands managing cognitive load while enforcing active processing so learners can understand and integrate information (Sweller, 2016). Cognitive load theory distinguishes three types of loads: *intrinsic* (complexity of content), *extraneous* (poor design), and *germane* (processing devoted to schema construction). Effective multimodal design minimises extraneous load, manages intrinsic load through sequencing and scaffolding, and promotes germane load through generative activities (Sweller et al., 2019).

Implications for Selecting Learning Activities

While the number of outcomes and the type of cognitive verbs dictate how many activities should be included, multimodality principles prescribe that activities be selected with sensory channels in mind. However, the earlier claim that "no two activities targeting the same sensory modality should appear in the same lesson plan" requires refinement. Contemporary research on *multisensory learning* (Shams & Seitz, 2008) indicates that combining congruent inputs across modalities (e.g., auditory + visual) can enhance learning, provided cognitive load is managed. For example, pairing a spoken explanation with a diagram produces better learning than either alone, because the two channels complement rather than compete (Mayer, 2021).

The more important principle is *variety and alternation* to prevent modality-specific fatigue and overloading, not the rigid exclusion of repeated modality uses within a lesson (Schneider et al., 2018). Research on sustained attention indicates that learners experience cognitive fatigue when engaged in prolonged same-modality processing, particularly for passive modalities such as listening to a long lecture (Risko et al., 2012). Alternating modalities—for example, moving from listening to writing to discussing—can maintain engagement and support deeper processing.

A well-organised lesson plan may alternate between modalities strategically. For example:

- Auditory: Teacher explanation of a concept (5 minutes)
- Visual: Students analyse a diagram or infographic (5 minutes)
- Kinesthetic: Students complete a hands-on sorting or matching task (7 minutes)

- Auditory plus Social: Peer discussion of findings (5 minutes)
- Visual plus Kinesthetic: Students draw or map their understanding (5 minutes)

Multisensory processing theory and embodied cognition research suggest that deploying multiple senses in processing a particular piece of information can deepen learning by creating richer mental representations (Barsalou, 2020). Embodied cognition posits that cognitive processes are grounded in sensory and motor systems; thus, physically manipulating objects, gesturing, or moving while learning can enhance understanding, particularly in domains such as mathematics and science (Pouw et al., 2014; Nathan, 2021). For example, students learning about fractions understand better when they physically partition objects than when they only view diagrams (Saxe et al., 2020).

However, not all multisensory combinations are equally effective. The *congruence principle* states that multisensory benefits occur only when information from different channels is *congruent*—that is, referring to the same content and mutually reinforcing (Shams & Seitz, 2008). Incongruent or irrelevant multisensory inputs (e.g., background music during a verbal explanation) can impair learning by creating extraneous load (Moreno & Mayer, 2007). Teachers must therefore ensure that multimodal activities are carefully coordinated, not merely varied for the sake of variety.

Monitoring and Assessment of Learning Progress

Much of what has been said about alignment applies equally to monitoring learning progress. Tomlinson (2014) recognised that monitoring learning does not directly influence it, but typical educational goals cannot be achieved through single, instantaneous events. Teaching must be systematic and extended over time, adapted in light of learning progress and evolving contextual factors. This requires ongoing monitoring—not merely checking whether learners are engaging in activities, but whether and what they are actually learning.

Formative assessment, therefore, is not an optional add-on but an integral part of teaching as a systematic, purposeful activity (Black & Wiliam, 2018). The original meta-analysis by Black and Wiliam (1998) found effect sizes for formative assessment ranging from 0.4 to 0.7, with particular benefits for lower-achieving students. Subsequent large-scale implementations have confirmed these findings, showing that well-implemented formative assessment practices significantly improve learning outcomes across subjects and grade levels (Kingston & Nash, 2011; Wiliam, 2018).

Effective formative assessment involves five key strategies (Wiliam, 2018):

- Clarifying and sharing learning intentions and success criteria so learners understand the target.
- Engineering effective classroom discussions, tasks, and activities that elicit evidence of learning.
- Providing feedback that moves learners forward, focusing on the task, process, or self-regulation rather than on the learner as a person.
- Activating students as instructional resources for one another through peer assessment and collaborative learning.
- Activating students as owners of their own learning through self-assessment and goal setting.

Teachers must consider teaching strategies for their potential to enable monitoring. A whole-class lecture may promote initial understanding but affords little opportunity to monitor what individual learners are making of that input. In contrast, strategies such as *think-pair-share*, *exit tickets*, *mini-whiteboard responses*, and *digital polling tools* enable real-time monitoring (Hattie & Clarke, 2018). Recent advances in classroom response systems (e.g., Kahoot! Plickers, clickers) provide immediate, aggregate data on student understanding, allowing teachers to adjust instruction in the moment (Wang, 2017). However, technology is not necessary; low-tech strategies such as thumbs up/down, coloured cards, or finger signals can be equally effective (Fisher & Frey, 2021).

Thus, teachers should intentionally incorporate pedagogical strategies that allow them to monitor learning, such as small-group discussions (enabling observation of individual contributions), individual tasks (providing written evidence of thinking), or one-minute papers (prompting brief written reflections). The key principle is *frequency and specificity*: monitoring should occur often enough to detect emerging misconceptions and be specific enough to inform instructional adjustments (Wiliam, 2018).

Aligning Closure with Learning Outcomes, Activities, and Assessment

Assessment enables teachers to evaluate whether lesson outcomes were attained. It is essential to engage learners in assessment tasks directly aligned with the stated outcomes. A mismatch between the cognitive processing demanded by the assessment and that specified in the outcome produces a false evaluation of learners' abilities. For example, if no outcome requires analysis, yet the assessment demands analysis, learners will likely perform below their actual capability due to this misalignment (Biggs & Tang, 2011). Conversely, if an outcome requires analysis but the assessment only requires recall, learners may appear successful while lacking the intended capability—a problem sometimes called *false-positive assessment* (Wiliam, 2018).

Closure activities should explicitly revisit the learning outcomes, allowing learners to demonstrate their achievement through brief, aligned performance tasks. Effective closure is not merely a summary delivered by the teacher but an active opportunity for learners to consolidate and demonstrate their learning (Fisher & Frey, 2021). Examples of aligned closure activities include:

- *Exit Ticket*: "Based on today's lesson, write one well-supported argument for or against [claim]." (aligns with *evaluate* outcome)
- *Three-Two-One*: "List three things you learned, two questions you have, and one connection to prior knowledge." (aligns with *understanding* outcome)
- *Mini-Whiteboard Response*: "Draw a diagram showing the relationship between X and Y." (aligns with *analysis* outcome)
- *Self-Assessment Rubric*: "Rate your ability to [outcome verb] on a 1-4 scale and justify your rating." (aligns with metacognitive outcome)

This final alignment ensures that the lesson's coherence—from outcomes through activities to assessment—is maintained, supporting both learning and valid evaluation (Wiggins & McTighe, 2005). When closure is aligned, teachers gain accurate evidence of outcome attainment, and learners experience a coherent learning episode in which goals, processes, and evaluation are meaningfully connected. The absence of such alignment fragments the learning experience, leaving learners uncertain about what they were supposed to learn and teachers uncertain about what was actually achieved (Biggs & Tang, 2011).

Conclusion

This paper has argued that effective lesson planning for evidence-based teaching requires more than the mechanical completion of a template; it demands principled alignment among learning outcomes, teaching activities, assessment methods, and an understanding of the psychological processes underlying learning. Drawing on the philosophical analysis of teaching as a purposeful activity (Fenstermacher, 1986; Hirst, 1997) and on instructional design theory (Reigeluth, 1996; Richey, 1986), the paper has shown that teaching is an interactive, content-specific endeavour in which visible instructional structures must be informed by the deep structures of learners' cognitive processing (Oser & Baeriswyl, 2001; Tomlinson, 2014).

A central contribution of this paper is the articulation of alignment as a multi-level principle. At the outcome level, teachers must select cognitive verbs that match intended capabilities, guided by contemporary frameworks such as the revised Bloom's taxonomy (Anderson & Krathwohl, 2001). At the activity level, each learning outcome requires a corresponding activity that operationalises its cognitive verb, while multimodality and cognitive load theory (Mayer, 2021; Sweller, 2016) inform how activities engage sensory channels without overwhelming processing capacity. At the assessment level, formative practices (Black & Wiliam, 2018) must be embedded within the lesson design to enable ongoing monitoring of learning progress, and closure activities must directly align with outcomes to ensure valid evaluation of achievement.

Importantly, the paper has refined earlier oversimplifications regarding sensory modality use in lesson planning. Rather than rigidly excluding repetition of the same modality, contemporary multisensory learning research (Shams & Seitz, 2008) supports strategic alternation and integration of congruent inputs across modalities to deepen mental representations and enhance retention (Barsalou, 2020).

Despite these insights, several limitations warrant acknowledgment. First, the paper has focused primarily on cognitive aspects of learning, with less attention to affective, social, and motivational dimensions—factors increasingly recognised as critical to student engagement and achievement (Hattie, 2012). Second, the proposed alignment principles assume a degree of teacher autonomy and curriculum flexibility that may not exist in all educational contexts, particularly those with standardised pacing guides or high-stakes testing regimes. Third, while the paper draws on instructional design theory, it has not empirically tested the application of these principles in authentic classroom settings.

Implications for practice are nonetheless clear. Teacher education programmes should move beyond procedural training in lesson plan formats to develop teachers' deep understanding of alignment principles, cognitive load management, and formative assessment design. Professional development should include collaborative lesson analysis using frameworks such as the revised taxonomy and multimodal design principles. Furthermore, school-based mentoring (Tomlinson, 2014) should explicitly address how experienced teachers model the connection between visible teaching structures and inner learning processes.

Future research should investigate how novice teachers develop competence in alignment over time, which design principles most reliably predict student learning gains, and how digital learning environments may augment or complicate multimodal lesson planning. Additionally, comparative studies across different subject areas (e.g., mathematics versus humanities) could reveal how content-specific pedagogical knowledge interacts with general alignment principles.

In conclusion, lesson planning is not merely a bureaucratic requirement but a core professional practice through which teachers exercise pedagogical reasoning. When planning is informed by evidence-based principles of learning and alignment, it becomes a powerful tool for professional growth—transforming what might otherwise be “one year of experience repeated thirty times” (Gudmundsdóttir & Shulman, 1987, as cited in this paper) into genuinely cumulative professional development. The challenge for teachers and teacher educators alike is to treat lesson planning not as a script to be filled, but as a hypothesis to be tested, refined, and shared in the ongoing pursuit of meaningful student learning.

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