

LEARNING DESIGN TOOLKIT (M.ED. IN INSTRUCTIONAL DESIGN AND EDUCATIONAL TECHNOLOGY)

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Learning Design Toolkit

Learning Theories

Module 1

Behaviorism

Behavioral theory focuses on the way humans learn through interaction with their environment. Behaviorism solidifies the fact that behaviors are learned through conditioning. Skinner mentioned that conditioning is a procedure that utilizes punishment and reinforcement. The behavioral model provides an organized approach to teaching, allowing educators to set clear expectations and provide consistent routines. Behavioral theorists believe there is a certain way to do tasks to cultivate a desired outcome, and the teacher determines what that looks like (Samoila et al., 2023).

Example

This theory can be applied to student behavior plans. Many students thrive with positive encouragement. They can better interact in school when their positive behaviors are rewarded (Bright, 2023). For example, if a young student struggles with speaking out inappropriately in class, they may have a positive behavior plan to encourage them when they appropriately follow classroom expectations. The plan could state that when the student does the desired task of raising their hand before asking questions, the teacher will thank them for raising their hand and waiting to be called on before speaking.

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Cognitivism

Cognitivism focuses on how learners process, store, and retrieve information and maintains that learning is primarily related to the brain and its associated functions (such as visual and auditory perception, memory and mental processes) (Connolly, 2018). Core principles the concept that learners build mental frameworks to organize and interpret information, learners use information processing to store and retrieve data, learners actively make sense of new input by connecting it to prior knowledge (making them active learners), and that awareness of one's own learning process is key—learners benefit from reflecting on how they learn (this is called

“metacognition”). The implications for instructional design include Chunking Content (break information into manageable units to reduce cognitive load); Scaffolding information (providing support at the foundational stages then gradually remove as learners gain mastery); using Feedback Loops (to offer learners timely, specific feedback to reinforce correct mental models), and adhering to Multimedia Principles (align visuals and text to support dual-channel processing (per Mayer’s Cognitive Theory of Multimedia Learning)).

Example

Cognitivism can be effectively applied to eLearning course design for adult learners by focusing on how they process, store, and retrieve information. Since adults bring a wealth of prior knowledge and experience to the learning environment, instructional strategies should activate and build upon that foundation. For example, activation exercises can be introduced that ask learners to reflect on their prior knowledge. Designers can incorporate tools like concept maps, advance organizers, and real-world scenarios to help learners organize new information meaningfully. Breaking content into manageable chunks and using multimedia elements aligned with cognitive load theory ensures that learners aren’t overwhelmed. Using branching chats to separate complex content can provide learners with a “brain break” and time to reflect upon what they are learning. Reflection prompts and self-assessment activities also encourage metacognition, helping adults monitor their understanding and adjust their learning strategies. By aligning course design with cognitive principles, eLearning becomes more engaging, efficient, and tailored to how adults learn best.

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Constructivism

Constructivism is a learning theory that emphasizes how learners actively construct their own understanding and knowledge of the world through experiences and reflection. Instead of passively receiving information, learners build meaning by connecting new ideas to prior knowledge, engaging in problem-solving, and interacting with their environment. This theory argues that students’ prior knowledge emerges from personal learning experiences and interaction with learning materials. While there are two major strands of Constructivism, based on the work of Jean Piaget (1896-1980) and Lev Vygotsky’s (1896-1934), there has been much development in pedagogy and educational ideology by other theorists.

Example

Critical to Constructionist learning theory “is the idea of learning as meaning making, and learning as the negotiation of meaning,” and an example of this would be utilizing the 5 E Model to develop online learning courseware. The 5 E Model includes myriad opportunities for knowledge creation (Kanselaar, 2002) and five stages: engage, explore, explain, extend, and evaluate; students and teachers have defined roles and behaviors for each stage. This model serves online facilitation because it requires the learners to consider how they will learn – through personal investigation and exploration. Also, this model allows learners to share their insights with each other, therefore synthesizing information and integrating their conclusions. Finally, this model supports the concept that instructors should be facilitators in the learning process, not enablers – which further supports Constructionism.

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Connectivism

Connectivism is a modern learning theory that views knowledge as a networked process, where learning occurs through the connections we make between people, digital tools, and information sources. It emphasizes that learning is no longer an entirely internal, individual activity—instead, it's shaped by our ability to access, filter, and apply information from a constantly evolving web of resources. In Connectivism, knowing where to find information and how to evaluate it becomes more important than memorizing facts.

Example

Connectivism can be applied to a professional development course for educators on emerging classroom technologies. Instead of relying solely on lectures, the course uses a collaborative online platform where participants explore curated resources, join discussion forums, follow experts on social media, and contribute to a shared knowledge base. Learners are encouraged to build their own learning networks, engage with diverse perspectives, and continuously update their understanding as new tools and ideas emerge. This approach reflects Connectivism by fostering dynamic, self-directed learning through real-world connections and digital engagement.

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Pedagogy vs. Andragogy

TPACK / Technological Pedagogical Content Knowledge

TPACK is basically a way to think about good teaching by blending three key ingredients: knowing your subject (content), knowing how to teach it well (pedagogy), and knowing how to use tech tools to support learning (technology). It's not just about using flashy gadgets—it's about making sure the tech actually helps students understand the material better and keeps them engaged. When designing lessons, TPACK encourages teachers to pick tools that fit their teaching style and goals, so everything works together smoothly to create meaningful learning experiences. Essentially, TPACK supports instructors' ability to smoothly integrate technology with pedagogy and content (Mishra & Koehler, 2006)

Example

Imagine a scenario involving adult learners in online project management training. In this scenario, technology becomes integrated with sound pedagogy and relevant content—in this case, for adult learners in flexible, online environments—which significantly enhances learning outcomes. For pedagogical strategies, the designer chooses case-based learning and peer feedback, which resonate well with adult learners who bring real-world experience to the table. The scenario highlights the importance of tailoring instructional design to the unique needs and contexts of adult learners, which aligns perfectly with the TPACK framework.

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TAWOK / Technology Andragogy Work Content Knowledge

TAWOK is like an upgraded version of TPACK, but built specifically for adult learners in vocational or technical training. It blends four key ideas: knowing your subject (Content), understanding how adults learn best (Andragogy), using the right tech tools (Technology), and connecting all of that to real-world job skills (Work). The idea is that learning should be hands-on, tech-savvy, and directly tied to what people actually do in their careers. So, if you're designing training for adults—say, in automotive repair or plumbing—TAWOK helps make sure the lessons are practical, engaging, and relevant to the workplace.

Example

In designing an online course for adult learners aiming to become certified auto technicians, TAWOK comes into play by blending practical tech tools, real-world relevance, and adult learning strategies. The course uses interactive 3D engine models, video demos, and virtual simulations to bring hands-on experience into digital space. Lessons are built around real problems—like diagnosing a car that flashes warning sensors—and are accessible anytime, respecting the busy lives of adult learners. Instruction focuses on actual garage tools, repair procedures, and safety standards to ensure job readiness, while mechanical concepts are explained using relatable analogies to make the content stick. It's all about making learning flexible, engaging, and directly tied to the work they'll be doing.

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Learning Process Models

Kolb's Experiential Learning Theory

Kolb's Experiential Learning Theory centers on the idea that real learning happens through doing—and then thinking deeply about what you did. It follows a four-step cycle: learners engage in a concrete experience, reflect on it, form abstract concepts, and then actively experiment with those ideas in new situations. For instructional design, this means moving beyond passive content delivery and instead crafting experiences that are hands-on, reflective, and directly applicable to real-world contexts. It's especially powerful for adult learners, who bring rich life experiences to the table and benefit from learning that feels relevant and practical. As Egan, Tolman, and McBrayer (2023) explain in their reconceptualization of Kolb's model, experiential learning should be seen not just as a one-time event but as a lifelong, episodic process that builds on prior knowledge and continues to evolve through future experiences.

Example

In an online Spanish course designed for healthcare professionals, Kolb's Experiential Learning Theory can guide instructional design by creating a cycle of active, reflective, and practical learning. Learners begin with simulated patient interactions in Spanish, engaging in real-world scenarios like greeting patients or explaining procedures (Concrete Experience). They then reflect on their performance through journaling or group discussion (Reflective Observation), which helps them identify strengths and areas for improvement. Next, they study grammar, vocabulary, and cultural nuances based on those reflections (Abstract Conceptualization), and finally, they apply their new understanding in fresh simulations or live peer practice (Active Experimentation). This approach not only builds language skills but also boosts confidence and cultural competence, making the learning experience deeply relevant and effective for adult learners.

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Gagne's Nine Events of Instruction

Kolb's Experiential Learning Theory is all about learning by doing—and then thinking about what you did. It's built around a four-step cycle: first, you dive into a hands-on experience; then you reflect on it; next, you make sense of it by forming ideas; and finally, you test those ideas in new situations. For instructional design, this means creating lessons that aren't just about reading or watching—they should get learners actively involved, give them space to reflect, help them connect the dots, and encourage them to try things out. It's especially great for adult learners who bring their own experiences to the table and want to see how learning applies to real life.

Example

In an online French course for medical professionals, instructional designers can combine experiential learning with Gagné's Nine Events of Instruction to create a highly engaging and practical module. Learners begin by watching a realistic patient scenario to spark interest, then receive clear objectives and recall prior language knowledge. New content—like key phrases and cultural tips—is presented through interactive dialogues, supported by pronunciation guidance and visual aids. Learners practice simulated patient interactions, receive targeted feedback, and complete assessments to demonstrate their skills. Finally, they apply their learning in new healthcare contexts, reinforcing retention and real-world transfer. This approach ensures adult learners gain relevant, usable language skills through active, reflective, and structured experiences.

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Continuous Improvement

PDSA Cycle / Plan Do Study Act Cycle

The PDSA Cycle—Plan, Do, Study, Act—is a continuous improvement model that helps instructional designers test and refine learning strategies in a structured, iterative way. It starts with planning a lesson or intervention based on learner needs and clear goals, then doing by implementing the plan on a small scale. Next, designers study the outcomes by analyzing data and feedback to see what worked and what didn't, and finally, they act by adjusting the design for better results in the next round. This cycle supports evidence-based decision-making,

encourages flexibility, and promotes ongoing refinement of instructional practices to enhance learner outcomes.

Example

The PDSA Cycle—Plan, Do, Study, Act—is like a smart, flexible way to keep improving how adults learn a new language. It starts with planning a lesson or activity based on what learners need (like mastering greetings or medical phrases), then trying it out in a small, low-pressure way. After that, you study how it went—maybe learners struggled with pronunciation or nailed the vocabulary—and use that info to tweak and improve the next round. For adult foreign language learners, it's perfect because it's goal-focused, adaptable to busy lives, and encourages reflection and growth without making mistakes feel like failures. It's all about learning smarter, not harder.

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Design Models

Module 2

Instructional Design (ID) vs. Learning Experience Design (LXD)

Instructional Design (ID) and Learning Experience Design (LXD) define an approach to creating a learning experience. Design includes understanding the audience's needs and goals to create learning activities and effective content delivery. The two methods are complementary and do not have to exist exclusively. ID emphasizes learning and supports a step-by-step process for developing instruction. Typically, instruction is driven by learning objectives, direct instruction, and uses traditional assessments to evaluate learning. LXD has an integrated approach with a heavier emphasis on emotional, social, and cognitive aspects of learning. In LXD, the focus is on integrating hands-on and collaborative instruction that often utilizes technology. According to Floor (2023), "A great way to explain the general difference between LXD and ID is by comparing a scientist to an artist" (para. 2). Like a scientist, the instructional designer follows a methodical process with clear objectives and measurable results. Meanwhile, the learning experience designer, like an artist, creates engaging, emotionally rich experiences that connect with learners on multiple levels beyond just transferring information.

Example

An example demonstrating the difference between ID and LXD can be illustrated in a professional development session with school staff. The staff will receive training on the new Assessment Feature in the school's LMS.

Table 1

Instructional Design (ID)	Learning Experience Design (LXD)
The staff is presented with the learning objective to learn the new online feature. Staff are required to use online assessments to collect data.	The staff is presented with a problem that needs to be solved. The administration needs a way to collect data as students complete formative work. The staff are given the new online assessment feature on the LMS as a possible option.
↓	↓
The instructor demonstrates the skills and steps to complete the goals.	The staff begins to explore the LMS and its features to experiment with how it works and what it can do. As they explore, they create lists of pros and cons. The staff notes items for which they need further training or exploration.
↓	↓
The staff members try the step-by-step implementation as guided by the instructor.	
↓	
Staff have begun using the new online feature in their classrooms. Instructors and administration evaluate and hold staff	Through collaboration, the staff determines that the online LMS is the best way to collect

accountable for carrying out the directive.	data. The staff begins using the assessment feature to collect data. ↓ As the data are collected, the administration and staff evaluate the effectiveness and adjust accordingly.
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First Principles of Instruction

Merrill's Principles of Instruction

Merrill's Principles of Instruction, developed by M. David Merrill, provides a framework for effective instructional design, emphasizing learner-centered, task-oriented teaching. Learning is facilitated when the following 5 core principles are met:

Table 2

Problem-Centered: (Also called Task-Centered Approach)	Learning is most effective when anchored in real-world problems. Instruction should engage learners by presenting authentic tasks or challenges that mirror <i>practical applications</i> , fostering relevance and motivation.
Activation	Learners should <i>activate prior knowledge</i> . Encourage learners to recall relevant experiences or skills, creating a foundation for new learning and making it more meaningful.
Demonstration	Instructional designers should <i>present new material</i> clearly and explicitly, ensuring learners understand key concepts and procedures.
Application	Learners should actively <i>apply knowledge</i> through hands-on tasks or problem-solving activities. Practice with feedback strengthens understanding and skill development, making learning more effective.
Integration	Encourage learners to <i>integrate new knowledge into their everyday lives</i> . Reflection, discussion, and opportunities to apply skills in real-world contexts help solidify learning and promote long-term retention.

Example

In an online eLearning course teaching basic web development (HTML/CSS) for beginners, Merrill's Five Principles of Instruction are applied to create an engaging experience. The course kicks off with a problem-centered approach, tasking learners with building a personal portfolio website to make learning relevant. To activate prior knowledge, learners reflect on familiar website features, like headers or images, connecting new concepts to their experiences. Clear demonstrations come through video tutorials and interactive code-along exercises, showing how to write HTML and CSS, such as coding a navigation bar with immediate visual feedback. Learners then apply their skills by coding parts of their portfolio, like adding images or styling text, with quizzes and challenges providing instant feedback to reinforce learning. Finally, integration happens as learners publish their website online, share it for peer feedback, and reflect on using these skills for real-world goals like freelancing or personal branding, ensuring the learning sticks and feels practical.

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Merrill's Four-Phase Cycle of Instruction

Merrill's Four-Phase Cycle of Instruction, developed by M. David Merrill, is a streamlined framework to guide instructional designers in creating effective learning experiences. The cycle begins with Activation, where designers spark learners' interest by connecting new material to prior knowledge through activities like recalling relevant experiences. Next, in the Demonstration phase, new concepts or skills are clearly presented using examples, videos, or guided demonstrations to ensure understanding. The Application phase follows, engaging learners in hands-on practice, such as solving problems or completing tasks, with immediate feedback to reinforce skills. Finally, the Integration phase encourages learners to apply their new knowledge in real-world contexts, fostering reflection or discussions to solidify learning and make it meaningful. Unlike Merrill's Five Principles, this cycle emphasizes a sequential process, focusing on engaging learners, showing new content, practicing skills, and connecting learning to practical use. By following this cycle, instructional designers can create engaging, structured, and impactful lessons that promote deep understanding and long-term retention.

Example

In an online learning environment, Merrill's Four-Phase Cycle of Instruction can be applied to create an effective course, such as one teaching the basics of digital marketing for beginners. During the Activation phase, learners are prompted with a discussion post asking them to share personal experiences with online ads, connecting learners' prior knowledge to new concepts. In the Demonstration phase, short video tutorials and interactive infographics illustrate key strategies, such as crafting a social media campaign, with clear examples shown in an online platform. The Application phase engages learners through hands-on tasks, such as creating a mock ad campaign, with automated feedback and quizzes to refine skills. Finally, in the Integration phase, learners upload their campaign to a peer-review forum, reflect on how to

apply these skills to real-world business goals, and discuss practical applications in a live webinar. This cycle ensures the online course is engaging, structured, and relevant, fostering deep understanding and practical use of digital marketing skills.

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Project Management Models

Agile

The Agile Project Management Model, when applied to instructional design, is a flexible, iterative approach that prioritizes collaboration, adaptability, and learner-focused course development. Instructional designers work in small, cross-functional teams to break projects into short cycles called sprints, typically lasting 1-4 weeks. Each sprint delivers a functional piece of the course, such as a module or interactive activity, allowing for continuous feedback from stakeholders and learners. This feedback drives rapid revisions, ensuring the content stays relevant and effective. Key principles include iterative development, where designers refine materials based on testing and user input; collaboration, with frequent communication among team members and clients; and adaptability, adjusting goals as needs evolve. For example, designers might create a prototype lesson, test it with learners, and tweak it based on results before moving to the next module. Agile emphasizes delivering small, usable outcomes quickly rather than a single, polished product at the end, enabling instructional designers to create engaging, responsive eLearning experiences that align closely with learner needs and project goals.

Example

In creating an online eLearning course on data analysis for healthcare outcomes using the Agile Project Management Model, a team of instructional designers, healthcare experts, and developers collaborates to build a learner-centric course. In the initial sprint (two weeks), they develop a prototype module on analyzing patient recovery rates with basic statistical tools, including video tutorials and a dataset-based quiz hosted on an eLearning platform. This module is tested with a group of healthcare professionals, who provide feedback via a discussion board, suggesting clearer explanations of statistical terms. In the next sprint, the team refines the module by adding glossary pop-ups and develops a new module on visualizing patient outcomes with charts, incorporating feedback from hospital stakeholders to ensure relevance. Daily virtual stand-ups keep the team aligned, and a project management tool tracks tasks. Through iterative sprints, the team tests and tweaks modules, such as one on predicting

readmission risks, ensuring each is practical and engaging. By the course's end, continuous learner and stakeholder input results in a tailored, effective course that equips healthcare professionals with actionable data analysis skills.

References

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SAM / Successive Approximation Model

The Successive Approximation Model (SAM), developed by Michael Allen, is an agile, iterative approach to instructional design that emphasizes flexibility and collaboration to create effective learning experiences. Unlike traditional linear models, SAM involves rapid prototyping and continuous refinement through small, iterative cycles. Instructional designers start with a collaborative planning phase, gathering input from stakeholders and learners to define goals. They then create a prototype, such as a single course module, which is tested with a small group to gather feedback. Based on this input, designers refine the prototype, make adjustments, and develop additional components in subsequent iterations. This process repeats, with each cycle improving the course based on real-world testing and stakeholder insights. SAM's key principles include iterative development, frequent evaluation, and adaptability, ensuring the final product aligns closely with learner needs and project objectives. By focusing on quick, testable deliverables and ongoing collaboration, SAM enables instructional designers to create engaging, effective eLearning courses that evolve dynamically, avoiding the rigidity of traditional models while maintaining a focus on quality and learner success.

Example

In developing an online eLearning course for beginner Chinese (Mandarin) using the Successive Approximation Model (SAM), a team of instructional designers, language experts, and developers works iteratively. During the initial planning phase, they collaborate with stakeholders and learners to set goals, such as mastering basic conversational phrases. In the first one-week sprint, they create a prototype module on greetings and introductions, featuring interactive audio exercises for tones and a quiz on simple dialogues, hosted on an eLearning platform. This is tested with a small learner group, who provide feedback via a survey, suggesting more practice with tones. In the next sprint, the team refines the module by adding tone-drill exercises and a short video on Chinese cultural greetings, like bowing, while starting a new module on ordering food. Daily virtual check-ins keep the team aligned, with progress tracked on a shared tool. Through iterative cycles, modules on topics like numbers or travel phrases are tested and refined based on feedback, resulting in an engaging, culturally relevant course tailored to beginners.

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<https://research.ebsco.com/linkprocessor/plink?id=fc9ecf66-0b42-3dac-a30b-7bc9051b9a4f>

SAMR / Substitution, Augmentation, Modification, and Redefinition

The SAMR model, developed by Dr. Ruben Puentedura, is a framework that guides instructional designers in integrating technology into education to enhance learning. It consists of four levels: Substitution, where technology replaces traditional tools without changing functionality (e.g., using a word processor instead of paper); Augmentation, where technology adds functional improvements, like spell-check or collaborative features in a digital document; Modification, where technology significantly redesigns tasks, such as creating interactive multimedia presentations instead of static reports; and Redefinition, where technology enables entirely new learning experiences, like global virtual collaborations or immersive simulations, that were previously impossible. For instructional designers, SAMR provides a roadmap to evaluate and elevate technology use, moving from simple enhancements to transformative learning experiences. By aligning tech integration with pedagogical goals, designers can create engaging, innovative eLearning courses that deepen student understanding and foster skills that would have been unattainable without technology, ensuring meaningful and impactful educational outcomes.

Example

In an online eLearning course teaching medical terminology for emergency room (ER) professionals, the SAMR model guides technology integration to enhance learning. At the Substitution level, learners use a digital glossary of ER terms (e.g., "tachycardia," "laceration") instead of a printed handbook. For Augmentation, the course incorporates interactive flashcards with audio pronunciations and case-based quizzes, improving retention and engagement over static study methods. In the Modification phase, learners create digital infographics using online tools to map terminology to ER scenarios, such as linking "hypoxia" to patient symptoms, transforming traditional memorization tasks. At the Redefinition level, students engage in a virtual ER simulation, collaborating in real-time with peers via a platform to diagnose and communicate using medical terms in realistic patient scenarios, an experience unachievable without technology. By applying SAMR, instructional designers elevate the course from basic digitization to an immersive, practical learning experience that builds confidence and proficiency in using medical terminology in high-pressure ER settings.

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Waterfall

Waterfall project management model has a sequential, linear approach and emphasizes process clarity, so that teams know the plan from the outset. This model works well in disciplined, structured organizations where scant resources are provided or there is a fixed budget. This model is highly predictive and lacks adaptability, so that there are no room for changes or addressing unforeseen challenges.

Example

The Waterfall Project Management Model, with its linear and sequential approach, is suitable for an online eLearning course when requirements are well-defined, stable, and unlikely to change. For example, consider a compliance training course on OSHA workplace safety regulations for a manufacturing company. The course content is based on fixed, government-mandated standards, requiring clear modules on topics like hazard identification and safety protocols. Using the Waterfall model, the instructional design team follows distinct phases: first, they analyze requirements with stakeholders to outline objectives; then, they design detailed storyboards and scripts; next, they develop the course with videos and quizzes in an eLearning platform; followed by rigorous testing to ensure accuracy; and finally, deployment to employees. Each phase is completed before moving to the next, ensuring a structured process with minimal revisions. This approach works well here because the regulatory content is static, the scope is clear, and the timeline is fixed, allowing the team to create a polished, standardized course efficiently without needing iterative feedback loops.

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ADDIE | Analysis, Design, Development, Implementation, and Evaluation

The ADDIE model is a structured framework for instructional design, guiding the creation of effective training programs through five phases: Analysis, where learners' needs and goals are identified; Design, where the instructional approach and objectives are outlined; Development, where content like videos or quizzes is created; Implementation, where the course is delivered to learners; and Evaluation, where its effectiveness is assessed and refined. This iterative process ensures training is aligned with learner and organizational needs, making it efficient and impactful.

Example

In developing an online eLearning course on how to file taxes for first-time filers, the ADDIE model ensures a structured and effective approach. During the Analysis phase, the instructional design team surveys young adults to identify knowledge gaps, such as understanding tax forms (e.g., W-2, 1040), and defines objectives like mastering deductions. In the Design phase, they create a storyboard outlining modules on tax basics, deductions, and filing processes, incorporating interactive scenarios and quizzes. The Development phase involves creating engaging content, including video tutorials on using tax software, infographics on tax brackets, and a simulated tax-filing tool, all hosted on an eLearning platform. In the Implementation phase, the course is rolled out to learners via a learning management system, with access to discussion forums for support. Finally, in the Evaluation phase, learner performance is assessed through quizzes and a final mock tax return, with feedback surveys identifying areas for improvement, like adding more examples of common deductions. Iterative refinements ensure the course remains clear, practical, and aligned with learners' needs, empowering them to file taxes confidently.

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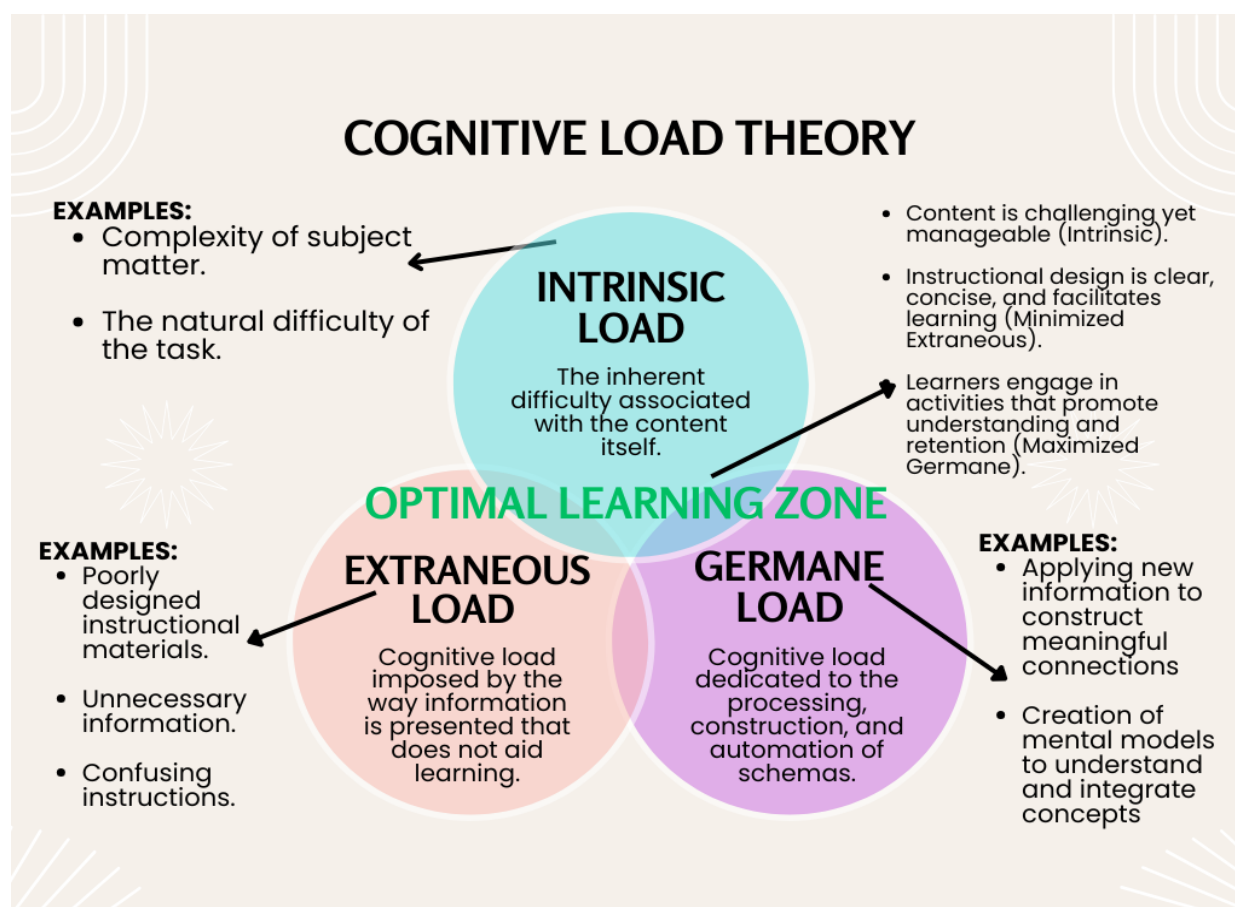
Cognitive Load

Module 3

Cognitive Load Theory

Cognitive load theory provides a framework for understanding the mental processes involved in learning and the limitations of our working memory. Clark and Mayer (2024) define learning as a change in knowledge caused by experience. Cognitive load theory builds on this by examining how our brains process, store, and manage information during learning.

Table 3



At its core, the theory recognizes that our working memory has limited capacity. When these limits are exceeded, learning becomes ineffective. The theory identifies three distinct types of cognitive load:

Intrinsic load represents the inherent complexity of the material being learned. This load varies based on the learner's prior knowledge and the complexity of the content itself. Effective

instruction carefully manages this essential processing to enhance learning (Clark & Mayer, 2024).

Extraneous load is the unnecessary mental effort caused by poor instructional design. This includes confusing layouts, irrelevant information, or unnecessarily complex explanations. As Clark and Mayer (2024) emphasize, well-designed courses minimize extraneous processing through thoughtful design strategies.

Germane load is the productive mental effort that contributes to deeper understanding. This includes activities that help learners construct schemas and apply knowledge. Courses should intentionally foster this generative processing to maximize learning and create lasting memories (Clark & Mayer, 2024).

In simple terms, cognitive load can be understood as the total mental effort required by a learner's brain when processing new information. Instructional designers must carefully balance these three types of cognitive load—reducing extraneous load, managing intrinsic load, and optimizing germane load—to create effective learning experiences.

Example

Cognitive load theory would apply during any instructional design project. If instructors were designing online professional development for training on new gradebook software at a school, they would minimize unnecessary cognitive burdens because learners have limited working memory capacity (Sweller, 2020). The designer would manage the intrinsic load by referring to what the staff currently uses for a gradebook. The course would refer to terms and names that the staff knows and break each component into smaller bits of information. The designer would minimize extraneous load by using a variety of learning experiences. The necessary content would be concise, include well-organized images, highlight important steps, and show each step necessary. Staff could easily follow the steps needed to learn the new gradebook. The training would maximize germane load by asking staff to work in groups and practice what they are learning during the training. The professional development would include scenarios asking the staff to solve problems using the new gradebook.

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Managing Cognitive Load

Multimedia Principle

The Multimedia Principle, as defined by Mayer (2008), states that learners understand material better when it's presented in both words and relevant graphics, rather than words alone. This principle is grounded in the dual-channel theory, which suggests that people process information through separate visual and auditory channels (Mayer,

2008; Moreno & Mayer, 2007). By engaging both channels, instructional designers can reduce cognitive overload and foster generative processing—the mental effort learners invest in organizing and integrating new information meaningfully (Mayer, 2021). When visuals are paired with text, learners are more likely to build mental models, connect new ideas to prior knowledge, and retain information longer. For example, a physics lesson that includes diagrams of pulleys alongside explanatory text allows learners to visualize mechanisms while reading about them, encouraging deeper cognitive engagement (Clark & Mayer, 2016). Instructional designers should also apply the contiguity principle, which emphasizes placing text near corresponding images to strengthen the connection between verbal and visual elements and reduce extraneous cognitive load (Mayer, 2008). These strategies align with current research in multimedia learning and cognitive science, demonstrating that well-designed visuals paired with concise text can significantly enhance learner comprehension and motivation (Mayer, 2021; Stanford Medicine, 2025).

Example

An example scenario where an instructional designer may utilize instructional design elements to illustrate the Multimedia Principle is introducing an online learning module for high school students about the water cycle. The subject matter expert provides a detailed written explanation of the water cycle, including terms like evaporation, condensation, precipitation, and collection. However, learners struggle to visualize how these processes connect. As the instructional designer, you know that people learn better from words and pictures than from words alone and introduce dynamic animation. The animation visually depicts each stage of the water cycle with audio that explains the process, in sync with the visuals. Labels and arrows highlight key transitions, and the designer avoids redundant on-screen text that simply repeats the narration. As a result, learners show improved comprehension and retention because the combination of visuals and spoken words helps them build mental models more effectively than text alone. Thus, learners interact with the knowledge in a deeper way and generative processing increases.

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Signaling

The Signaling Principle—also known as the Cueing Principle—states that learners benefit when key information is visually or verbally highlighted in instructional materials. This principle minimizes extraneous processing, which refers to mental effort spent on irrelevant or poorly organized content (Mayer & Fiorella, 2014). By guiding attention to essential elements, signaling helps learners focus on what matters, reducing cognitive overload and enhancing comprehension. Signals can take many forms: arrows, bold text, color coding, audio emphasis, or layout cues. These design choices help learners organize information, recognize structure, and integrate concepts more efficiently. For example, when a diagram includes arrows pointing to key components or when a narrated animation emphasizes critical steps, learners are more likely to build coherent mental models (Mayer, 2008). Research shows that signaling improves learning outcomes across various media formats. In one study, learners who received cued materials performed better on transfer tasks than those who received uncued versions, suggesting that signaling supports deeper cognitive processing and analogical reasoning (Abercrombie, Hushman, & Carbonneau, 2019). Eye-tracking studies further confirm that signals guide learners' visual attention toward relevant content, improving retention and reducing split attention effects (Alemdag & Cagiltay, 2018). In summary, signaling is a low-effort, high-impact strategy that instructional designers can use to make learning more efficient, especially in multimedia environments where cognitive load is a critical concern.

Example

To illustrate how the Signaling Principle can be used by instructional designers, imagine that you are asked to design an interactive eLearning module to teach hospital staff the correct steps for performing CPR (Cardiopulmonary Resuscitation). As CPR involves multiple steps that need to be taken in order, it can be hard for learners to remember. In order to help learners recall the steps and the details, an instructional designer can apply the Signaling Principle, using numbered steps with bold formatting to clearly separate each phase of CPR; color-coded highlights (e.g., red for emergency actions, blue for supportive steps); animated arrows and pulse icons to emphasize hand placement and compression rhythm; and audio cues that signal transitions between steps, reinforcing the structure. Signaling is like giving learners a mental highlighter—it helps them know what to focus on and when. However, IDs must be careful not to overdue the signals, which would cause cognitive overload in the learner.

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Chunking

The Chunking Principle, also known as the Segmenting Principle, enhances learning by breaking complex content into smaller, meaningful units that are easier to process. According to Mayer and Pilegard (2014), segmenting multimedia instruction into learner-paced chunks reduces essential cognitive overload, allowing learners to focus on one concept at a time. This aligns with the Cognitive Theory of Multimedia Learning, which emphasizes the limited capacity of working memory and the need to manage essential processing (Mayer, 2021). When instructional designers present content in segmented steps—such as pausing between animations or dividing lessons into short modules—learners are better able to organize and integrate information, leading to improved retention and transfer (Rey et al., 2019). Research also shows that segmenting is especially beneficial for novice learners, who may struggle with continuous streams of information (Fiorella & Mayer, 2022). By allowing learners to control the pace and absorb content in digestible chunks, instructional designers foster deeper cognitive engagement and reduce unnecessary mental effort.

Example

An scenario where this principle might be actionable for an instructional designer could be a training module for new employees learning to use a complex customer relationship management (CRM) system. The CRM has dozens of features—contact management, lead tracking, reporting, automation—and presenting everything at once overwhelms learners. In order to reduce cognitive overload, an instructional designer can break down the information into logical blocks of information, presented as modules to the learners. For example: Module 1: Basic Navigation and Interface; Module 2: Managing Contacts and Accounts; Module 3: Tracking Leads and Opportunities; Module 4: Reporting and Analytics; Module 5: Automation and Workflows. Each module can include short videos, interactive walkthroughs, and practice exercises focused only the material in that module. The designer also uses visual separators and progress indicators to reinforce the structure. By chunking or breaking down the information into logical blocks (using modules), learners are able to engage with the knowledge bit by bit.

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Visual Cognitive Load/C-R-A-P

Visual cognitive load refers to the mental effort required to process visual information. In instructional design, managing this load is crucial to prevent overwhelming learners and to support effective learning. CRAP principles reduce visual cognitive load by making content easier to scan, interpret, and retain. They also support learner engagement and accessibility.

Table 4

Principle	Purpose in Instructional Design
Contrast	Differentiates elements to guide focus and improve accessibility. Highlights key content.
Repetition	Creates consistency across screens/modules. Reinforces branding and structure.
Alignment	Ensures visual harmony. Aligns text and images to reduce disorientation and cognitive effort.
Proximity	Groups related items together. Helps learners intuitively understand relationships between elements.

Example

An instructional designer was tasked with revamping a digital training module for military personnel learning cybersecurity protocols. The original module was dense with text, cluttered visuals, and inconsistent formatting—resulting in high extraneous cognitive load and poor retention. In order to reduce visual cognitive load, the instructional designer followed these protocols:

- **Contrast & Alignment (CRAP principles):** The designer applied consistent alignment and high-contrast color schemes to differentiate headings, instructions, and interactive elements. This helped learners visually parse content more efficiently.
- **Chunking & Signaling:** Information was broken into digestible segments using accordion-style menus and progressive disclosure. Key terms were highlighted, and arrows guided attention to critical steps in diagrams.
- **Modality Principle:** Instead of pairing dense text with static images, the designer used narrated animations to explain complex processes. This leveraged dual-channel processing (audio + visual) without overloading either.
- **Spatial Contiguity:** Labels were embedded directly onto diagrams rather than placed in separate legends. This reduced the need for learners to mentally integrate disparate elements.
- **Scenario-Based Visuals:** Realistic scenarios were illustrated with simplified visuals that mirrored actual field conditions. This helped learners focus on relevant cues and apply knowledge contextually.

Based on implementing these principles, the learner enjoys higher engagement and clarity.

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Strategies for Student Learning

Scaffolding

Scaffolding is a powerful instructional strategy that helps regulate how information enters the learner's working memory, thereby reducing cognitive strain and enhancing learning efficiency. According to van Nooijen et al. (2024), scaffolding behaviors—such as cueing and chunking—actively guide learners' attention and structure information in ways that align with cognitive load theory. These supports allow learners to focus on essential content without being overwhelmed by complexity. Scaffolding also facilitates the gradual transfer of responsibility from instructor to learner, enabling deeper engagement and long-term retention (Paas & van Merriënboer, 2020). By breaking tasks into manageable steps and providing timely prompts or feedback, instructional designers can prevent overload and promote meaningful processing. This is especially critical in multimedia environments, where learners must integrate visual and verbal information simultaneously. Effective scaffolding not only supports novice learners but also

adapts to individual needs, making it a cornerstone of personalized instruction and Universal Design for Learning.

Example

To improve tactical decision-making training for junior military officers, an instructional designer redesigned a blended learning program that replaced dense manuals and lectures with scaffolded, cognitively optimized instruction. Each module began with a simplified mission briefing to prime learners' schemas and reduce extraneous load. Scenarios progressed from low-stakes, single-variable simulations to complex, multi-variable challenges involving enemy movement, weather, and communication breakdowns, gradually increasing interactivity. Early modules included decision support tools like tactical maps and decision trees, which were phased out to promote autonomous reasoning. After each simulation, learners engaged in structured reflection and peer-led debriefs to deepen processing and connect decisions to outcomes. For advanced missions, instructors modeled expert reasoning through think-aloud walkthroughs, which were recorded for review. These strategies collectively reduced cognitive strain, supported meaningful learning, and improved situational awareness and decision-making under pressure. The program's success led to its adoption across multiple units as a scalable model for high-impact military training.

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Levels of Challenge

Levels of challenge refer to the degree of cognitive effort and complexity required from learners during a learning experience. Thoughtfully adjusting these levels helps instructional designers balance engagement, mastery, and motivation—especially for adult learners (Knowles et al., 2015; Merriam & Bierema, 2013). Levels of challenge range from low levels such as simple recall, recognition, or basic comprehension—often used in onboarding or pre-training—to moderate levels such as application, analysis, or decision-making in familiar contexts, which can be supported through scenarios, branching logic, or guided practice (Clark & Mayer, 2016). High levels of challenge involve complex problem-solving, synthesis, or judgment in novel situations, often delivered through simulations, case studies, or collaborative problem-solving (Reigeluth et al., 2017). Instructional designers can reduce cognitive strain and support learners by scaffolding complexity—starting with low-level tasks and gradually increasing difficulty—

differentiating activities based on learner performance, and embedding challenges in authentic contexts to enhance relevance and transfer (van Merriënboer & Kirschner, 2018).

Example

A mid-sized tech company needs cybersecurity training after a phishing incident, and the instructional designer must tailor the content to employees with varying levels of expertise. To ensure the training fits each learner, a pre-assessment routes them into one of three challenge tiers: new hires receive foundational drag-and-drop activities to identify phishing emails; mid-level staff engage in branching scenarios that simulate suspicious login alerts; and IT specialists tackle complex breach simulations with peer review. Each tier includes scaffolded feedback and ends with a reflection prompt to encourage real-world application. This adaptive approach respects adult learners' prior experience, prevents disengagement, and builds confidence progressively. It also demonstrates instructional design mastery by aligning challenge levels with learner readiness, ensuring relevance, and promoting transfer of learning.

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Active Learning

Active learning for instructional designers refers to designing experiences that require learners to actively engage with content through meaningful tasks—such as problem-solving, discussion, simulation, or reflection—rather than passively consuming information (Prince, 2004; Bonwell & Eison, 1991). Rooted in constructivist and experiential learning theories, active learning promotes deeper understanding, critical thinking, and long-term retention by encouraging learners to connect new knowledge to prior experience (Kolb, 2015; Merriam & Bierema, 2013). For instructional designers, this means crafting activities that foster interaction, collaboration,

and real-world application, whether through scenario-based modules, peer feedback, or adaptive challenges (Freeman et al., 2014). Effective active learning design also includes intentional scaffolding, clear learning objectives, and embedded assessment to ensure learners are not just participating, but progressing (Clark & Mayer, 2016; van Merriënboer & Kirschner, 2018).

Example

An instructional designer at a healthcare organization is tasked with creating compliance training for nurses on patient privacy laws (HIPAA). Instead of relying on static slides and quizzes, she designs an interactive module where learners navigate a simulated hospital shift. Throughout the scenario, nurses encounter realistic dilemmas—like overhearing a colleague discussing patient details in a public area or receiving a request for medical records from an unauthorized family member. Learners must make decisions at each point, receive immediate feedback, and reflect on the consequences of their choices. The module includes branching paths, peer discussion prompts, and a final debrief where learners compare their decisions to best practices. This approach transforms passive content into an engaging, experiential learning journey that builds critical thinking and real-world application—hallmarks of active learning.

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Problem-Solving Tasks

Active learning and problem-solving tasks both allow learners to apply what they know, making them active participants in the learning process (Bonwell & Eison, 1991; Prince, 2004). When learners engage in real-life scenarios and are challenged with problems that require solutions, they develop creative and critical thinking skills (Beichner et al., 2007). Problem-solving tasks are engaging learning activities that require learners to apply knowledge in realistic, often complex contexts, going beyond memorization to foster analysis, decision-making, and creativity (Dori et al., 2003). For instructional designers, these tasks—delivered through simulations, case studies, or branching scenarios—activate deeper cognitive processing and promote learner ownership (Clark & Mayer, 2016). When scaffolded appropriately and paired with feedback and structured reflection, problem-solving tasks support active learning, boost motivation, and enhance real-world transfer across varied skill levels (van Merriënboer & Kirschner, 2018).

Example

In an online eLearning course for an HR company, instructional designers can incorporate a problem-solving task by creating a branching scenario where learners act as HR managers resolving a workplace conflict. Learners analyze digital artifacts, conduct virtual interviews, and choose resolution strategies, receiving feedback based on their decisions. The task is scaffolded to build complexity, includes reflection prompts to deepen understanding, and offers adaptive support through microlearning modules. This approach promotes critical thinking, learner ownership, and real-world application of HR policies, while boosting engagement and transfer of learning.

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Knowing the Learner

Module 4

Learner and Context Analysis

Dick and Carey Model

The Dick and Carey model, also known as the Systems Approach Model, represents a comprehensive and systematic framework for instructional design first introduced in 1978 in "The Systematic Design of Instruction" (Instructional Designers of Penn State, 2018). This influential model stands apart from earlier linear approaches by emphasizing the interconnections between all design elements and incorporating crucial feedback loops throughout the process.

This model's iterative nature makes it particularly effective—instructional designers can continuously refine and modify components based on evaluation data, ensuring the entire instructional system evolves to better meet learner needs. Rather than viewing instruction as simply delivering content, the Dick and Carey model conceptualizes instruction as a complete system aimed at helping learners achieve specific outcomes (Dick & Carey, 2015).

Table 5

Steps	Definition/Description
1. Identify Instructional Goals	Determine what learners should be able to do after completing instruction by analyzing needs, examining existing goals, or conducting needs assessments.
2. Conduct Instructional Analysis	Break down the instructional goal into specific component skills and knowledge required for successful performance.
3. Analyze Learners and Contexts	Identify characteristics of target learners, including prior knowledge, skills, attitudes, and the learning environment where skills will be used.
4. Write Performance Objectives	Specify exactly what learners can do, under what conditions, and to what standard after instruction.
5. Develop Assessment Instruments	Create assessments directly tied to performance objectives that measure learner achievement of each objective.
6. Develop Instructional Strategy	Plan the specific instructional activities, including pre-instructional activities, content presentation, learner participation, assessment, and follow-through.
7. Develop and Select Instructional Materials	Create or select instructional materials based on the instructional strategy, including instructor guides, student materials, and media.
8. Design and Conduct Formative Evaluation	Test instructional materials with representative learners to identify areas for improvement before full implementation.
9. Revise Instruction	Use data from formative evaluation to improve the effectiveness of instruction through targeted revisions.

This comprehensive understanding of learners, including their academic motivation, learning preferences, and contextual needs, enables instructional designers to create targeted, effective

learning experiences that align with performance objectives while accommodating the specific characteristics of the learner population.

Example

As an instructional designer at a mid-sized university, I was tasked with developing a new online graduate course in educational leadership. Rather than diving straight into content creation, I employed the Dick and Carey model to ensure a systematic approach.

I met with the subject matter expert to identify the core instructional goal: preparing students to develop data-driven school improvement plans. Through careful analysis, we determined the essential skills students would need and examined the unique characteristics of our working professional student population.

With established, clear performance objectives, I developed authentic assessments that measure students' ability to analyze school data and create implementation plans. These assessments directly informed my instructional strategy, which balanced theoretical foundations with practical applications relevant to the students' professional contexts.

As I developed the course materials, I maintained focus on the interconnected nature of the Dick and Carey model. When initial testing with a small student group revealed confusion around data analysis procedures, I quickly revised those specific modules while ensuring the changes aligned with the established objectives and assessments.

This systematic, iterative approach allowed me to create a cohesive learning experience that addressed the specific needs of the graduate students while maintaining rigorous academic standards—demonstrating the practical value of the Dick and Carey model in higher education instructional design.

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Sociocultural Factors

Sociocultural Theory

Sociocultural Theory, rooted in the work of Lev Vygotsky, emphasizes that learning is fundamentally a social process shaped by cultural, historical, and interpersonal contexts. For instructional designers, this means recognizing that learners construct knowledge through interaction with others, particularly within their Zone of Proximal Development (ZPD) -- the space between what a learner can do independently and what they can achieve with guidance (Vygotsky, 1978). Instructional strategies such as collaborative problem-solving, peer mentoring, and guided participation are essential for activating this zone (Rogoff, 1990). Language plays a central role as a psychological tool that mediates thinking and learning, making dialogue, reflection, and feedback critical components of design (Scott & Palincsar, 2013). Sociocultural Theory also encourages the use of authentic, culturally relevant tasks that connect learners to real-world contexts and shared experiences. Rather than viewing learning as an isolated cognitive event, instructional designers apply this theory by designing

environments that foster social interaction, scaffolded support, and meaningful participation in community-based learning activities.

Example

An instructional designer is developing a professional development course for multilingual educators working in urban schools. Recognizing the diverse cultural and linguistic backgrounds of the participants, the designer integrates collaborative learning activities such as peer-led discussions, case study analysis, and community storytelling. These tasks are framed within authentic contexts—like resolving classroom management challenges or designing inclusive lesson plans—that reflect the educators’ lived experiences. To activate the Zone of Proximal Development (Vygotsky, 1978), the designer includes scaffolded supports such as expert video walkthroughs, guided prompts, and peer mentoring. Participants engage in dialogue-rich environments where language is used not just to communicate but to co-construct meaning (Scott & Palincsar, 2013). By embedding learning in socially and culturally relevant tasks, the designer ensures that knowledge is built through interaction, reflection, and shared problem-solving. This approach fosters deeper engagement, supports transfer to real-world practice, and honors the sociocultural contexts that shape how adult learners make sense of new information.

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Universal Design for Learning

The Universal Design for Learning (UDL) is an evidence-based framework developed by CAST (a nonprofit founded in 1984) with the goal of making spaces and information more accessible to people with disabilities (Story et al, 1998; Trachtman et al, 2000). Instructional designers utilize the UDL framework to improve learning environments and experiences by adding flexibility, customization, and accessible to all learners through various strategies. UDL has three core principles:

1. Engagement: Supporting learners with multiple means of engaging learners (such as personalized topics or diverse tools) to support different background knowledge, learner culture, or personal experience (CAST, 2018; Understood, 2025).
2. Representation: Providing learners with multiple means of representation (such as using a variety of audio, text, and visuals or scaffolding concepts with examples) to support learners’ individualized learning styles and preferences (CAST, 2018; Vanderbilt University, 2025).

3. Action and Expression: Providing learners with multiple means of participating in the learning process (such as through group work or autonomous learning) based on their personal preferences or abilities (supporting learners with assistive technologies or flexible tools, using Responsive Design in mobile devices) (CAST, 2018; CLRN, 2025).

UDL can increase motivation by optimizing personal choice and autonomy, encouraging self-reflection and process evaluation, as well as benefit the learning planning process through setting goals and process monitoring. UDL also leverages neuroscience-based knowledge networks to design instruction that resonates with how people learn (Arkansas Division of Elementary and Secondary Education, 2021). According to the Arkansas Division of Elementary and Secondary Education (2021), “barriers to learning are lessened or removed,” enabling broader access to learning. Bastoni et al. (2023) further emphasize that adult learners benefit from UDL’s focus on autonomy and self-directed learning (p. 3).

Example

In a professional development module designed for teachers transitioning into instructional design, Universal Design for Learning (UDL) principles can be applied to enhance engagement by aligning with the brain’s natural learning networks. The module might begin with scenario-based challenges that tap into the affective network, fostering motivation and relevance through real-world applications (Rose & Meyer, 2002). Content delivery would engage the recognition network by offering multimodal formats—such as infographics, podcasts, and interactive timelines—that support diverse ways of perceiving and processing information (Stanford Medicine, 2025). To activate the strategic network, learners could choose how to demonstrate mastery, whether through narrated slide decks, peer-reviewed critiques, or portfolio pieces tailored to their career goals (Orkwis, 1998). This approach not only respects learner variability but also empowers participants to engage deeply, understand meaningfully, and express confidently. By mapping instruction to these cognitive pathways, UDL transforms learning into a flexible, inclusive experience that supports autonomy, emotional safety, and sustained engagement.

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