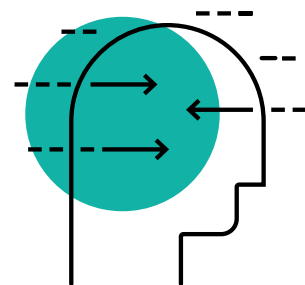




Learning Design Principles  
Minds in Mind

# Developing Understanding



Summary

# What are Pearson's Learning Design Principles?



Our Learning Foundations describe the optimal conditions for learning and reflect the learner experience we hope our products will create. We do this by incorporating our Learning Design Principles.

Each of our Learning Design Principles goes into detail about a key principle, supporting product design and marketing by describing:

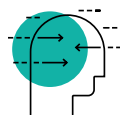
- the research that informs the principle
- why it matters in learning
- how we can apply it in practice

Our portfolio of Learning Design Principles will continue to grow over time.



## Welcoming Experience

- Motivation & Mindset
- Social & Collaborative Learning



## Minds in Mind

- Developing Understanding
- Attention & Cognitive Load
- Active Learning, Memory & Practice
- Desirable Difficulty & Scaffolding
- Feedback for Learning



## Learning Behavior

- Self-Regulated Learning & Metacognition



## Purposeful Design

- Objective Design
- Assessment & Evidence-Centered Design
- Personalized Learning & Adaptive Systems
- Authentic Learning



## Learn Anywhere

- English Performance Standards
- Digital & Virtual Learning

# Developing Understanding

Learners have trouble taking what they've learned and using it in the flexible, back-and-forth way that real life usually demands.

How can we make sure learners gain meaningful knowledge they can use flexibly to solve real-world challenges?

True learning happens when learners build meaningful, connected, at-the-ready, 'usable' knowledge. To do this, learners need to actively construct an accurate mental model, practice and refine it, and weave it meaningfully into the tapestry of their mind. This is what we mean by **developing understanding**.

## Why it matters

Instruction that does not have thoughtful learning design can lead to disconnected knowledge, where learners can only reproduce what they've learned by rote. They don't know when to apply it in the next situation or in slightly different contexts, including situations where it is potentially applicable.

This lack of transfer from in-school to out-of school settings is a serious problem for traditional instructional approaches.

This is a distillation of the core learning process that all learners must think through in an end-to-end learning experience for robust and high-quality learning outcomes.

Introduce new content & build on prior knowledge

Develop knowledge & skills

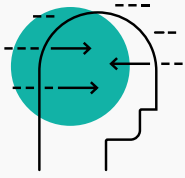
Deepen & connect

Feedback and reflection

## Impact

When we successfully incorporate this principle into learning experiences, we can have an impact on these learner outcomes:

- learners are interested and motivated by what they are learning, because the experience prompts them to connect it to what they already know
- learners persist because the experience provides opportunities for practice and timely feedback
- learners become proficient and can transfer their knowledge to new contexts, because the experience supports them to attain deep and flexible conceptual understanding
- learners apply their knowledge to real-world tasks and engage in self-directed learning, because they have had the chance to reflect on their learning



## Developing Understanding

# The big ideas

1

New information is best learned, remembered, and integrated in a learner's mind when it is **connected to information they already know**.

*Ah ha! This is like something I already know.*

2

*I'm practicing, and getting faster and better.*

Skills and knowledge must be practiced to **build 'muscle memory'** and take on more complex tasks.

3

Knowledge can be flexibly applied if a learner's knowledge is **deeply organized and connected**, and the learner understands the underlying concepts and can recognize when to apply what they've learned.

*I'm deepening what I know. And I can make connections. I can apply what I'm learning.*

4

Learners develop their understanding through **checking** their performance and **reflecting** on how they might improve. Feedback and reflection help learning stick.

*I get feedback on what I'm learning and I take time to think about it. It helps me remember and makes the knowledge stay with me.*

# Activate prior knowledge

New information is best learned, remembered, and integrated in a learner's mind when it is connected to information they already know.

### What it feels like for learners

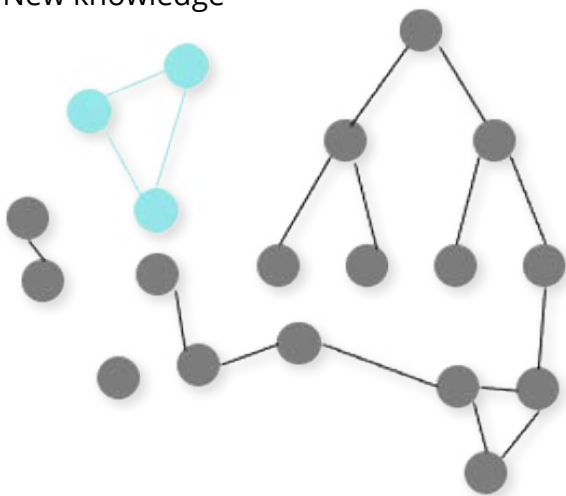
*Ah ha! This is like something I already know.*

- **Knowledge activation is necessary for learning**

We construct new understanding by relating new information to what we already know.

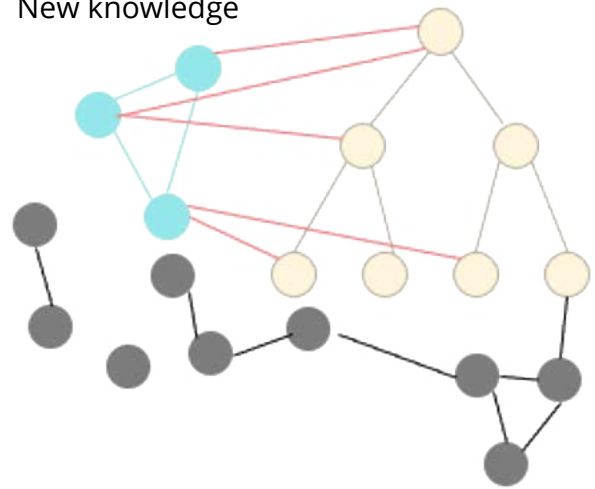
### Prior knowledge not activated

New knowledge



### Prior knowledge activated

New knowledge



- **Knowledge activation jumpstarts understanding**

When new information is taught within the context of something learners already understand, the information is easier for them to learn. Building on ideas the learner already knows “ports over” understanding from the prior knowledge. Learners can then use it to structure and incorporate the new knowledge.

- **Knowledge activation can spark curiosity, excitement, and interest**  
Getting learners excited about a topic can motivate them to learn about it more effectively. Introducing a new topic by posing a puzzling question or a contradiction can spark curiosity. When a topic is presented within a context the learner is already interested in, that interest often carries over and will motivate learning about the new topic.

- **Knowledge activation can sometimes hinder learning**

When a learner has insufficient, inappropriate, or inaccurate prior knowledge, calling it to mind will be less helpful for understanding the new ideas.



**See these Learning Design Principles:**

Personalized Learning  
and Adaptive Systems  
Authentic Learning



**See this Learning Design Principle:**

Motivation & Mindset

## What it means for designing learning experiences

- Gauge prior knowledge
- Activate prior knowledge to jumpstart understanding
- Overcome prior misconceptions and misunderstandings
- Use prior knowledge to spark curiosity, excitement, or interest
- Deliberately connect new information to things the learner already knows and is able to do.
- Use analogies as a bridge between what a learner already knows and a new concept
- Pose puzzling questions to spark curiosity and motivate learners to learn more



# Develop knowledge and skills

Skills and knowledge must be practiced to build 'muscle memory' and take on more complex tasks.

### What it feels like for learners

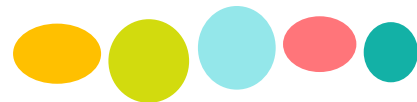
*I'm practicing, and getting faster and better.*

- **Practice is necessary for expertise**  
With deliberate practice and feedback, retrieving knowledge goes from effortful to fluent to automatic. Automatic retrieval of knowledge is an important characteristic of expertise.
- **Practice starts with component skills, then complex tasks**  
Use scaffolding to focus practice on the component skills within a complex task. Then fade out the scaffolding as the learner becomes more proficient. Worked examples (which present an expert's step-by-step process for solving a problem) are effective for novice learners
- **Practice should align with the target knowledge or ability**  
Figure out the type of knowledge the learner is acquiring, and the demands on their cognitive processes. Only then can you select the best instructional activities and learning environment.

Separate complex skills...



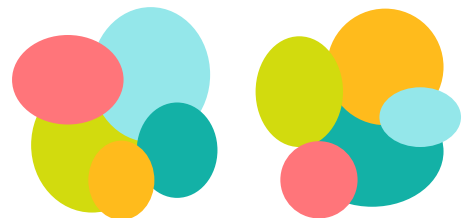
... into component skills. Practice...



... then reassemble.



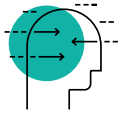
Integrate complex skills...



...into complex tasks







**See these Learning Design Principles:**

Active Learning, Memory & Practice  
Desirable Difficulty & Scaffolding



**See these Learning Design Principles:**

Assessment & Evidence-Centered Design  
Authentic Learning

## What it means for designing learning experiences

- Support deliberate practice, with feedback, to make retrieval of skills and concepts automatic
- Provide practice opportunities that are appropriately challenging
- People learn what they practice, so make sure practice tasks are aligned with the target knowledge or skill
- Provide support and scaffolds in the early stages of practice. Fade them out as the learner grows more proficient.

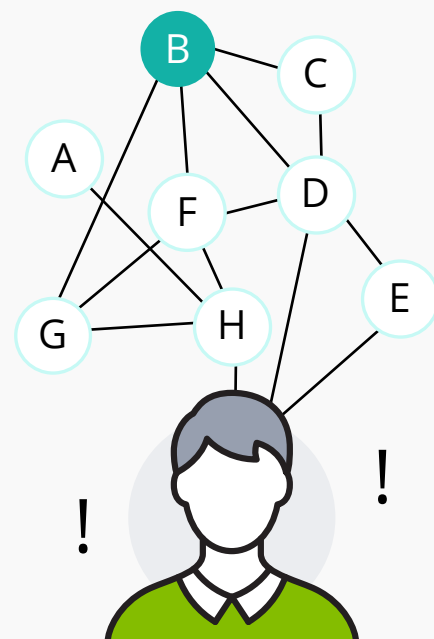
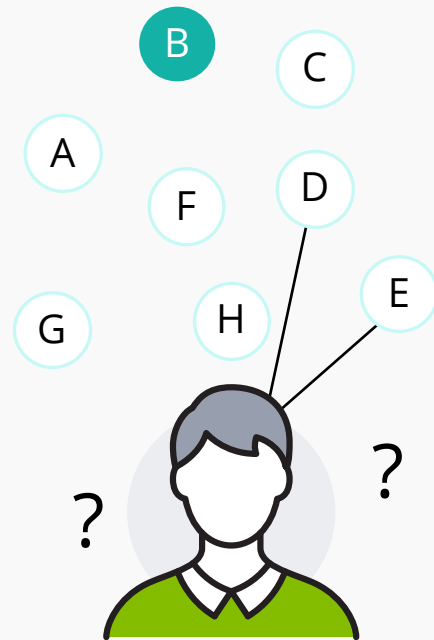
# Deep and connected knowledge

Knowledge can be flexibly applied if a learner's knowledge is deeply organized and connected, and the learner understands the underlying concepts and can recognize when to apply what they've learned.

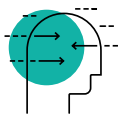
### What it feels like for learners

*The things I'm learning fit together into a bigger picture.*

- **Deep and connected knowledge is organized around underlying concepts and meaningful structure**  
How learners organize their knowledge influences how they learn and apply what they know. Surfacing the organizing principles helps learners understand when to use their knowledge.
- **Deep and connected knowledge can be accessed flexibly**  
When knowledge is connected, there are many access routes to activating the knowledge. The more ways you can get to it, the more likely it can be recalled in the moment when it needs to be applied.



- **Deep and connected knowledge aids knowledge transfer**  
Knowledge often gets “stuck” in the context it was learned in. The ability to apply skills learned in one context to a new context (“transfer”) is an important goal of education. Connected knowledge is essential for transfer.
- **This organization around underlying concepts allows them to build connections between their understandings and see patterns across varied contexts**



**See this Learning Design Principle:**  
Active Learning, Memory & Practice



**See this Learning Design Principle:**  
Authentic Learning

## What it means for designing learning experiences

- Surface core concepts and underlying principles, so learners can flexibly apply
- Practicing applying knowledge in different contexts allows for generalization
- Increase discrimination by using compare and contrast exercises
- Use analogies to encourage transfer
- Provide authentic practice opportunities for learners to deepen their knowledge and connect to authentic practices
- Make knowledge explicit by asking learners to explain their reasoning
- Encourage learners to explain how instances are examples of certain underlying concepts. Consider asking learners to group or organize instances by concepts, not by surface features.
- Provide opportunities for learners to practice deciding how and when they need to apply their knowledge at appropriate times.

# Feedback and reflection

Learners develop their understanding through checking their performance and reflecting on how they might improve. Feedback and reflection help learning stick.

### What it feels like for learners

*Getting feedback tells me how I'm doing, and gives me a chance to think about what I've learned.*

Feedback and reflection are grist for the mill of learning. Feedback provides opportunities to gauge learners' progress and to adjust and target learning accordingly.

Formative assessment increases the efficiency of learning. It allows the instructor or learner to target their learning efforts on content they have yet to master, and to avoid wasting time and energy re-learning stuff they already know.

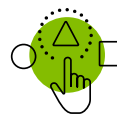
In addition, providing support for student reflection helps effectively manage study time, improve insight into what they need for their own learning process (metacognition), and learn more efficiently and robustly.

- Goal-directed practice coupled with targeted feedback are critical to learning
- Feedback is information to the learner on where they are now, where they need to go, and ideally, how they can improve and get there.

- Reflection helps people become self-directed learners. It supports students learning the demands of the task, evaluate their own knowledge and skills, plan their approach, monitor their progress, and adjust strategies as needed.



**See this Learning Design Principle:**  
Feedback for Learning



**See this Learning Design Principle:**  
Self-Regulated Learning & Metacognition

### What it means for designing learning experiences

- Provide lots of opportunity for low-stakes formative assessment with feedback
- After providing feedback, provide an opportunity to act on it as soon as possible
- Include spaced practice and elaboration to enhance long-term performance help learners connect new ideas to what they already know
- Highlight misconceptions through feedback and providing opportunities for (self) remediation
- Collect usage and performance data on formative assessments
- Encourage reflection and scaffold self-regulated learning opportunities.

# Making it inclusive

We aim to design a great learning experience *for everyone*. These considerations will help you get closer to designing a truly inclusive experience.

## Accessibility

*Accommodations provided to allow learners with specific needs to participate in a learning experience*

- Encourage development and content teams to provide multiple examples that account for different ways of perceiving information
- Avoid imposing time constraints on learners, and allow multiple attempts, to give learners with varied levels of self-regulation the time and comfort to learn and understand content

## Availability and access

*Barriers — often external and systemic — that affect whether the tools and resources needed for learning are available to learners*

- Learning experiences may have media-rich examples to boost understanding, which can affect learners with limited access based on many factors. Include non-media rich equivalents that can be accessed at any time
- Create learning experiences that are in shorter, bite-sized chunks to allow learners to efficiently schedule their learning around their daily life

## Identity

*The combination of dimensions that define who learners are to themselves and others*

- Create opportunities for learners to deepen understanding and apply learning to solve challenges in the real world — especially in relation to learners' immediate and future goals
- Whether feedback is attended to or disregarded relies on whether learners trust the source of that feedback, how feedback is delivered, and whether the learner is an active participant in evaluating the feedback and deciding how to respond to it

## Culture

*Shared patterns of behaviors and interactions, cognitive constructs, and affective understanding that learners acquire through socialization*

- Encourage content teams to engage with members of diverse cultural communities to make sure that multiple ways to deepen and apply understanding are built into a learning experience
- Present information in as neutral a way as possible, without the need for assumed cultural knowledge or background

In partnership with  **CAST**

CAST is a nonprofit education research and development organization that created the Universal Design for Learning framework and UDL Guidelines, now used the world over to make learning more inclusive.

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Katherine McEldoon is a research-to-practice connector. After earning her Ph.D. in cognitive and learning sciences at Vanderbilt University and a post at Arizona State University's Learning Sciences Institute, she has worked in academia, government, and industry to ensure the best scientific insights support student learning, no matter the context. Katherine has most recently worked as Lead Learning Scientist on Pearson's Efficacy & Learning team, bringing evidence-based insights to Pearson's world of learners.



## **Daniel Belenky, Ph.D.**

Daniel Belenky is a learning scientist with over 10 years of experience applying educational research to improve learning outcomes. He is passionate about helping learners achieve their goals, with experience designing, testing, iterating, and communicating about innovative and impactful educational experiences. He earned a Ph.D in Cognitive Psychology from the University of Pittsburgh, where his research focused on how student motivation influences learning and transfer. Dan also completed a Post-Doctoral Fellowship in the Human-Computer Interaction Institute at Carnegie Mellon University.

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