Making Science Stick: An ASE Masterclass

In Partnership with Educake and supported by AQA

Making Revision Accessible to SEND Learners

Dr Katy Bloom
York St John University
k.bloom@yorksj.ac.uk

ASSOCIATION FOR SCIENCE EDUCATION

Educake

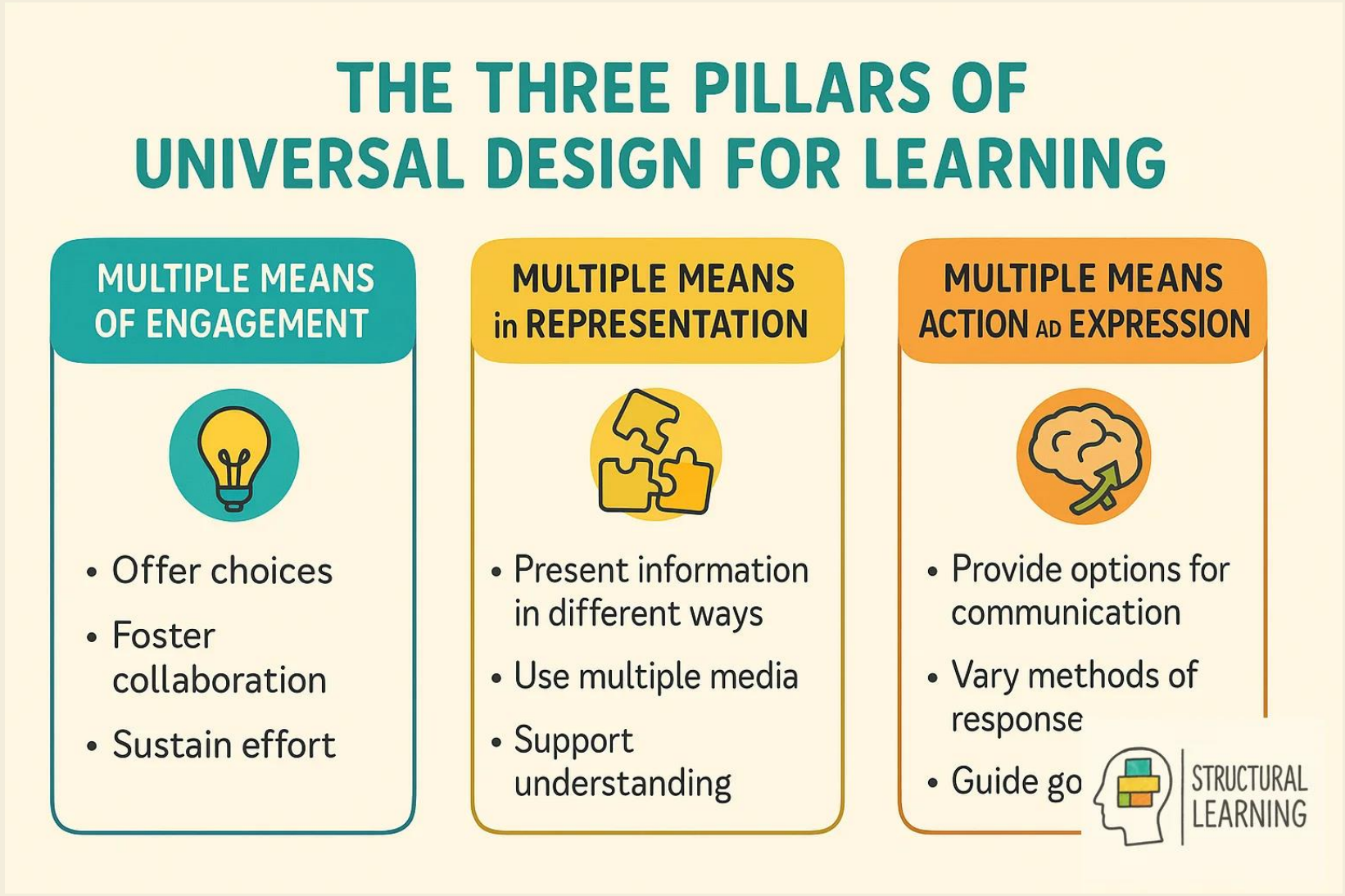
AQA Questions matter

Key takeaways

- Practical revision techniques aligned with UDL principles
- Resources you can implement immediately
- Specific adaptations for common SEND profiles
- Exam access strategies and reasonable adjustments

ASSOCIATION FOR SCIENCE EDUCATION

Universal Design for Learning [UDL]



UDL emphasises the creation of instructional goals, methods, materials, and assessments that are inherently flexible.

build accessibility into initial planning, ensuring lessons naturally accommodate diverse learning needs

The ‘why’ of learning

The ‘what’ of learning

The ‘how’ of learning

ASSOCIATION FOR SCIENCE EDUCATION

Multiple means of Engagement (the why of learning)

- ✓ Motivation – optimise choice and autonomy
- ✓ Flexibility
- ✓ Allowing choice reduces anxiety
- ✓ Clear success criteria
- ✓ Using assistive technology & resources
- ✓ Frequent short breaks
- ✓ Recognise effort and persistence
- ✓ Creative arts to enhance learning
- ✓ Specific attainable goals
- ✓ Mnemonics and acronyms (personal, silly, rude), Songs
- ✓ Managing exam stress and well being – emotional capacity

ASSOCIATION FOR SCIENCE EDUCATION

Reducing anxiety and building confidence: low stakes practice – quiz formats for different needs

For students who freeze under pressure:

- Open-book quizzes initially
- "Phone a friend" option (can ask one person one question)
- No time limits
- Can have second attempt immediately
- Self-marking with mark scheme provided

For students who need immediate feedback:

- Kahoot or Quizizz (instant results, gamified)
- Self-checking flashcards (answer on reverse)
- Online quizzes with instant scoring
- Partner quizzes where students swap and mark

For students who struggle with writing:

- Multiple choice questions
- Drag-and-drop digital activities
- Verbal quizzes (speak answers instead of write)
- Point to answer options

Choice in methods – modality options

Written Options:

- Traditional notes
- Mind maps
- Bullet point summaries
- Question and answer format
- Create quiz questions for others

Creative Options:

- Create posters or infographics
- Make revision videos (screencast or self-recording)
- Build models or demonstrations
- Design board games or card games about topics
- Write songs or raps
- Create TikTok-style short videos

Verbal Options:

- Record voice explanations
- Teach someone else (family, friend, study group)
- Create podcasts or ‘revision radio’
- Answer questions out loud (record for playback)

Digital Options:

- Build a revision website or blog
- Create PowerPoint presentations
- Design Canva infographics
- Make Quizlet sets
- Use Padlet or OneNote for organised notes

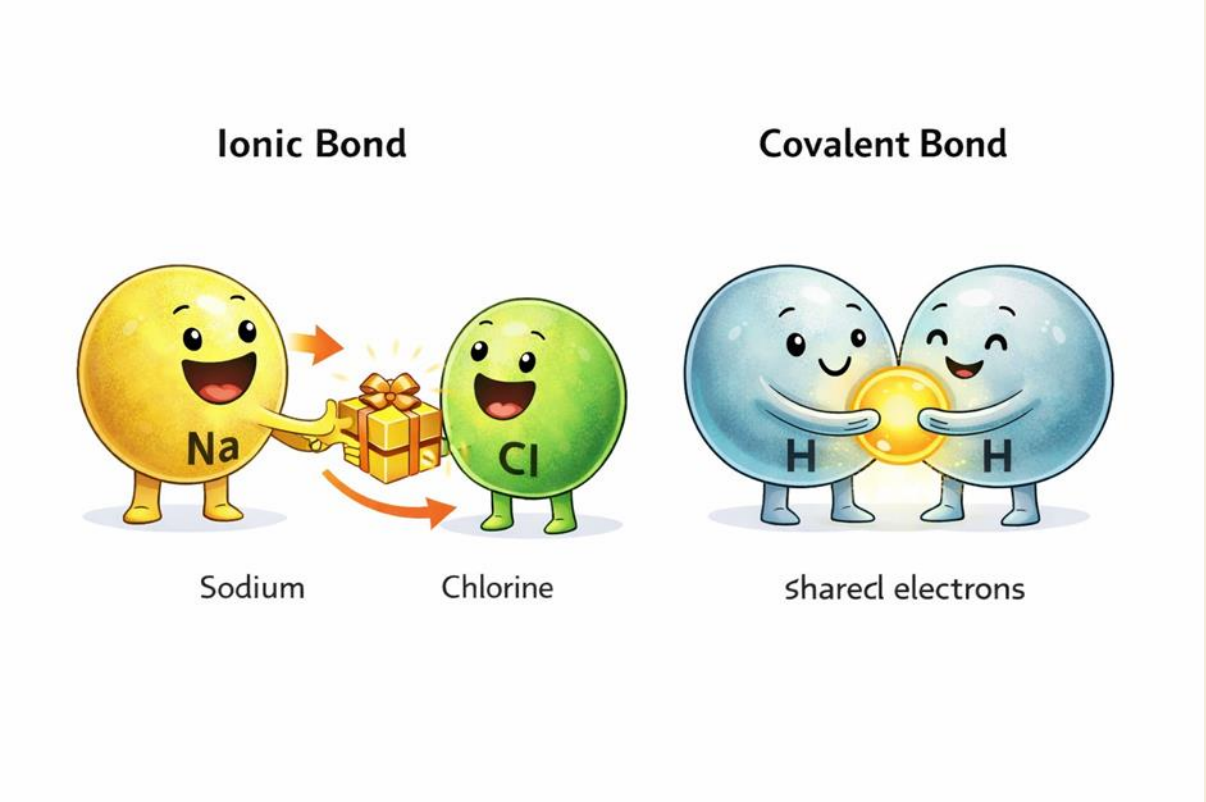
Multi-sensory learning approaches: visual supports 1

Colour coding

- assign colours (e.g.) blue for physics
- Use highlighters to categorise information (yellow for definitions, blue for equations
- Create visual hierarchies

Visual memory techniques

- Memory palace
- Sketch noting
- Develop symbol systems (arrows for causes, stars for important, triangles for warning/hazard)
- Visual cue cards; one image per card that triggers memory of concept



Dual Coding Rule: Always draw the image on one side of your card and write the formal definition on the other.

Next step: describe and get them to sketch

Multi-sensory learning approaches: visual supports 2

Graphic organisers are useful scaffolds, but also can support processing levels

- Bubble/ Cluster/ Target map/ model map for a define/describe level
- Sequence/ Cause and effect/ Flow bubble for a sequence level
- Compare-contrast or Venn for similarities and differences/justify/evaluate
- Analyse or Fishbone for Find cause/explain

They can also be used very actively for revision ☞ Task!

Multi-sensory learning approaches: physical

Physical models

- DNA models from pipe cleaners, beads, or sweets
- Cell structures using household items (balloon for cell membrane, sponge for cytoplasm)
- Particle arrangement models using students themselves (solid/liquid/gas demonstrations)
- Forces demonstrations with everyday objects/sweets(friction, gravity, air resistance)
- Chemical reaction modelling with LEGO or coloured balls

Acting out

- Act out processes: students become atoms in a reaction, electrons in a circuit, or blood cells traveling through the heart
- Use gestures for concepts (fist opening for cell division, wave motions for different types of waves)
- Create revision walk-routes: place topic cards around a room and physically move between them
- Build 3D models that can be manipulated and examined from all angles

Link to physical examples

- Link to practical work done, use virtual labs (PHET)

Multi-sensory learning approaches: using audio

Recording Strategies:

- Record revision notes in own voice
- Create ‘explain it to a child’ recordings
- Make quiz recordings: record questions with 10-second pauses before answers
- Use background music [caution]

Podcast-Style Learning:

- Listen to BBC Bitesize Daily podcasts
- Use text-to-speech for textbook sections
- Use Google Notebook to create short podcasts
- Talk script

Verbal rehearsal:

- Read notes aloud while walking (movement + auditory processing)
- ‘Teach’ concepts to pets, family members, stuffed toys or the kettle
- Use voice notes to answer practice questions rather than writing

Darwin being interviewed

Reporter: Mr. Darwin, your theory of natural selection has been revolutionary. Can you explain its core principle in simple terms?

Darwin: Certainly. Nature favours variation. Organisms within a species differ; some beaks are stronger, some survive droughts better. Those better suited to their environment survive and pass their traits to offspring.

Reporter: So survival of the fittest means best adapted, not strongest?

Darwin: Precisely. Strength matters little if an organism cannot find food or resist disease. Adaptation is everything. Over countless generations, small variations become new species entirely.

Reporter: How did you arrive at this theory?

Darwin: The HMS Beagle's voyage revealed finches with different beaks on the Galápagos Islands, each suited to available food. If pigeon breeders could engineer traits so quickly, why not nature over millennia?

Reporter: What would you say to modern critics who reject your theory?

Darwin: Evidence speaks louder than doctrine. We see natural selection operating today—antibiotic resistance in bacteria, colour shifts in moths during industrialisation. The mechanism is undeniable. These are not hypotheticals; they're observable facts.

Multiple means of action and expression: chunking information

Detailed approach (photosynthesis):

1. What it is: Definition only (plants making glucose)
2. Where: Chloroplasts and chlorophyll
3. Inputs needed: Carbon dioxide, water, light
4. Outputs produced: Glucose, oxygen
5. The equation: Word equation, then symbol equation separately
6. Limiting factors: Temperature, light, CO_2 (tackle one at a time)
7. Uses of glucose: Each use as separate mini-topic

Make into a template?

Visual chunk map: knowledge tree

trunk = main topic

branches = sub-topics

leaves = specific facts

Again, use a template so that it is pictorial?

Chunking continued…

Micro learning sessions:

- 10-15 minutes focused sessions on single concepts
- Use Pomodoro technique: 15 minutes work, 5 minutes break
- Complete one chunk before moving to next
- Keep daily revision logs to track which chunks are secure

Manual Spaced Repetition, such as Leitner Box System: Physical flashcards in boxes

- Box 1: Review daily (new or struggled-with cards)
- Box 2: Review every 3 days (getting there)
- Box 3: Review weekly (confident)
- Box 4: Review monthly (mastered)

Move cards forward when correct, back when incorrect

Watch your language…

Original Textbook Language:

Osmosis is the net movement of water molecules from a region of higher water potential to a region of lower water potential through a partially permeable membrane.

Simplified Version 1:

Osmosis is when water moves through a special membrane from where there's lots of water to where there's less water.

Simplified Version 2 (with analogy):

Think of osmosis like people moving from a crowded room to an empty room through a doorway that only lets people through (not furniture). The water is the people, and the membrane is the doorway.

Dual coding

Combining words with visuals creates two memory traces, doubling retrieval pathways.

1: Icon Notes

- Next to "Photosynthesis" → draw simple leaf with sun
- Next to "Respiration" → draw lungs or person breathing
- Next to "Exothermic" → draw thermometer with arrow up
- Next to "Endothermic" → draw thermometer with arrow down

2: Cartoon Strips Create mini comic-strip stories for processes:

- Cell division in 4-6 panels
- Digestive system as journey from mouth to anus
- Electricity flow through circuit as adventure story

3: Infographic Style

- One A4 page per topic
- 70% visual (diagrams, arrows, colour, symbols)
- 30% text (key words only, no full sentences)

4. Digital Dual Coding:

- Use Canva or similar to create visually appealing notes
- Combine images from Google with typed key terms
- Create digital posters or Instagram-style posts for topics

No artistic skill needed:
Stick figures work perfectly
Simple shapes (circles, squares, arrows)
Use symbols consistently (= for "same as", ≠ for "different from")
Download icons/clipart if needed

ASSOCIATION FOR SCIENCE EDUCATION

Pedagogy planning toolkit download

Thinking Skills Placemat download

ASSOCIATION FOR SCIENCE EDUCATION

UDL suggest a simple ‘plus one’ strategy: adding one alternative way for students to engage with, represent, or express knowledge each time you plan.

What will you do next?

https://udlguidelines.cast.org/more/downloads/#choose-your-udl-guidelines-v-30-representation

Universal Design for Learning Guidelines

The goal of UDL is learner agency that is purposeful & reflective, resourceful & authentic, strategic & action-oriented.

	Design Multiple Means of **Engagement**	Design Multiple Means of **Representation**	Design Multiple Means of **Action & Expression**
Access	Design Options for **Welcoming Interests & Identities** (7) • Optimize choice and autonomy (7.1) • Optimize relevance, value, and authenticity (7.2) • Nurture joy and play (7.3) • Address biases, threats, and distractions (7.4)	Design Options for **Perception** (1) • Support opportunities to customize the display of information (1.1) • Support multiple ways to perceive information (1.2) • Represent a diversity of perspectives and identities in authentic ways (1.3)	Design Options for **Interaction** (4) • Vary and honor the methods for response, navigation, and movement (4.1) • Optimize access to accessible materials and assistive and accessible technologies and tools (4.2)
Support	Design Options for **Sustaining Effort & Persistence** (8) • Clarify the meaning and purpose of goals (8.1) • Optimize challenge and support (8.2) • Foster collaboration, interdependence, and collective learning (8.3) • Foster belonging and community (8.4) • Offer action-oriented feedback (8.5)	Design Options for **Language & Symbols** (2) • Clarify vocabulary, symbols, and language structures (2.1) • Support decoding of text, mathematical notation, and symbols (2.2) • Cultivate understanding and respect across languages and dialects (2.3) • Address biases in the use of language and symbols (2.4) • Illustrate through multiple media (2.5)	Design Options for **Expression & Communication** (5) • Use multiple media for communication (5.1) • Use multiple tools for construction, composition, and creativity (5.2) • Build fluencies with graduated support for practice and performance (5.3) • Address biases related to modes of expression and communication (5.4)
Executive Function	Design Options for **Emotional Capacity** (9) • Recognize expectations, beliefs, and motivations (9.1) • Develop awareness of self and others (9.2) • Promote individual and collective reflection (9.3) • Cultivate empathy and restorative practices (9.4)	Design Options for **Building Knowledge** (3) • Connect prior knowledge to new learning (3.1) • Highlight and explore patterns, critical features, big ideas, and relationships (3.2) • Cultivate multiple ways of knowing and making meaning (3.3) • Maximize transfer and generalization (3.4)	Design Options for **Strategy Development** (6) • Set meaningful goals (6.1) • Anticipate and plan for challenges (6.2) • Organize information and resources (6.3) • Enhance capacity for monitoring progress (6.4) • Challenge exclusionary practices (6.5)

Making Science Stick: An ASE Masterclass

In partnership with Educake, and supported by AQA

ASSOCIATION FOR SCIENCE EDUCATION

Educake

AQA Questions matter