

How brains learn

Activities and supporting materials

Throughout the 'How brains learn' video there are activity prompts where the viewer/s can pause and do an activity.

These activities are designed for training sessions where viewers can discuss what they have learnt in small groups, and exchange ideas of how this might be relevant to their own teaching, subject and/or students. An ideal group size would be approximately 4 to 7 members. Timings for activities are guidelines and can be modified to your needs.

If you are intending to use this resource independently we suggest that you exchange ideas or notes with a colleague.

To carry out the activities participants will need a textbook or course outline for a topic they will be teaching.

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1. Table of top ten classroom methods

Top ten methods		
1	Similes and analogies	<p>This method comes in several parts:</p> <ol style="list-style-type: none"> using similes, analogies, models etc in your teaching to link the new knowledge to things the students already know about is one of the most effective methods of improving learning. getting your students to identify similarities and differences between ideas which they can easily muddle up <p>Similes and analogies can also be used as an active learning method if students create them themselves.</p>
2	Note-making and summarizing	<p>This is a process by which your students discover the big picture, the main points from their learning. Examples:</p> <ul style="list-style-type: none"> Doing a précis. Students make notes as you talk, or as they watch a video. Making a mindmap at the end of a topic <p>Notes made by the learner are more effective than copied notes, books etc.</p>
3	Reinforcing effort	<p>Also known as Attribution Training (to what do they attribute the results of their learning?) and creating a Growth Mindset. Learners who attribute their performance to things they cannot change (natural ability, quality of teaching etc) do significantly worse than those who attribute it to their effort.</p> <ul style="list-style-type: none"> Use language with students which recognises effort, not ability.
4	Homework and practice	<p>Staged repetition: The brain needs repetitions to secure memories.</p> <ul style="list-style-type: none"> Will you have to change the way you teach your topic to build in the staged repeats needed for good memories?
5	Graphical methods	<p>This means using any method other than spoken or written words. Visual methods are especially effective.</p> <ul style="list-style-type: none"> Pictures, diagrams, mind-maps, graphical organiser etc
6	Cooperative learning	<p>This covers a wide variety of ways that students can work together. Some examples:</p> <ul style="list-style-type: none"> Discuss a question in pairs before answering. Work together to make a presentation. Initially, students work on their own, then come together as a group and agree a shared answer. Work together on a practical task to achieve an objective, solve a problem etc

7	Goals and feedback	<p>Setting goals and objectives helps the learner see where they are going. Providing feedback shows them how far they are on this learning journey. Assessment for Learning (AfL) is an example of this.</p> <p>Summative assessment: a test or task which is marked by the teacher and the student receives a numerical mark, grade etc</p> <p>Formative assessment: feedback given to a student which increases their learning.</p> <p>Research shows that summative tests have an overall slight negative effect on learning and should be used as little as possible. Formative Assessment is a highly effective learning device which can take a huge variety of forms.</p> <ul style="list-style-type: none"> • Peer and self-assessment. Learners mark/assess themselves or other learners. • Formative comments. Verbal or written. (e.g. “three stars and a wish”) • Card sorting. • Assertive questioning
8	Hypothesis testing	<p>A “hypothesis” is an unproven explanation, the first step to developing a “theory”. This approach covers active learning methods where students grapple with a problem</p> <ul style="list-style-type: none"> • Modern history: “Why did we invade Iraq?” • Building: “Why don’t we have the bedrooms downstairs?” • Fitness: “What sort of training routine would suit someone with high blood pressure?” • Teaching: “Why are evidence based methods not taught in PGCE courses?”
9	Activating prior knowledge	<p>Students need to be able to link their new learning to something they already know. We need to assess the current level of knowledge and build on it. The old learning needs to be “activated” by bringing it to mind. Nothing new can be learned (other than by rote) unless it is linked to existing concrete knowledge.</p>
10	Advance organisers	<p>Advance Organisers show the student what will be covered in the session (or course) and should be referred to it during the course. This helps make the links between the detail and the big picture.</p> <p>They work better if presented graphically, either with words or, preferably, pictures. Mind-mapping is a variation.</p>

2.2 Activities

Part 1: Brain basics

Activity 1: Main brain areas

Activity duration: approx 15 mins

Video timing: 15 min / part1

Objective: consider implications of how brain functions can affect teaching.

Section summary:

- The brain has a number of specialist areas.
- “Intelligence” is not just in one place.
- Most thinking uses several parts.
- Plasticity means the brain can change.

Task:

In your group discuss how each of the brain functions below can affect the way in which you teach. As a group create a bullet pointed list of implications for teaching.

Activity 2: Forming memories

Duration: 15 mins

Video location: 27 min 33 sec / part1

Objectives: identify and apply effective classroom methods

Section summary:

Learning happens when the brain changes. Students who believe their ability is fixed, learn more slowly than those with a correct view.

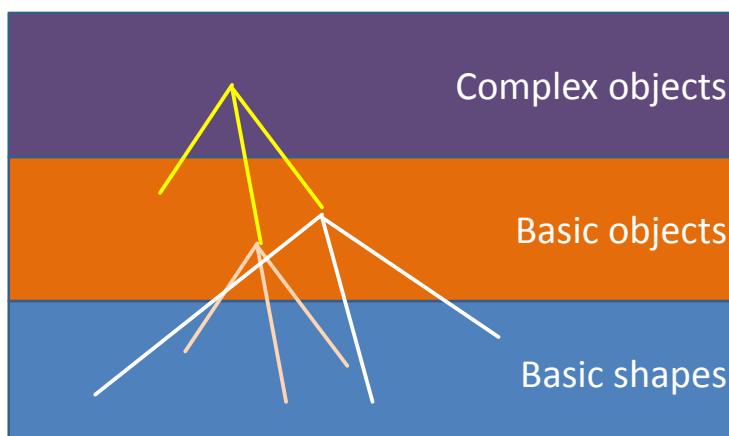
The visual cortex makes up nearly 1/3 of the total and works well for the majority of students. Graphical and other visual methods are often more effective than words.

The brain works at two levels at once: at the detail and at the overall picture. We need to include both levels in our teaching.

Memories are connections between brain cells. These connections cannot be formed at a single "visit". Repetition is vital to learning.

The brain builds up memories of objects by making connections to component shapes. Memories of complex ideas are networks of such links. They are imperfect and often get muddled.

Knowledge is in a hierarchy : linking down through simpler objects to basic building blocks.



Task:

Allow 5 minutes for each member of your group to select an effective method from the list below and write down how you would use it in your teaching. Finally spend 10 minutes to share your ideas and discuss.

Pick an activity from this list

- **Reinforcing effort:** how will you help your students develop a Growth Mindset? What sorts of things will you say, or not say?
- **Graphical methods:** create a graphic to explain one item in the course.
- **Advance organiser:** create a simple mind-map to show an overview of the topic.
- **Homework and practice:** how will you give the opportunity for students to secure memories by repetition?

Activity 3: Organising memories**Duration:** 15 mins**Video location:** End of Part 1**Objective:** to identify the different ways the brain organises the knowledge and practice one of them**Section summary:**

Memories are built up as a hierarchy with new knowledge building on prior learning.

Memories are not isolated (as they are on a computer). They are linked together in ways we call classification, analogies, explanations/theories etc. Securing these links makes memories accessible to the learner.

Task:

The effective methods below were identified in this section 'memories and learning'. The task is to apply some of these methods to a topic you will be teaching. Ask each member of your group to try out a method from the list below.

Take 5 minutes to write down how to use the method in a topic. Use 10 minutes to share plans and discuss.

- **Activating prior knowledge:** Identify the prior learning needed to understand the topic. How will you assess your students' prior knowledge? How will you remedy missing material?
- **Similes and analogies:** Identify new examples which can be used to teach your topic.
- **Models:** Devise a physical or mental model relevant to your topic
- **Theories:** Identify a theory used in your topic. What is the simplest version you can use to introduce your students?

Part 2: Higher order thinking

Activity 4: Thinking skills

Duration: 15 mins

Video location: 20 min 30 sec / Part 2

Objective: consider how to develop your student's skills

Section summary:

Higher order thinking requires the skills of the pre-frontal cortex as listed below. Without these skills abstract thinking will be difficult.

Task:

Individuals or pairs, pick one of these skills and discuss how to develop it in your students. Take 5 minutes to write down your ideas. Use 10 minutes to share plans with the group and discuss how these ideas could be implemented in your school/college.

- attention
- controlling emotions
- working memory
- delayed gratification
- visual imagination

Activity 5: Abstract concepts (2 activities)**Section summary:**

Learning an abstract concept requires a whole network of connections to be made in the brain. Only active learning tasks can do this.

Abstract ideas can only be developed when linked to concrete knowledge. Activity 5b develops ideas touched on in part 1.

Activity 5 a: Using active learning methods

Duration: 15 mins

Video location: end of Part 2

Objective: to plan to use Active Learning methods to secure abstract knowledge

Task:

Allow each member of your group to select one of the following Active Learning methods to secure an abstract idea/concept to their students.

Explain why you have chosen the method to your peers.

- Presentation
- Mind-mapping
- Problem solving (hypothesis testing)
- Group-work
- Note-making and summarising
- Card sort
- Creating analogies

Activity 5 b (extension activity): Identifying abstract concepts

Duration: 15 mins

Video location: end of Part 2

Objective: to identify abstract concepts in a topic of your choice and how best to link them to concrete knowledge.

Task:

- Identify symbols, keywords and abstract concepts in your topic.
(Ask: "What do they find hard in this topic?")
- Plan how you will secure the link between the symbols and the thing they represent.
(for example linking the symbol "3" with the "threeness" of a group of cups)
- Develop similes to link unfamiliar keywords to concrete knowledge
(concrete is like mortar, but with stones added; grapefruit are like large yellow oranges; the United Nations is like a parliament for all the nations on Earth)
- Develop analogies or models to link abstract concepts to existing knowledge
(the pope is like the father of the church family; the flow of electricity is like the flow of water in a hose-pipe)

3 - Books and other references

3.1 Books

Classroom-based evidence

Author	Title	Description
Geoff Petty	<i>"Evidence based Teaching"</i>	A teacher-friendly guide to the findings of Hattie and Marzano.
Robert Marzano	<i>"Classroom Instruction that Works"</i>	Based on meta-studies of good classroom experiments
John Hattie	<i>"Visible Learning"</i>	A study looking at a wider range of experiments including curriculum, teachers' skills and school management.

Brain science evidence (Neuroscience for teachers)

Author	Short title	Descriptive title
Eleanor Dommett	Learning and the Brain Pocketbook	Jargon-free and very accessible
Sarah-Jayne Blakemore	<i>The learning brain</i>	An authoritative account of how the brain learns
Judy Willis	<i>Ignite</i>	Research-based strategies to ignite student learning
David Sousa	<i>How the brain learns</i>	For educators who want to ground their professional development in research about the brain
James Zull	<i>The art of changing the brain</i>	Enriching the practice of teaching by exploring the Biology of learning
Patricia Wolfe	<i>Brain matters</i>	Translating research into classroom practice
John Geake	<i>The brain at school</i>	A guide to how cognitive neuroscience can inform teacher's practice

Rita Carter	<i>The Brain Book</i>	DK large format guide to the brain with clear diagrams and non-technical text
Rita Carter	<i>Mapping the mind</i>	Shows how scans can be used to reveal aspects of our behaviour

3.2 Video

The top ten methods are explained and demonstrated with clips from real classrooms in this video resource: **The Evidence-based Teacher's top ten methods.**

Available from www.evidencebasedteaching.co.uk

3.3 Websites

- Geoff Petty has a wide range of free resources: www.geoffpetty.com
- The Evidence Based Teaching website has a section on recommended books, video and other resources: www.evidencebasedteaching.co.uk
- Handbook in PDF format from Marzano
http://www.mcrel.org/pdf/instruction/5992tg_what_works.pdf