

Growth Mindset Through Neuroplasticity



Part 2: Lesson Plan

A 60-minute interactive lesson that helps students explore how the brain changes with learning, practice and perseverance.



Ages
Upper Primary
& Secondary



Duration
60 minutes



Includes
Learning Objectives
Step-by-Step Lesson Plan
Differentiation & Assessment



When students understand that their brain can change, they unlock the powers to learn and grow.



Growth Mindset Through Neuroplasticity

Part 2: Lesson Plan

Info



Suggested age range: Upper primary to secondary

Duration of lesson: 60 minutes

Main teaching tool: Interactive 3D Neural Plasticity Simulator

Core message: The brain is not fixed. Learning and practice change the brain by strengthening useful connections and weakening unused ones.

1. Lesson Overview

Students explore the idea that learning physically changes the brain. They begin with a crumpled paper activity to create a tactile metaphor for neural pathways. They then observe a 3D neural plasticity simulator showing learning, practice, signal firing, and pruning. Students connect the simulation to growth mindset language by changing fixed-mindset statements into growth-mindset statements. The lesson ends with a personal practice commitment.

The lesson can be used with upper primary or secondary students. For younger learners, the biological vocabulary should be reduced and the lesson should focus on simple ideas such as practice, mistakes, “yet,” and trying again. For older learners, the teacher can introduce more precise vocabulary such as neurons, synapses, dendritic spines, neuroplasticity, long-term potentiation, and pruning.

2. Learning Objectives

By the end of the lesson, students should be able to:

1. Explain that the brain can change through learning and practice.
2. Describe, in simple terms, how practice can strengthen neural connections.
3. Identify fixed-mindset language and rewrite it using growth-mindset language.
4. Give one personal example of something they improved through practice.
5. Commit to one specific learning behaviour they will practise this week.

3. Success Criteria

Primary success criteria

- I can say, “My brain can learn.”

- I can say, “I cannot do this yet.”
- I can name one thing I practised and improved.
- I can choose one small thing to practise.

Secondary success criteria

- I can explain that learning changes neural networks.
- I can connect practice to stronger pathways or synapses.
- I can rewrite fixed-mindset language with a strategy, not only the word “yet.”
- I can explain why mistakes are useful only when I respond to them.
- I can make a specific practice plan.

4. Key Resources

1. Interactive 3D Neural Plasticity Simulator
2. Projector or large screen
3. One blank sheet of paper per student
4. Pen or pencil per student
5. Student worksheet
6. Board or slides for key vocabulary and sentence frames

5. Guiding Questions

General guiding questions to use throughout the lesson:

1. What changes when we learn something new?
2. What changes when we practise something many times?
3. What happens to learning that we do not use?
4. Why is “I cannot do this yet” more accurate than “I cannot do this”?
5. What is one thing your brain has already learned to do better?

6. Lesson Sequence: 60 Minutes

0–5 minutes: Starter – Crumpled Paper Brain

Give each student one blank sheet of paper.

Ask students to crumple the paper into a ball, then unfold it carefully. They should not try to make it perfect. Next, ask them to trace some of the crinkle lines with a pen or pencil.

Explain that the crinkle lines represent pathways formed by experience. The paper has changed because something happened to it. Even if students try to smooth the paper, the marks remain. This is a physical metaphor for learning and experience: the brain changes through what it does.

Keep this activity calm and concrete. Students should physically feel that the paper is different after being crumpled. This prepares them to understand that learning is not invisible magic; it has a physical basis.

Teacher note: Do not overextend the metaphor. A paper cannot repair or reorganise itself, but the brain can. The paper is only a starter image for the idea that experience leaves traces.

5–10 minutes: Introduce the Lesson Question

Display the lesson question: How does practice change the brain?

Introduce the key idea: The brain is plastic. This means it can change with experience, learning, and practice.

Ask students to complete this sentence orally or in writing: “One thing I used to find difficult was _____.”

Do not ask for long explanations yet. The aim is to activate personal memory of improvement.

10–25 minutes: Simulator Demonstration

Open the simulator on the projector/TV screen. Begin from the baseline view.

Step 1: Observe the Starting Network

Ask students:

- “What do you notice?”
- “What colours do you see?”
- “What do you think the lines represent?”

Confirm that the model shows neurons and connections. Keep the explanation short.

Primary framing

Use the words “brain cells” and “connections” rather than too many biological terms.



Suggested language:

“These dots are like brain cells.”

“These lines are like connections.”

“The brain uses connections to learn and remember.”

Step 2: Click Learn New Concept

Students observe the orange neuron and new connections.

Explain that the model is showing a new idea becoming part of a network. When students learn something new, the brain connects the new idea to things already known. For example, learning Newton's Third Law connects to force, motion, collisions, and everyday experiences such as pushing a wall or jumping.

Primary framing

Do not tell younger students that a brand-new neuron appears every time they learn. Use the orange neuron as a simple symbol for a new idea.



Suggested language:

“The orange dot means a new idea.”

“The new idea is joining other ideas.”

“Your brain connects new learning to things you already know.”

Step 3: Click Practice (Varied) Several Times

Ask students to watch carefully for changes. They should notice brighter connections and small spine-like structures.

Explain that practice strengthens useful connections. Varied practice is especially useful because it asks the brain to use the idea in different ways. For example, a student may practise a physics idea by answering questions, explaining it to a partner, drawing a diagram, and correcting a mistake.

Ask:

- “What changed after practice?”
- “Did the network stay the same?”

Expected student idea: the connections became stronger, brighter, or more numerous.

Primary framing

Focus on the big visible change: practice makes the pathway stronger.



Suggested language:

“We practised.”

“The connections became stronger.”

“When you practise reading, maths, sport, music, or drawing, your brain gets better at that pathway.”

Step 4: Click Fire Signal Cascade

Let students watch the signal move through the network.

Explain that thinking involves signals passing through networks. When pathways are stronger, it can become easier to retrieve and use information. This is one reason practice matters: it makes useful pathways easier to activate.

Primary framing

Use the idea of messages moving.



Suggested language:

“The brain is sending messages.”

“The messages move along the learning path.”

“A stronger path is easier to use.”

Step 5: Click Neglect / Pruning

Students observe weak connections fading or disappearing.

Explain that the brain is efficient. Connections that are not used may weaken over time. This is why revision should be spaced out and repeated. It is also why cramming is usually weaker than revisiting ideas across days or weeks.

Reassure students that forgetting does not mean they are stupid. Forgetting is normal. It means the pathway needs to be reactivated.

Primary framing

Be careful that young students do not become anxious. Do not make pruning sound like punishment.



Suggested language:

“If we do not use a path for a long time, it can become weaker.”

“That is okay.”

“We can practise again and make it stronger.”

25–35 minutes: Class Discussion – From Brain Change to Learning Behaviour

Write the following chain on the board:

Practice → stronger connections → easier retrieval → better performance

Ask students to complete sentence frames:

- “When I practise, my brain _____.”
- “When I make a mistake, I can _____.”
- “When something is hard, it means _____.”

Suggested answers:

- “When I practise, my brain strengthens connections.”
- “When I make a mistake, I can learn from it.”
- “When something is hard, it means my brain needs more practice or a better strategy.”

Introduce the difference between fixed and growth mindset.

A fixed mindset says: “I cannot do this because I am not smart.”

A growth mindset says: “I cannot do this yet. I need practice, feedback, and a strategy.”

Emphasise that growth mindset is not pretending that everything is easy. Growth mindset is an accurate response to difficulty.

Primary framing

Use two simple characters or columns: Fixed Mindset and Growth Mindset.



Primary language:

“Fixed mindset says: I cannot.”

“Growth mindset says: I cannot yet.”

“Fixed mindset stops.”

“Growth mindset tries a step.”

Primary sentence frames:

- “I cannot do this yet.”
- “I can try again.”
- “I can ask for help.”
- “I can use a new strategy.”

35–48 minutes: Student Worksheet – Reframing Learning Language

Students complete the worksheet independently or in pairs. For EAL students, pair work is recommended. Keep the task structured and quiet.

Students rewrite fixed-mindset statements using growth-mindset language. Encourage them to use the following sentence tools:

- “I am learning to...”
- “I cannot do this yet.”
- “I need to practise...”
- “My mistake shows me...”
- “A better strategy could be...”

Circulate and check for misconceptions. If students only add “yet” mechanically, ask them to add a strategy. For example, “I do not understand forces yet” is better than “I do not understand forces,” but it becomes stronger as, “I do not understand forces yet, so I will draw a free-body diagram and ask for feedback.”

Primary framing note

Primary framing

For younger students, reduce the number of statements. Use oral rehearsal before writing. Allow drawings, matching, or choosing from sentence cards.

Primary sentence frames:



- “I cannot ____ yet.”
- “I can practise ____.”
- “I can ask ____ for help.”
- “My mistake helps me ____.”

Primary examples:

For very young or low-English learners, students can circle the better sentence rather than write full responses.

48–55 minutes: Pair Reflection – Evidence from Their Own Lives

Students pair up and share one thing they used to find hard but now find easier. This can be academic or non-academic. Examples might include speaking English, riding a bicycle, solving equations, using chopsticks, playing an instrument, cooking, coding, or understanding a game.

Each student uses this frame:

“I used to find _____ difficult, but now I can _____ because I practised by _____.”

After pair sharing, ask for two or three examples from the class. Name each example explicitly as neuroplasticity:

“That is neuroplasticity. Your brain changed through practice.”

Primary framing

For younger students, make the pair share short and safe. Allow very simple examples.

Primary sentence frame:

“Before, _____ was hard. Now, I can _____.”

Optional follow-up:



“I got better because I practised.”

Primary examples:

- “Before, reading was hard. Now, I can read a page.”
- “Before, swimming was hard. Now, I can swim.”
- “Before, English was hard. Now, I can say more words.”

Teacher response:

“Your brain learned. Your brain changed.”

55–60 minutes: Plenary – Commitment Card

Students return to their crumpled paper. On the paper, they write one specific practice commitment for the week.

The commitment should be small and measurable.

Weak example:

“I will get better at maths.”

Better example:

“This week I will practise solving three algebra questions on Monday, Wednesday, and Friday.”

Strong example:

“This week I will practise free-body diagrams for ten minutes on three different days, then check my answers and correct one mistake.”

Students keep the crumpled paper in their notebook, pencil case, or folder as a physical reminder that learning changes the brain.

Primary framing

For younger students, commitments should be very small and easy to understand.

Primary sentence frame:

“This week I will practise _____.”

Optional support:

“I will practise for 5 minutes.”

“I will practise with my teacher / parent / friend.”

“I will try again when I make a mistake.”



Primary examples:

- “This week I will practise reading five words.”
- “This week I will practise counting by 2s.”
- “This week I will practise writing my name neatly.”
- “This week I will practise saying three English sentences.”

End with simple language:

“My brain can learn. I can practise. I can grow.”

7. Possible Misconceptions and How to Identify Them

Misconception 1: “Growth mindset means I can do anything if I believe.”

How to identify it:

Students write vague statements such as “I can do anything” or “just believe in yourself.”

Correction:

Growth mindset is not magic. Improvement requires effort, good strategies, feedback, and time.

Misconception 2: “If I make a mistake, that automatically makes me smarter.”

How to identify it:

Students say, “Mistakes grow your brain,” but cannot explain what they do after the mistake.

Correction:

Mistakes help learning when students notice them, correct them, and practise again.

Misconception 3: “The simulator shows exactly what happens in my brain.”

How to identify it:

Students say that one click equals one real neuron growing, or that the brain literally glows in these colours.

Correction:

The simulator is a model. It shows important ideas visually, but real brains are more complex.

Misconception 4: “If I forget something, my brain deleted it.”

How to identify it:

Students become anxious about pruning or describe forgetting as permanent deletion.

Correction:

Forgetting is normal. Revisiting learning can reactivate and strengthen pathways.

Misconception 5: “Some people are just smart and do not need practice.”

How to identify it:

Students compare themselves negatively to high-performing classmates.

Correction:

Performance can reflect prior practice, background knowledge, confidence, support, and strategy use. Visible success often hides invisible practice.

Misconception 6: “Practice means doing the same thing again and again.”

How to identify it:

Students describe practice only as copying notes or rereading.

Correction:

Effective practice includes retrieval, feedback, varied examples, correction, and spacing.

8. Differentiation and EAL Support

General language support

Provide sentence frames

- “Neuroplasticity means...”
- “When I practise, my brain...”
- “I cannot do this yet.”
- “My next strategy is...”
- “I used to find ___ difficult, but now...”

Provide word banks

brain	strategy	weaker
change	feedback	yet
practise	connection	
mistake	stronger	

Primary EAL support

Use short, repeated phrases

- “My brain can learn.”
- “I can practise.”
- “I cannot do it yet.”
- “Mistakes help me.”
- “I can try again.”

Use gestures

- hands close together for “connection”;
- hands pulling apart for “weaker”;
- fist opening for “grow”;
- finger tracing a path for “pathway.”

Allow students to respond by pointing, circling, drawing, or repeating a phrase.