10 Principles of Learning

Prior knowledge — Working memory — Cognitive load — Building schema — Spacing & interleaving

Desirable difficulty — Interactions with learning — Multimodal input — Metacognition — Language and learning

Aims and Purpose

We recognise that to raise standards further at St Paul's CofE Primary School, we must be focused upon the quality of teaching and learning in the classroom. Continued and sustained improvement is dependent upon improving the quality of teaching and learning that is taking place on a daily basis. Across our school, the expectation is that all pupils are provided with high quality learning experiences that lead to consistently high levels of achievement for all pupils. The aim of this document is to help the teachers in the school become the most effective practitioners they can be by using principles established from evidence-based best practice research, cognitive science and experience.

By adopting a whole school approach to teaching and learning across our school, we aim:

- to ensure consistency of teaching and learning in each classroom and enable teachers to teach as effectively as possible
- to create effective learning environments to support and facilitate pupils learning
- to give children the skills they require to become effective lifelong learners
- to learn from each other, through the establishment of an enquiry based approach to teaching and learning and a culture where opportunities for sharing good practice are in place
- achieve deep understanding, by helping children connect new knowledge with existing knowledge so they are fluent and unconsciously competent at applying their knowledge as skills
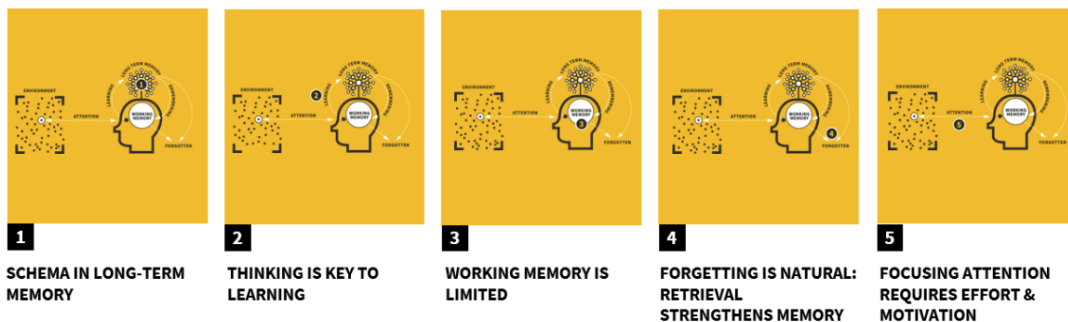
- deliver academic excellence by securing knowledge into long-term memory through developing secure schemas with connected networks of ideas
- enable children to become confident and interested learners, actively engaged in their own learning
- develop children's self-respect and respect for the cultures and values of others
- develop core learning behaviours

The Science of Learning

The study of how we think is called **cognitive science** or **cognitive psychology**. As a student, it can be helpful to understand some of the key findings, using a simplified model of the process. The model we use is based on the work on cognitive scientists such as **Professor Dan Willingham**. It also draws on some of the ideas in **cognitive load theory**. This theory helps us understand a lot of the challenges we face when learning something new.

1	2	3	4	5
SCHEMA IN LONG-TERM MEMORY	THINKING IS KEY TO LEARNING	WORKING MEMORY IS LIMITED	FORGETTING IS NATURAL: RETRIEVAL STRENGTHENS MEMORY	FOCUSING ATTENTION REQUIRES EFFORT & MOTIVATION

Schema in long-term memory

- Our brains store vast arrays of information; our knowledge and experiences.
- Memory is a dynamic organic system, not a set of fixed files like in a computer.
- Schema are webs of interconnected knowledge linked by pathways that can be weak or strong. e.g a schema for making toast, football or pets or Paris or poverty or Macbeth.
- We connect new knowledge to what we already know so it makes sense.

Thinking is key to learning

- Willingham tells us that 'memory is the residue of thought'. This means we only usually remember things that we think about. Conversely, it's the things we think about that we tend to remember. e.g.
- If you just copy something down without really thinking, you can write it now but almost immediately forget it.
- If you fiddle around with Powerpoint animation tools, you might not remember much of the actual subject content, just the animation tools.

Forgetting is natural: retrieval strengthens memory

- A key challenge in learning is just how easy it is to forget things. It's part of being human - everyone has trouble with forgetting.
- To avoid forgetting, we must connect ideas to what we already know, then practice retrieving them repeatedly in different ways.
- Information we access regularly in a variety of ways becomes easier to remember, eventually leading to fluency, when it's almost effortless.

Working memory is limited

- Working memory is where you think; the conscious thought processes as you retrieve existing knowledge and explore new knowledge.
- All of us can only handle a limited amount of information at once in our working memory.
- We can make learning easier by making best use of our working memory:
  - break new ideas down into small steps
  - remove distractions
  - use images as well as words (dual coding)
  - capture transient information (eg make notes)

Focusing attention requires effort & motivation

- Many things compete for your attention out in the learning environment e.g. a TV screen or people talking around you. You also have multiple thoughts in your head competing for attention.
- To learn well, focus your attention, minimising distractions. Thinking hard and trying to predict what is coming next can help sustain attention.
- Keeping focused is something you can control if you keep your motivation high and make changes to avoid distractions.

Teaching and Learning strategies

We have agreed a new Planning Framework that encompasses the Rosenshine's Principles of Instruction.

THE PRINCIPLES OF INSTRUCTION

TAKEN FROM THE INTERNATIONAL ACADEMY OF EDUCATION

This poster is from the work of Barak Rosenshine who based these ten principles of instruction and suggested classroom practices on:

- research on how the brain acquires and uses new information
- research on the classroom practices of those teachers whose students show the highest gains
- findings from studies that taught learning strategies to students.

HOW2
teachinghow2s.com

01 DAILY REVIEW

MO TU WE TH FR

Daily review is an important component of instruction. It helps strengthen the connections of the material learned. Automatic recall frees working memory for problem solving and creativity.

02 NEW MATERIAL IN SMALL STEPS

Our working memory is small, only handling a few bits of information at once. Avoid its overload — present new material in small steps and proceed only when first steps are mastered.

03 ASK QUESTIONS

The most successul teachers spend more than half the class time lecturing, demonstrating and asking questions. Questions allow the teacher to determine how well the material is learned.

04 PROVIDE MODELS

Students need cognitive support to help them learn how to solve problems. Modelling, worked examples and teacher thinking out loud help clarify the specific steps involved.

05 GUIDE STUDENT PRACTICE

Students need additional time to rephrase, elaborate and summarise new material in order to store it in their long-term memory. More successful teachers built in more time for this.

06 CHECK STUDENT UNDERSTANDING

Less successful teachers merely ask "Are there any questions?" No questions are are taken to mean no problems. False. By contrast, more successful teachers check on all students.

07 OBTAIN HIGH SUCCESS RATE

A success rate of around 80% has been found to be optimal, showing students are learning and also being challenged. Better teachers taught in small steps followed by practice.

08 SCAFFOLDS FOR DIFFICULT TASKS

Scaffolds are temporary supports to assist learning. They can include modelling, teacher thinking aloud, cue cards and checklists. Scaffolds are part of cognitive apprenticeship.

09 INDEPENDENT PRACTICE

Independent practice produces 'overlearning' — a necessary process for new material to be recalled automatically. This ensures no overloading of students' working memory.

10 WEEKLY & MONTHLY REVIEW

WEEK 1 WEEK 2 WEEK 3 WEEK 4 WEEK 5 WEEK 6 WEEK 7 WEEK 8

The effort involved in recalling recently-learned material embeds it in long-term memory. And the more this happens, the easier it is to connect new material to such prior knowledge.
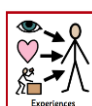
At St Paul's, we have spent time researching the Rosenshine principles and reflected on how these support our planning, so that all learners are supported and reach their potential. We have adapted our planning proforma to reflect these elements. Teachers are clear that their role is to teach in a precise way, which makes it possible for all children to engage successfully with tasks at the expected level of challenge. At St Paul's, we strive to have the following in all of our lessons:

1. A daily review of previous learning using retrieval practice strategies.
2. New material presented in small steps, with teachers ensuring that each step is mastered before moving on.
3. Teachers asking a variety of open questions, and using a range of questioning techniques, to establish children's understanding and develop schema.
4. Teachers model clearly, using equipment, visual and/or other aids to show children how to be successful.
5. Time for children to do guided practice.
6. Teachers check all children's understanding using a range of assessment for learning approaches.
7. Children have a high rate of success, with enough mistakes to show that they are being challenged.
8. Scaffolds are provided for all.
9. Children are given opportunities to practice independently.
10. There are regular reviews of learning

A detailed guide to our lesson structure at St Paul's

All lessons in our school should follow a basic structure made up of four key phases:

Phase One: set the scene, place learning in a wider context, review and retrieve prior learning; review previous lesson; share intended learning outcomes.

Phase Two: explaining and introducing new learning in small chunks and providing rehearsal time for pupils

Phase Three: Time for pupils to complete guided or independent practise

Phase Four: Review learning and plan next steps

Precise interpretation of the four phase structure will inevitably be vary in different situations. Age, ability, timing of the lesson, subject area and the particular focus for the lesson will all have a significant impact. Teachers may well scroll through the phase more than once during the lesson. The phases are not always sequential. Review, for example, is not confined to the end of the lessons.

Phase One – Review and retrieve prior learning.

❶ Daily review

❿ Weekly and monthly review

Rosenshine's evidence shows that lessons should include some recall of previous learning – not just of recently learned information, but also of information that was learned much earlier. This helps to build and strengthen the schema of knowledge in the child's mind, enabling new information to be understood, stick more easily and for longer. For knowledge to be used and applied in the long term memory, knowledge needs to be retrieved. It is vital that children are asked to search their memory for prior learning and then apply this knowledge in their learning.

At St Paul's, we ensure we plan for lots of low stakes retrieval practice. This does not have to be all and only quizzes. Other strategies encouraged are: Cops and Robbers, Retrieval tennis, Retrieval rockets, Retrieval relays or use retrieval challenge grids structured talk happening.
See Appendix 1
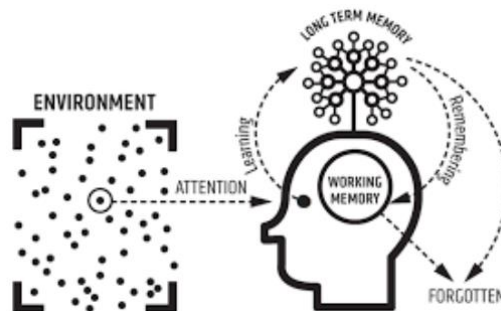
Phase Two – Explaining and introducing new content and providing opportunities to rehearse.

❷ Present new material using small steps   **❹** Provide models   **❽** Provide scaffolds for difficult tasks

Providing Pupils with new information or skills

This is the teaching phase. Although it is our intention for pupils to understand the information as they encounter it, the emphasis within this phase is upon providing new content in small chunks The quality of the input at this stage will clearly have a large bearing upon the extent to which the children understand information that they are given. We aim to achieve this through teaching skills in sequential parts with regular opportunities for children to rehearse and discuss their learning. At St Paul's, we use a range of techniques to try to ensure that the input is of high quality on a daily basis.

Periods of input are short

We recognise that children have limited concentration spans particularly those in the younger year groups. Periods of input are therefore kept short and punctuated by rehearsal activities and partner talk. Research shows that significantly more learning takes place when new information is shared in shorter bursts of ten minutes, rather than extended periods of time.

Questioning (including checking for understanding)

❸ Ask questions   **❻** Check for student understanding

Effective Questioning and Classroom Talk is essential to develop learning & higher order thinking, promoting imagination, speculation, creative thinking & to pitch a suitable challenge level. This is where the quality of questioning is paramount.

Questions can highlight misconceptions and challenge children to think deeper. The greatest value of questioning is that they force children to practise retrieval; this strengthens and deepens memory hence the importance of high quality questioning. Although we encourage questions to be planned we also encourage questioning to be responsive to what is happening in the lesson.

At St Paul's, we ensure talk time is given to children to allow them to talk to other children and adults. We use talk partners to promote talk in all classrooms. Wait times are given to allow children to pause and review to enable the children to process the information. We have invested time in staff

training to support effective questioning in the classroom as well as a graduated approach to high quality questioning and we encourage higher order questions to encourage deeper investigation of concepts.

Some effective questioning techniques that are used daily at St Paul's can be seen in Appendix 2.

Monitoring levels of understanding

We recognise the importance of ensuring that levels of understanding of taught concepts are secure before learning is moved on in lessons. To achieve this, teachers ask carefully crafted questions, using a range of techniques - as seen in appendix 2, and carefully monitor pupils responses to questions and tasks.

Teachers give careful consideration towards the deployment of adults in the room and how this supports the ongoing assessment process. Once misconceptions and gaps in learning have been identified within or after lessons we aim to maximise the impact of additional adults in the school.

• Teaching Assistants are utilised to support the feedback process to enable pupils to complete pinpoints

• They deliver pre-teaching and corrective teaching tasks with pivotal pupils as directed by class teachers.

• Teaching Assistants are deployed to work with specific pupils during lessons, both within and outside the classroom to consolidate and extend children's learning.

For further information, see our Effective Use of Teaching Assistants document.

Provide Models and Scaffolds

Rosenshine found that successful teachers spent longer guiding children's practice through explanations and modelling than less effective teachers. After children have been exposed to highquality explanations and models, they can begin to be involved in the knowledge recall or procedural process. This is where children begin to take ownership over parts of the task with the support of the teacher as a scaffold or guide.

At St Paul's, we understand the importance of providing all children with scaffolds, despite their level of ability, to help guide their responses or help them recall information. This could be in the form of a help-sheet, sentence starters, word mats, writing frames or physical resources. We have high expectations and with these scaffolds, expect all children to take part in the learning.

The input phase is punctuated through clear modelling of whatever it is that we want the children to be able to do. Opportunities for modelling key learning points are carefully considered in every lesson and clearly outlined within lesson planning. Through ensuring periods of input are followed by rehearsal activities, teachers ensure that children are given opportunities to apply and deepen their understanding before the lesson moves on. For example, a teacher might be modelling how to use embedded clauses within sentences. They might ask the children to work with a partner to construct a sentence together on a whiteboard before continuing with further instruction.

Phase Three – Time for pupils to complete guided or independent practice.

5 Guide student practice   **7** Obtain a high success rate   **9** Independent practice

Guided Practice

More effective teaching occurs when you give more time for guided practice, this is directly linked to children spending more time asking questions, more time checking for understanding and using more worked examples. The idea is that if learners are going to be successful in becoming confident and independent within a certain knowledge area, the teacher needs to make sure they are forming strong schema early on. Therefore, at St Paul's, we ensure learners spend additional time rephrasing, elaborating and summarizing new material in order to store material in the long term memory. All children need to practice, however, practice must be guided so that the chance of forming misconceptions is minimised. If children have any misconceptions, then these misconceptions are unpicked, and retaught where appropriate.

At St Paul's, guided practice is where learning activities involve thorough explanations, high frequency, short answer questions or simple tasks where the teacher and learners are engaged interactively, with plenty of modelling, corrective or affirming feedback and aspects of re-teaching where gaps remain. An example of this would be the Graduated Release Model (I do; We do; You do) approach.

Within lessons and over a series of lessons within a teaching unit, children are given time to practice using new knowledge and skills. Rosenshine (2012) recognises independent practice as a vital part of learning because it provides pupils with the much-required opportunity to complete a procedure or activity over and over. He identifies 'overlearning' as necessary for pupils to become fluent or automatic in a skill. When children become automatic in a process or skill, they free up their working memory which can be used to apply their learning to new contexts. This is when pupils can consolidate their learning.

Independent Practice

At St Paul's, we consider the following when planning effective independent practice.

- Planning the right practice activity (during independent practice, pupils should work on the same material covered during guided practice to give them an opportunity to consolidate their learning).
- Providing further guides and scaffolds
- Using collaborative practice to best effect
- Gradually removing scaffolding

The more children practise the material, the stronger the retrieval strength becomes. Without enough independent practise, children will find it more challenging to recall information or procedures at a later stage as the retrieval strength of the new material won't be as strong.

Phase Four – Review learning and plan next steps.

The emphasis in this phase is reviewing what has been learned and reflecting on how and why it has been learned. Review is key to memory, and we understand that it is important not just to confine it to the end of the lesson.

At St Paul's, we recognise that good teaching requires teachers to constantly refer back to the WALT throughout the lesson and reinforce prior learning. This is a very important aspect of the lesson and the learning process in general as large amounts of information can be forgotten quickly by children. We recognise that when teachers summarise what has been learned, the effect on children's memories can be restricted. However, when the children are involved in identifying what they have learned in the lesson, their memories will be significantly boosted.

Across the wider curriculum, we have introduced Knowledge Webs that are used throughout units of work to retrieve previous learning on a regular basis. An example can be seen in Appendix 3.

All lessons at St Paul's should include the following key elements to ensure the effective delivery of the Teaching and Learning Model:

All lessons...	
are built upon planning, which has clear learning outcomes	• Planned units of work centre around identified learning outcomes which are recovered regularly throughout the year • Intended learning outcomes create the right level of challenge and are built upon prior learning • All learning outcomes are written up and shared orally in child friendly language
have well planned success criteria	• All children are clear about how they will achieve the intended learning outcome through clear modelling and discussions of strategies • Toolkits are displayed for the children to follow, or drawn up with the children, during the lesson where appropriate • Teachers ensure that the success criteria outlined within toolkits are revisited regularly throughout the lesson • Teachers may refer to individual children's work during lessons to illustrate examples of good practice and successful use of success criteria
are clearly designed to meet the needs of different groups of learners	• All groups of learners are challenged appropriately in lessons, including the needs of pupils with SEND. More information can be found in the SEND policy. • This is achieved through the use of scaffolded questioning, and planned tasks which support different depths of learning. • Intended learning outcomes are the same for all children. This is to ensure that all our pupils are able to access the same learning. • It is the responsibility of the class teacher to scaffold tasks through the use of questioning, resources and levels of support. This is the responsibility of the class teacher to scaffold learning to enable learning through questioning, levels of support and resources etc
allow pupils to receive regular and clear feedback which	• The schools policy for providing feedback and responding to children's work is embedded in everyday practice and is used to support and inform teaching and learning • All pupils are clear about what they need to do in order to improve their work

enhances their learning	• Marking is sharply focused against the intended learning outcome and identifies next step prompts • Pupils are given regular time to respond to marking prompts and this is built into lesson planning and facilitated through adult support. • Live marking – The use of live marking in lessons ensures that misconceptions or observations and assessments are quickly addressed either on the same day or the next morning via post teaching interventions.
ensure learning is enhanced through the use of consistent behaviour and classroom management approaches	• Positive behaviour management systems are designed to minimise the time spent on behaviour management and maximise the time spent on learning. All our staff must consistently apply the same approaches which are clearly outlined in the positive behaviour policy
allow pupils to be actively engaged in their learning	• Pupils are actively engaged during all parts of the lesson – teachers take into account children's concentration span and ensure pupils are not sitting passively for long periods. • Through the use of Talk Partners, pupils are provided with regular opportunities to think and share ideas together to develop their learning • Mini whiteboards are used for short bursts of activity, to develop and check for understanding and to ensure children are active and engaged during the lesson.

Classroom Environments

The surroundings in which children learn can greatly influence their academic performance and wellbeing in our school. The better the school looks, the more it inspires the people inside it. A well cared for and organised classroom and school can make pupils feel that they want to achieve and how they themselves are perceived is important.

At St Paul's, we believe that classrooms should be calm, well organised learning spaces. Pupils need to know how to access resources and respect the classroom environment. To ensure a sense of consistency across the school, the following points below need to be taken on board in each classroom.
• The PROMISE and school moto displayed in each teaching room
• School Values to be clearly visible.
• Prayer Area.
• A Read Write Inc sound chart, appropriate to stage
• Classrooms are tidy, labelled and organised. Pupils take responsibility for ensuring their classroom is a pleasant and safe place to learn.
• Pupils are taught to respect equipment and resources
• Zones of Regulation area
• WOW Wall
• Sensory area/ board/ panel
• Well-organised and inviting book area
• Children's risk assessment

Missed Learning

If a child has missed school due to absence, it is important that they are able to keep up with learning so they do not fall behind. In the event of an absence, staff must ensure that their future planning is adapted to ensure that an appropriate amount of learning time is allocated to catch pupils up on what has been missed.

The amount of allocated catch-up time will depend on the length of absence the child has experienced. Whilst we acknowledge that is will not be possible for children to experience the full lesson offer, the curriculum may be tailored in the following ways:

- Pre-learning
- Pre-reading
- Conversations with staff prior to/ at the start of a lesson
- Home learning activities
- Flashback sessions
- Breakaway groups with a member of staff
- Formal intervention

Assessment for Learning strategies should be used, as well as analysis of summative assessments to ascertain if further intervention is required.

Homework

Each half term, class teachers will send home a Home Learning Grid containing open-ended activities for children to complete at home, which are linked to current learning in school. Children should be encouraged to complete an activity each week, following the school's presentation expectations. Children should bring their homework books in each week so that outcomes can be shared with teachers. Feedback will be given orally, although children can earn a star sticker for each activity they complete. If children complete all six or more activities, they will receive a Homework Champion certificate at the end of each half term.

Appendix 1 – Retrieval Strategies at St Paul's

Cops and Robbers	Retrieval Practice Placement	Retrieval Tennis
Cops – Students write as much as they can from memory about a certain topic. Robbers – Students get out of their seats, sharing and stealing ideas from their peers.	Key questions such as: What keywords did you use last lesson? State 3 facts from last lesson Explain a key concept from last lessons Ask your partner 3 questions based on…	Pairs take turns to recall facts/information that is relevant to the topic. They cannot repeat themselves or say something that their partner has already said.
Retrieval Relay Race	**Retrieval Rockets**	**Retrieval Baskets**
4 box grid. Box 1 – Write as much as you can remember about our topic. Box 2 – A peer writes what they can recall. Repeat for boxes 3 and 4 but no one is allowed to repeat what has already been written.	Countdown 5 to 1 to launch the rocket. At each of the 5 steps, pupils must recall a fact.	Throught the lesson, write questions based on the content of the lesson and store in a basket. These questions then get asked in future lessons via cold calling techniques.

Appendix 2 – Questioning Techniques at St Paul's

Cold-call	No hands up or calling out. Asking everyone – select who answers
No opt out	If students get an answer wrong or don't know, go back to them to check that they now
Check for understanding	Ask selection of students to relay back what they have understood about the question under discussion.
Probing questioning	Make each question and answer exchange a mini dialogue, probing to explore student's understanding.
Say it again better	Accept students' first half-formed responses but then help them to reframe a better more complete response.
Whole class response	Use techniques like mini whiteboards to provide simultaneous responses from a whole class; phrasing of questions; use of child's name etc.

Cold-calling Techniques	
Pre-call	This is when you tell one or more students that you will ask them to respond after you've given an explanation, read a passage or watched a video. *Ok, John and Sabrina, after the video, I'd like you to summarise the key points for us.* This gives them that extra bit of notice to prepare. Other students know they too could be cold called afterwards but John and Sabrina get some prep time.
Batched cold call	When you tee up a number of students to answer in one go. *Right, now I've explained my examples, I'd love to hear your versions. I'll start with Michael, then Daisy, then Samuel.* You then ask them one by one. It gives Michael and especially Daisy and Samuel a heads up. They can get ready. Any sense of 'gotcha' is removed entirely.

Rehearse and affirm	This is where, first, you have given all students an opportunity to share their answers nonverbally through a means you can see such as whiteboards (Show me!); You select answers that are correct or interesting and then cold call the students to ask them to expand. *Robyn, what a great answer. Could you explain how you came to that conclusion?* *Jason, well done, B is the correct answer. How did you know that?* This technique has the effect of giving Robyn and Jason confidence in their understanding before they give their answer publicly. They already know they are right. It's a technique that is great for the less confident students; you build them up by asking them to explain their good ideas or correct answers you've already seen – rather than them feeling it's a risk offering answers at the point when they are still unsure.

Appendix 3 – Knowledge Webs at St Paul's

Animals, including humans

Senses

Nose

Ears

T

Hand

Eyes

Humans