Action Research

NORTH GOWER PARTNERSHIP

Staff:	Steph Chafey, Lisa Marchant, Mike Dowsett
Date:	September to June 2024
Title:	To explore how metacognition can impact upon pupil resilience within mathematical reasoning.
Key Words:	**Numeracy, reasoning, collaborative thinking, trial and error, resilience.**
Summary:	Please identify the focus, main strategies and main outcomes of your development project.

Action Research

Context:

This was a whole school target taken from the school development plan for pupils from reception to Year 6.

The action research involved 3 staff members from across the school. One from each Pod.

All learners were the focus, in a school of approximately 160.

Learning areas were observed in each year group through learning walks and teaching trios.

All learners from across the school had their learning environments observed and how they interacted within them.

Research and professional development was completed by staff, this was then implemented in class with the impact being monitored and reflected on in AoLE team meetings, staff Adds sessions and later, feeding into the school development plan when it was evaluated.

Aims and objectives:

- Pupil resilience in mathematical reasoning.
- Decision making during the stages of setting the 2023-2024 school development plan targets, along with pupils' Welsh Government personalised assessment data.
- Whole school approach to metacognition and a better understanding of how to improve pupil resilience when faced with reasoning questions.

Action Research

NORTH GOWER PARTNERSHIP

Research:

Metacognition – Cambridge Assessment

Effective Questioning

Strategies:

Professional development for staff with numeracy consultant Lynwen Barnsley in Adds sessions focused on reasoning. AoLE team focused on metacognition research and presented this to staff on an INSET day and in an Adds session. AoLE completed learning walks and a teaching trio to see reasoning being delivered in each Pod across the school. A new whole school approach to reasoning was agreed upon for the pupils to focus on when facing reasoning questions.

RATTY – Read It, APK, Talk, Try It, Yes or No?

There were several AoLE meetings, learning walks, teaching trio observations.

Let's Think and CAME lessons were successful and delivered across the school by all staff. These were reflected on in Adds sessions with a numeracy consultant and reflected on in AoLE meetings when assessing the target for the SDP.

CAME lessons needed to be personalised and chilli challenged in-line with school approach for other AoLE and general school approach, to tailor them to the topics in school and make them engaging and have an authentic hook for the pupils.

Outcomes:

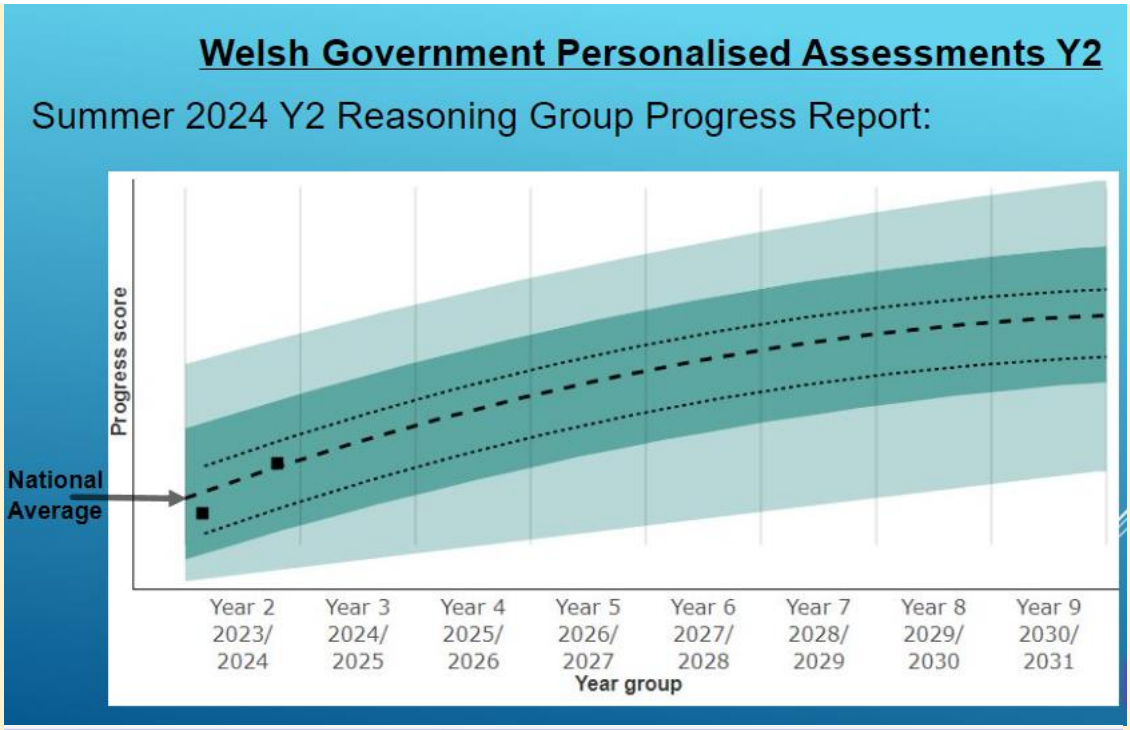
It was observed that pupils are more resilient with their approach to reasoning questions. Pupils displayed strong oracy skills when questioning was observed. Pupils could explain their thinking and the process they took to come to their decision.

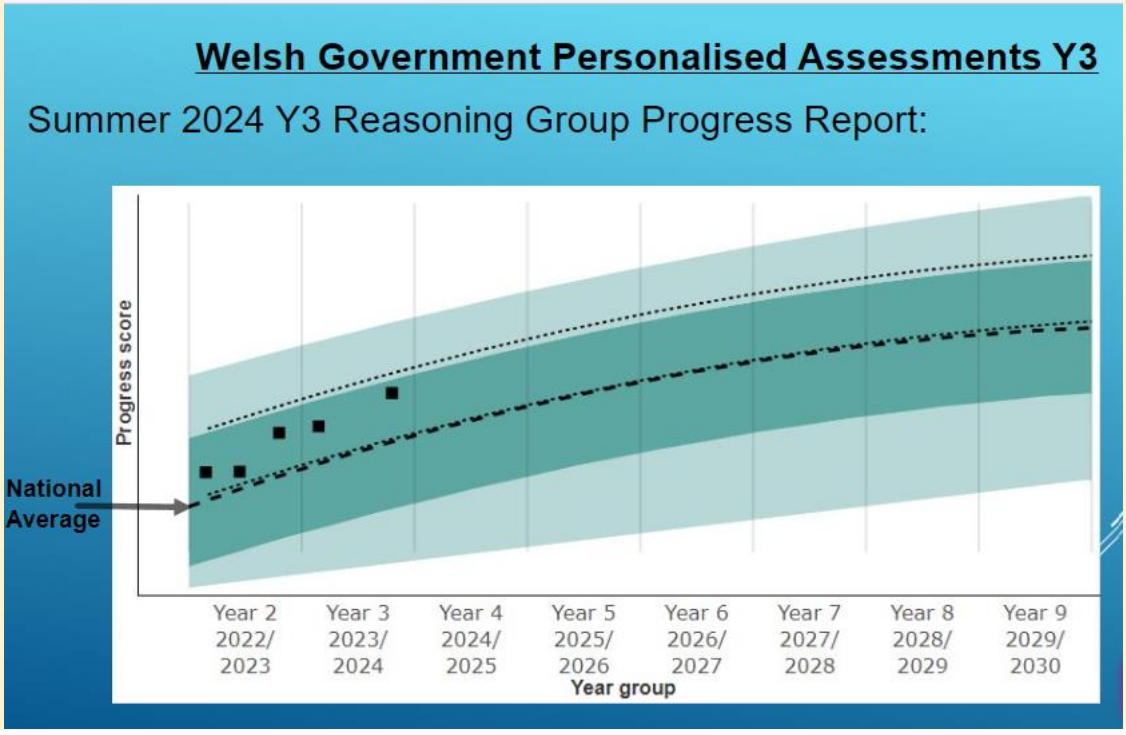
Staff have a better understanding of the process behind metacognition and with RATTY an agreed process to follow to help scaffold and give the pupils a model to follow to apply to a reasoning question when they are faced with it.

- Quantitative data: Welsh Government personalised assessments.

Action Research

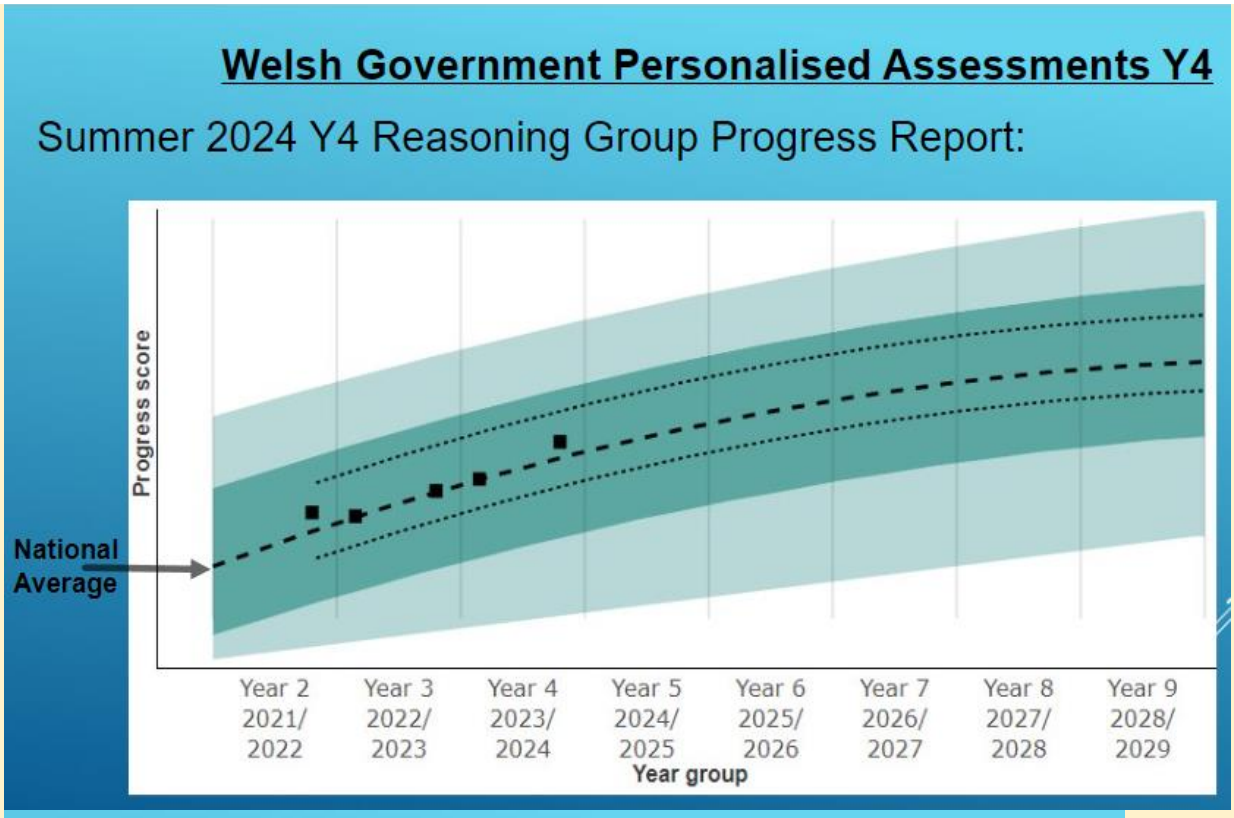
NORTH GOWER PARTNERSHIP

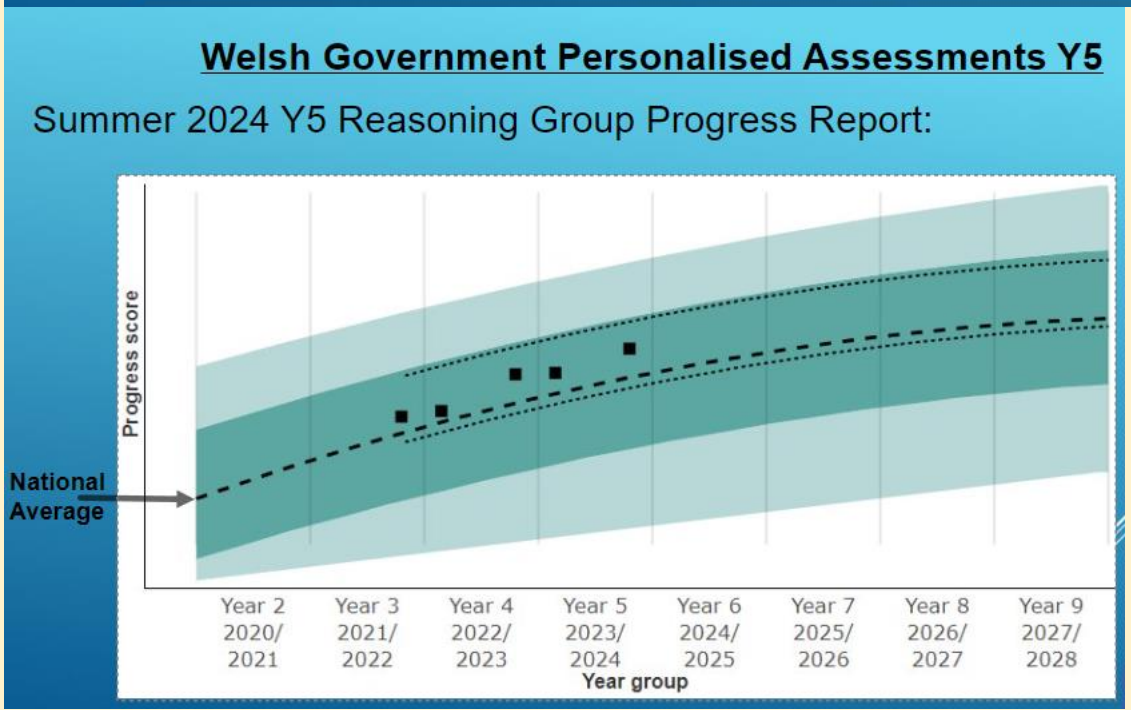
- 

- 

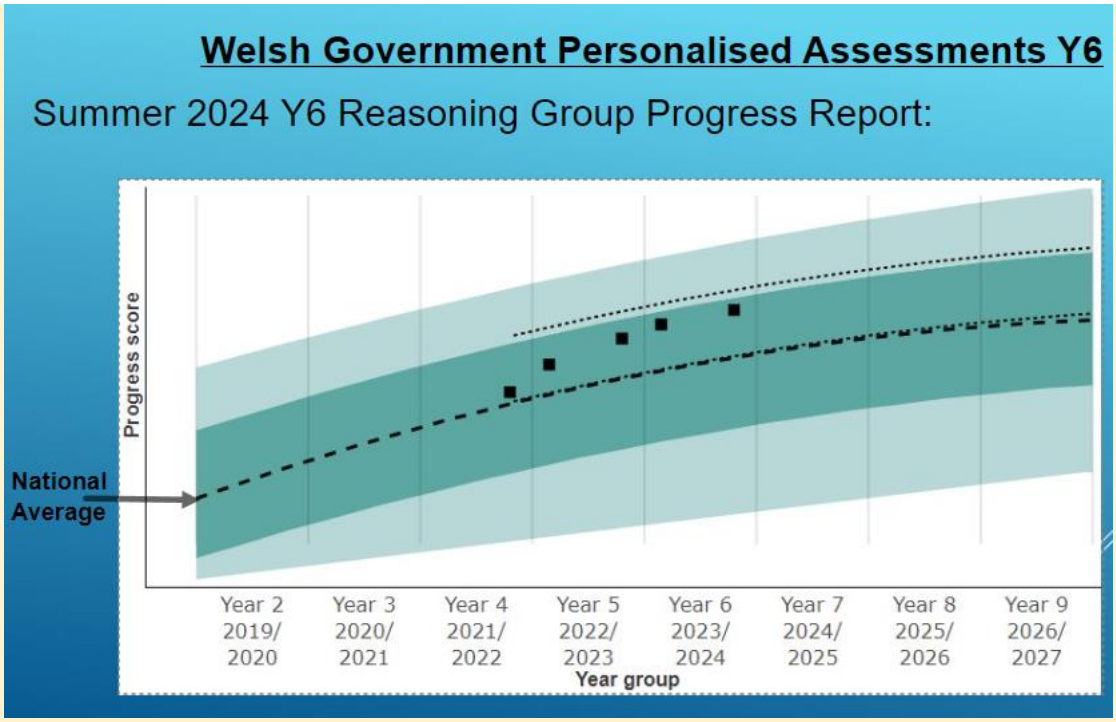
Action Research

NORTH GOWER PARTNERSHIP

- 

- 

Action Research



-
- Qualitative data: Staff understand the process towards metacognition and how the use of questioning is important to encourage learners to discuss their thought process before they make an attempt at answering the question. Staff agreed that they have seen the benefits of pupils voicing their ideas, reasons and ideas first and that this has led to surprising results, with some learners standing out, where writing or reading has previously been their barrier. The use of RATTY has given staff peace of mind that they now have template to follow to get pupils approaching questions consistently in the same way. Staff feel more confident delivering Let's Think and CAME lessons.

Learning points:

Plan – Monitor – Evaluate is important by both staff and pupils. Trial and Error is an important process that builds resilience and lets the children see that making mistakes is okay and part of the process of reasoning questions.

How far did you achieve your aims? Aims were achieved. However, RATTY needs to be monitored by staff and fed back in Adds sessions in the next school year to check its success.

The professional development of all staff and the engagement of all pupils in Let's Think and CAME lessons went well.

As an AoLE team, we have focused on a whole school strategy earlier (RATTY) in the project, so that this method could be evaluated with more evidence at the end of the school year.

Next steps:

Action Research

School staff will feedback and monitor as a rolling agenda point in Adds sessions. To establish a consistent reasoning approach school-wide, staff have devised the acronym RATTY (Read; Activate; Talk; Try; Yes?). This framework should now be implemented, monitored, and evaluated in each Pod to ensure uniformity. Its application will vary based on pupils' needs and staff observations, ensuring timely intervention when required.

Contact details:
Steph Chafey: colwills9@hwbcymru.net
Lisa Marchant: marchantl7@hwbcymru.net
Mike Dowsett: dowsettm@hwbcymru.net

Supporting documents:
Metacognition – Cambridge Assessment
Effective Questioning

Notes from research:

How to use metacognition in numeracy:
To use metacognition in numeracy, learners can apply reflective thinking and self-awareness to their mathematical problem-solving processes. This can be done by following these steps:
1.Predict and estimate solutions: Encourage learners to make predictions and estimates before solving a mathematical problem. This helps them develop an awareness of their own thinking and reasoning.
2.Check answers and reflect on results: After finding a solution, learners should check their answers to see if they are reasonable. They can reflect on their results and evaluate their approaches, considering if there are alternative methods or strategies that could have been used.
3.Evaluate approaches and decision-making: Learners should reflect on the strategies and techniques they used to solve a problem. They can evaluate the effectiveness of their approaches and consider if there are more efficient or alternative methods they could have employed.
4.Set goals and plan: Metacognition can also be used to set goals and plan how to achieve them in numeracy. Learners can use their self-awareness and reflection to identify areas they want to improve and set specific goals for their mathematical learning.
By incorporating metacognition into numeracy, learners can develop a deeper understanding of their own mathematical thinking processes, become more confident in decision-making, and improve their problem-solving skills.

Action Research

NORTH GOWER PARTNERSHIP

Research on metacognition in numeracy, or mathematical thinking and problem-solving, highlights several key points related to how primary school children develop and use metacognitive skills in this domain:

Development of Metacognitive Skills in Numeracy:
1. Awareness of Mathematical Strategies:
- Primary school children develop an awareness of various mathematical strategies, such as counting, using manipulatives, and applying arithmetic rules. As they grow older, their repertoire of strategies becomes more sophisticated.

2. Monitoring and Regulation:
- Children gradually learn to monitor their problem-solving processes and regulate their use of strategies. This includes recognising when a chosen strategy is ineffective and switching to a different approach.

Teaching Metacognition in Numeracy:
1. Explicit Instruction in Problem-Solving Strategies:
- Teaching specific problem-solving strategies, such as breaking down a problem into smaller steps or checking work, helps students become more metacognitive in their approach to numeracy.

2. Use of Metacognitive Prompts:
- Teachers can use metacognitive prompts during mathematics lessons to encourage students to think about their thinking. Questions like "What strategy will you use to solve this problem?" or "How do you know your answer is correct?" can stimulate metacognitive thinking.
3. Think-Aloud Protocols:
- Teachers modelling their thought processes while solving mathematical problems can help students understand how to approach problems metacognitively. This involves verbalising steps, decisions, and checks during problem-solving.

Benefits of Metacognition in Numeracy:
1. Enhanced Problem-Solving Skills:
- Students who use metacognitive strategies are better at solving mathematical problems. They can plan their approach, monitor their progress, and make adjustments as needed.

2. Improved Mathematical Understanding:

Action Research

NORTH GOWER PARTNERSHIP

- Metacognitive practices help students gain a deeper understanding of mathematical concepts. By reflecting on their problem-solving processes, they can identify misconceptions and gaps in their knowledge.

3. Increased Persistence and Resilience:
- Metacognitive skills contribute to students' persistence in the face of challenging problems. They learn to view mistakes as opportunities for learning and are more resilient when encountering difficulties.

Research Findings on Metacognition in Numeracy:
1. Impact of Metacognitive Training:
- Studies have shown that metacognitive training can significantly improve mathematical performance. For example, interventions focusing on self-monitoring and strategy use have led to better problem-solving abilities and higher test scores in mathematics.

2. Role of Feedback:
- Providing feedback that encourages metacognitive thinking can enhance students' mathematical performance. Feedback that focuses on process (e.g., "What steps did you take to solve this problem?") rather than just the correctness of the answer helps students develop their metacognitive skills.

3. Collaborative Learning:
- Collaborative learning environments where students discuss their problem-solving strategies with peers can promote metacognitive awareness. Group discussions about different approaches and solutions foster a deeper understanding of mathematical concepts.

Strategies for Promoting Metacognition in Numeracy:
1. Encouraging Reflection:
- Incorporate regular opportunities for students to reflect on their mathematical thinking, such as math journals or self-assessment checklists.

2. Teaching Self-Questioning Techniques:
- Teach students to ask themselves questions during problem-solving, such as "What do I already know about this problem?" and "Is there another way to approach this?"

3. Scaffolding Metacognitive Practices:

Action Research

NORTH GOWER PARTNERSHIP

- Provide structured support to help students develop metacognitive skills. Gradually reduce support as students become more proficient in using these skills independently.

4. Creating a Metacognitive Classroom Culture:
- Foster a classroom environment that values thinking about thinking. Encourage students to share their thought processes and strategies openly and to view errors as learning opportunities.

In summary, metacognition in numeracy is crucial for developing effective problem-solving skills and a deep understanding of mathematical concepts. Teaching strategies that promote metacognitive awareness and regulation can significantly enhance students' mathematical performance and their overall approach to learning.