

Portfolio on Numeracy-
By Rebecca Jones -2416233

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Why is Good Numeracy Important?

By Rebecca Jones – 2416233

This essay will discuss the value of being numerate and the financial and social impact poor numeracy skills can have. Being numerate is not simply about being capable of accomplishing mathematical arithmetic or calculating equations, a numerate individual has the capacity, disposition, and confidence to utilise mathematical knowledge in various contexts of everyday life, to make informed decisions (Goos et al., 2019).

The expanding requirement to be numerate is more prevalent the older we get. When we are enquiring into mortgages, budgeting, understanding the financial implications of borrowing money, exploring interest rates and pensions it is fundamental that we have sufficient numerical skills to make prudent decisions (Schleicher, 2014). It is estimated that fifty eight percent of working age adults in the UK have low numeracy skills (Franklin, 2021). Improving adult financial literacy requires a collective effort across all sectors of society to remove barriers, build confidence and provide accessible learning opportunities. Government and policymakers need to work with learning providers to equip individuals with the tools they need to navigate financial systems (Connolly, 2025). The Financial Inclusion Strategy are empowering employers to assist their workforce's welfare by way of payroll saving schemes, upheld by a new National Coalition of employers and endorsed by a regulatory statement from the Financial Conduct Authority (HM Treasury, 2025). Charities such as National Numeracy can also have influence to upskill individuals to strengthen confidence. Priority should be on economically disadvantaged areas as a potential strategy to support the levelling-up agenda (Department for Levelling up, Housing and Communities, 2022). Additionally, businesses can assist in developing essential skills for a resourceful, inclusive, equitable workforce. This facilitates the changing economy and supports social mobility (Ra, 2024). Individuals should engage in a dedicated praxis of numeracy, developing confidence necessary to succeed in a changeable global economy. The Crowther Report, formally titled Fifteen to Eighteen, was published in 1959 by the Central Advisory Council for Education (England). The report highlighted deep class divides in Grammar school access revealing only ten percent from poorest backgrounds admitted (Hamman et al., 2019). The report produced a comprehensive, critical assessment of Upper Secondary Education in England, resulting in consequential reforms extending opportunities, and addressing social disparities (Spolton, 1967). Inequality of outcome is a quantifiable contrast in outcome between those who have faced socio-economic disadvantage and those who have not (Gov. Wales, Nd). The creation of Medr, the Commission for Tertiary Education and Research found the main obstacles facing policy makers in Wales were post sixteen education and training. They established low levels of engagement of higher education and training, and extensive socio-economic disparity (Wcpp.org.uk, 2022). A report by Comparing policies, participation and inequalities across UK post-16 Education and Training landscapes observed Wales has the highest share of pupils 'Not in Education, Employment or Training' (Neet). The report proposes that an immediate response is essential in Wales and that policy makers should take proactive measures to understand and strengthen post sixteen educational outcomes and inequalities (Education Policy Institute, 2024). PISA is an eminent model of the globally structured reform agenda forming education policy through internationally comparable performance measures (Gov.UK, 2024). Following the 2010 "PISA shock" in which Wales fell to their lowest level, the Welsh Government implemented a succession of systematic reforms including the introduction of national literacy and numeracy framework, national testing, an increased measurement of performance and data collection, grading of schools into bands, and Masters level training for NQT's (Swaffield, 2017). Better skills in financial literacy are fundamental in bridging the gap between individuals that who are at a socio-economic disadvantage to improve educational attainment and improved future potential and opportunities.

Connections between citizenship education and mathematical education focuses on preparing individuals to navigate society through vital numerical and analytical skills. This ensures citizens possess the mathematical and statistical proficiency required to be informed, participatory, and responsible (Geiger et al., 2023). Mathematical literacy empowers citizens to interpret data, challenge misinformation, and engage in meaningful dialogues regarding social issues such as poverty, discrimination, gender inequality, and environmental disquiet (Sus and Drew, 2023). To have competence in quantitative reasoning and mathematical modelling is integral for evaluating complex societal challenges, such as economic shifts, overconsumption, and health and healthcare issues (Soken-Huberty, 2024). Responsible citizenship involves using mathematical tools to understand rights and responsibilities, promoting equity, and tackling structural injustices through a critical lens (Ministry of Justice, 2009). Teachers are the primary guide for developing future citizens. Forming associations between responsible and critical citizenship and mathematics education is necessary if young people and adults are to be prepared to make the judgements required to establish a sustainable, equitable, and peaceful world. The incorporation of teaching mathematics and science stimulate dialogue regarding ethical, social and cultural consequences of decisions based on mathematical/scientific evidence, these are the moral dilemmas of innovation according to Geiger et al., (2023), cited in (Maass et al., 2019). The Curriculum renewal for Wales, led by Professor Donaldson's Successful Futures report (2015) emphasized the necessity for a curriculum that further meets the needs of children in Wales (Dauncey, 2024). His review determined the need of a more applicable and pertinent curriculum centring on skills and competencies such as critical thinking, planning and organising, creativity and innovation, and personal effectiveness rather than traditional subject-based learning (Donaldson, 2015). Curriculum renewal for Wales considers effective pedagogy, reflective practice, and professional development as the engine of change (Conn and Hutt, 2020).

It would seem that there is a lack of confidence among adults in Britain about many of the essential mathematical processes of everyday life (Haylock and Manning, 2019). Negative attitudes rather than absence of innate talent, are the source of mathematical insecurity. Poor experiences have led to fear and anxiety when tackling mathematical problems, inducing disengagement, and a reluctance to attempt to enhance skills. What can be done to improve negative attitudes towards maths and numeracy? Recognising and valuing the benefits of improving numeracy skills, acknowledging that perseverance and effort is needed to achieve this, having a 'Growth Mind-set' belief, learning from mistakes and embrace challenges (National Numeracy, 2020).

To conclude, being numerate is a critical life skill not just an academic requirement, it is an essential life tool for navigating adult life. "Good Numeracy is the best protection against unemployment, low wages, and poor health" (Schleicher, 2014).

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What Can Schools Do to Encourage Numeracy?

By Rebecca Jones – 2416233



“I’m Just Not a Math Person!” How many times have we heard this phrase?

(Bing Images, 2020)

According to research conducted by the charity National Numeracy, a 2022 YouGov survey found that 54% of the UK’s working-age population has low numeracy skills (National Numeracy, 2022).

A lack of confidence in basic mathematics is fundamentally intertwined with maths anxiety and pervasive feelings of inadequacy. There are common confusions amongst the adult population in Britain about many of the rudimentary mathematical processes of everyday life (Haylock and Manning, 2014).



According to Haylock and Manning (2014) as cited in (Briggs and Crook, 1991) many teachers experience a sense of maths anxiety, often reporting a wave of panic when confronted with unfamiliar problems. Defeatist mentality from bad experiences lead to a fixed mindset and an unwillingness to try and improve skills (Dweck, 2008).

If teaching is defined as helping others learn, then mastering the subject matter is an absolute prerequisite (Hanson, 2008).

Seeing the positive...

Educators with mathematics anxiety often possess a profound empathy for their learners’ struggles, frequently resulting in more supportive and effective teaching.

Moving from panic to power...

- Avoid comparisons to other people.
- Develop a ‘growth mindset’.
- Learn from mistakes.
- Professional development.
- Emancipate your mind from self-imposed limitations!

(Skyrme and Hunt, 2022) (Dotts, 2025)

So, what can schools do to encourage numeracy I hear you ask?

Teaching critical numeracy goes beyond basic math; it is giving children the power to use data to scrutinise and influence the social, economic, and political forces around us (Goos et al. 2018).



(Cockcroft, 1982)

Following Wilfred Cockcroft's findings schools should provide an engaging environment including a mixture of classroom talk, practical work, and problem solving. This style of learning was also advocated by Jerome Bruner, a Constructivism theorist who favoured active learning supported by 'scaffolding' to encourage children as they develop creative problem-skills, rather than just rote memorization as associated with Skinner's Operant Conditioning (Bates, 2015).

The impact of Cockcroft's report (1982) led to the creation of the National Curriculum and GCSE's as we know them (Cornelius, Nd).

Five Reasons for Teaching Numeracy

- It's prominence in everyday life and society.
- It's relevance in other curriculum areas.
- It's value in relation to learners' intellectual development.
- It's influence in developing the learner's enjoyment of learning'
- It's remarkable position in human knowledge and culture.

(Haylock and Manning, 2014)



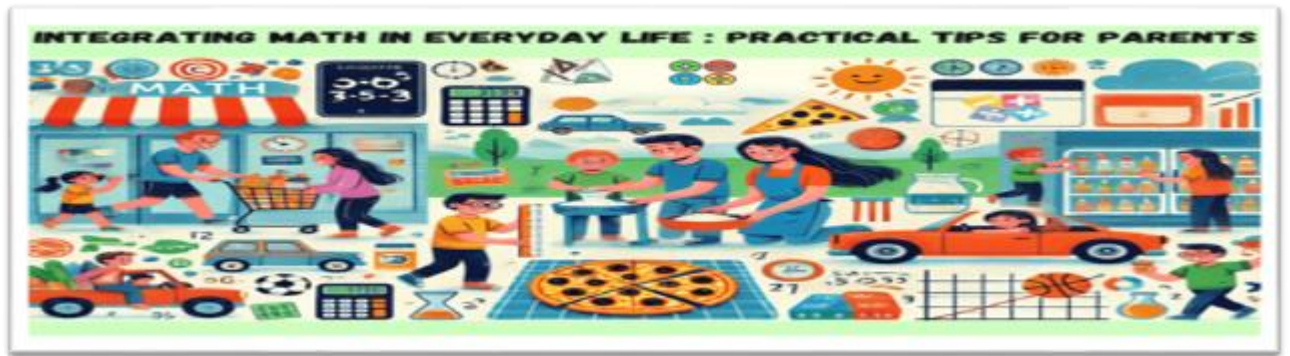
(Getty Stock, 2026)

Mathematics is about real life

Make it real for children in innovative ways

Evaluate numerous opportunities to foster mathematical reasoning through routine daily experiences and play-based activities.	Experiences such as shopping, cooking, time management, travel, sport, playing games, reading stories.
Assess the significance of making connections within the field of mathematics.	This leads to deeper conceptual understanding in the real world, the past, other curriculum areas, and within strands.
Investigate the significance of providing opportunities for mathematical development in children's imaginative play.	It makes abstract concepts tangible, promoting cognitive growth and problem-solving skills.
Explore strategies for recognising children's interests and using them to scaffold mathematical progress.	Engage their interests providing varied and frequent opportunities to solidify understanding.

(Pound, 2008)



(Bing images, 2026)

How can we encourage numeracy in our learners?

Discuss mathematics in a positive fashion - emphasize the value of learning, fostering a growth mindset, framing it as an essential, everyday tool.



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Celebrate effort, curiosity, and learning from mistakes, to inspire and motivate continued learning and enhancing skills.



Utilize everyday objects to recognise shapes, count, sort, measure. The outdoors also provides 'messy', large-scale environment to master basic concepts.



(Kay, 2023) (Bing images, 2026)

In accordance with Welsh Government guidance, mathematics and numeracy area of learning and experience centres on five interconnecting non-hierarchical proficiencies.

1. Conceptual Understanding.
2. Communication with symbols.
3. Fluency.
4. Logical Reasoning.
5. Strategic Competence.

These proficiencies are essential for a curriculum that ensures every learner's progression (Welsh Government, 2020) (Evans, 2022).

Andrews and Hudson (2024) recommend for schools to encourage numeracy they should provide:

- A dynamic learning space that fosters mathematical perseverance, resilience, and confidence.
- Opportunities to practice numeracy skills in authentic day-to-day operations.
- Scope to work collaboratively, explore ideas and problem-solve.
- Moments to make connections within and between mathematical concepts.

(Andrews and Hudson, 2024)

Why are real-world contexts so important?



“Why am I doing this?”

(RDNE Stock Project, 2021)

To many children, mathematics feels like a series of isolated rules rather than a tool for the real world. A balanced and nuanced approach to the examination of real-world issues is more invaluable, rewarding, and practical for children than futile, repetitious standard mathematical facts, procedures, and processes...it is just more authentic! (Tout, Nd)

Mathematical enquiry and investigation are defined by their position at the open end of the open/closed dimensions, prioritizing exploratory discovery over the application of fixed procedures (Haylock and Cockburn, 2013).

Being open-minded and thinking creatively, rather than inflexibly, divergently rather than convergently and being willing to make mistakes is essential to be a good problem solver. This can be done through a process of planning, developing, and reflecting which helps learners acquire a deeper understanding. By thinking creatively and critically, learners can effectively plan, execute, and evaluate their findings. These three processes are complimentary and can be used interchangeably (Haylock and Cockburn, 2013) (Conn and Hutt, 2020).

In inclusive schools, a learner’s sense of belonging is the primary focus of success. To promote inclusivity teachers should utilise continuous formative assessment to make informed decisions regarding individual requirements (Conn and Hutt, 2020).

How does inclusive practice look?...

- Stage not age – Piaget (1936).
- Person-centred practice – Rogers (1942).
- Scaffolding – Vygotsky (1930)
- Universal provision (2021)

(Welsh Government, 2022) (Bates, 2016)

Is there a need for standardised testing?

Standardised testing is considered necessary by many, including PISA (Programme International Student Assessment) and GERM (Global Education Reform Movement), for providing objective, consistent, and comparable data on learners' performance across different countries. GERM is focused on standardisation, competition, and accountability as main tools for education improvement. However, it is also debated, with concerns over excessive stress, and narrow curriculum performance (Fuller and Stevenson, 2018).

Are you for or against standardised testing?



(Education Wave, Pros and Cons Explained, 2025)

Is it the case that policy makers compare data and tailor frameworks for learners to just pass tests? If this is the case, we are doing our learners a great injustice just so countries can look good on the result's table! The purpose of assessing mathematical learning is to identify any gaps in learning. The most valuable way to do this is the use of formative and summative assessment.

To conclude, why is numeracy important?

- To enable learners to be informed contributors of society.
- Connecting curriculum and pedagogy to children's life worlds.
- For social justice and equality.
- For learners to have numerical capabilities, confidence and be critical thinkers. If we do not equip our learners with these essential life tools now, when exactly do we expect them to be ready for the real world?

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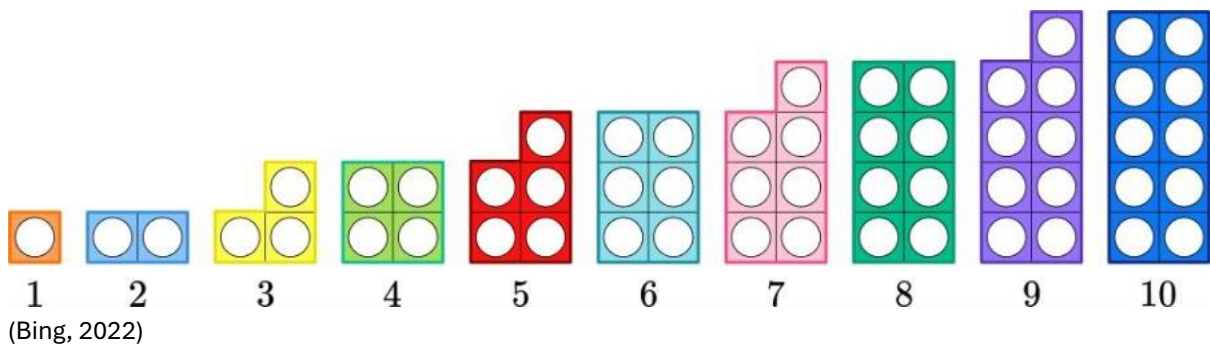
Using Numicon to Support Children with ALN - Understanding Place Value

By Rebecca Jones – 2416233

What is Numicon?

Numicon is a visual, hands-on maths resource designed to help children understand mathematical concepts in a multi-sensory way. Numicon provides a solid foundation for pedagogy, helping teachers make abstract mathematical notions tangible for every child (Atkinson et al., 2014).

Many ALN pupils struggle with abstract thinking – Numicon supports concrete needs.



Purpose of Numicon

- **Makes numbers concrete and visual**

The shapes show number size, order, and patterns, helping children understand what numbers mean.

- **Strengthens understanding of number relationships**

Children can easily see concepts like one more, one less, bigger, smaller, and number bonds.

- **Supports children who find abstract maths difficult**

Numicon is especially helpful for pupils with gaps in learning, ALN needs, or maths anxiety, it is hands-on, kinaesthetic way to make maths clearer, less scary, and more fun.

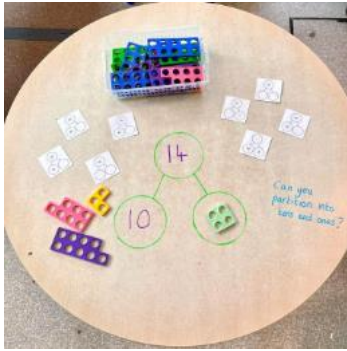
- **Encourages mathematical reasoning - what do you notice? Can be used to challenge thinking**

Using the shape prompts children can explain their thinking and visualise/recognise patterns.

(Crawley, 2016)

Benefits of using Numicon supporting year 3 children with specific cognitive learning needs that affect working memory and number recall: Highly visual and tactile resource to support understanding of mathematical concepts. By physically handling the Numicon shapes, children can feel the difference between numbers, which reduces reliance on abstract symbols alone. The consistent colour and hole patterns help make connections between quantities and numerals, while repeated, hands-on practice supports memory retention.

(Marlow, 2023)



Numicon helps teach place value by providing a concrete and visual representation of numbers. By using Numicon, children can see and feel the value of each number, making it easier to grasp the abstract idea of place value (Hope, 2025).

(Bing, 2026)

Key learning goals understanding place value in year 3

- Secure understanding of place value up to 1000.
- Apply number knowledge to problem solving.

Practical strategies: Use Numicon shapes to build 2-digit numbers (tens, ones) followed by 3-digit numbers.

Differentiation Tips: Pre-teach specific vocabulary (digit, place/position, value, tens, ones). Use repetition and overlearning. Revisit concepts daily in short bursts.

Additional support ideas: Pair Numicon with number grids for reinforcement, use real-life contexts (money) alongside Numicon, encourage peer support and collaborative problem-solving.

(Gov. Wales, 2021)

Assessment and progress tracking

Initial baseline task: Note how much support they need, use observation checklists, record pupil explanations to assess conceptual understanding.

Improvement in independence: Demonstrated through quicker decision-making, rely less on adult guidance.

Accuracy increases: Early attempts maybe incorrect or hesitant, later attempts show correct placement.

Improved problem solving: Early attempts, lots of trial and error, later attempts, more logical piece selection and checking their own work.

Visual evidence: Take photos at start and end of session showing- how they built their numbers, how their drawings changed, their written calculations. This provides clear 'before and after' progress.

Personalised assessments: Tailored to individual ability.

Formative assessment: Provides immediate feedback to advance learning.

Summative assessment: End of stage/unit determination of progress.

(Gov. Wales, 2025)

Progress over time

Pupils begin to seek out Numicon for themselves as a resource without being asked, progressing to being able to solve problems with less reliance on concrete materials (Academy21, 2025).

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Element four...Link to video – Numicon in action:

https://eur01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fdrive.google.com%2Ffile%2Fd%2F1m2Dnnwh-966loCYjO4hO9uvR_smzoqEV&data=05%7C02%7C2416233%40student.uwtsd.ac.uk%7Cedd0e4d71f78447fe20d08de77a11441%7C4e0f11f9046e45059cb8db2152311e21%7C0%7C0%7C639079731163886950%7CUnknown%7CTWFpbGZsb3d8eyJFbXB0eU1hcGkiOnRydWUsIlYiOiIlwLjAuMDAwMCIslIAiOiJXaW4zMilslkFOljoiTWFpbCIslldUljoyfQ%3D%3D%7C60000%7C%7C%7C&sdata=XJRnch798yV7K58SZ%2FapFk8xoNizr9G0GxefDJORV3o%3D&reserved=0

Evaluation of the use of Numicon to Support Children with ALN

By Rebecca Jones – 2416233

I am going to evaluate broadly the effectiveness of using Numicon to support children with ALN

The purpose of using Numicon to support children with ALN is it is an engaging, colourful, and interactive resource that allows children to explore in numerous ways to reinforce learning (Towerhamlets.sch.uk, 2026). Numicon, developed by Oxford University Press, builds confidence and eases maths anxiety by providing a tactile, hands-on learning experience.

Numicon is an immersive resource that has the capacity to stimulate high levels of engagement and helps learners visualise mathematical patterns before moving to theoretical symbols. When children explore with concrete materials it facilitates the cognitive transition from tactile learning, to learning the mastery of abstract principles (Main, 2021b). The Numicon pedagogy follows a Concrete-Pictorial-Abstract sequence, based on work by Bruner in 1964 (Main, 2021a) (Caniglia et al., 2025). It begins with tactile experiences, transitions into visual representations, and finally moves toward symbolic mathematical notation (Gibson et al., 2023). A possible drawback is the exclusion of some essential early number development, while Numicon is an effective resource it should be used in conjunction with other mathematical initiatives (Towerhamlets.sch.uk, 2026). Several studies have attempted to scientifically validate Numicon, with many reporting positive numerical trends and improved mathematical outcomes for children using it (Nye et al., 2005). According to Rinaldi et al. (2020) children who had internalized the colours of Numicon displayed considerably stronger numerosity, where children can see the colours and shape, subitising rather than counting, this is also supported by Caniglia (2025). Marlow (2023) pertained that learners may become reliant on the colours rather than numbers and saw this as a disadvantage. Based on a report by Oxford University Press (2011), the impact data from 2008-2011 suggests, findings from the Cambridge Local Authority trials indicated that the Numicon programme led to statistically significant improvement in learners' mathematical performance across various tasks. The disposition of Numicon is evident in its popularity, with over ninety percent of teachers using Numicon believe it has enhanced their teaching of mathematics, with over thirty percent finding a notable improvement. Over seventy percent of teachers have witnessed learner's enjoyment of mathematics increase. Lack of teacher training on using the resource can hinder learning by preventing the effective implementation of its multi-sensory approach (Oxford University Press, 2011). For learners' with ALN teachers may be required to make suitable adaptations for successful engagement and learning, and lack of training would affect this. Ineffective use of the resource could result in missed opportunities (Caniglia et al., 2023). Ongoing professional development and up to date relevant training is the cornerstone of effective pedagogy which is essential for enhancing learners' achievement and educational outcomes (Ofsted, 2024).

The Numicon teaching and learning cycle is built around three key elements. **Communicating Mathematically**- applying subject specific vocabulary, conjecturing, and oral reasoning. **Generalizing**- building on prior knowledge in different contexts, many children with ALN often need varied approaches to achieve the same result to meaningfully utilise and embed their new-found knowledge. **Exploring Relationships**- exploration is central to every stage of learning, ranging from cause and effect to intricate relationships within advanced mathematics (Gibson et al., 2023). For many children, repetition is essential and should be interpreted through relatable, real-life examples to ensure learners can apply their knowledge in a variety of ways (Oxford University Press, 2011). For children working below the level of national curriculum assessments, teacher are to use the Engagement Model (Standards and Testing

Agency, 2020) which focuses on five areas of engagement, **exploration, realisation, anticipation, persistence, and initiation**. Within the framework of graduated approach for learners with ALN, the Engagement Model serves as a vital assessment tool. It allows teachers to qualitatively measure and evidence how effectively learners are connecting with their learning and developing new skills using formative and summative assessments (Gibson et al., 2023)) (Caniglia et al., 2025). Although Numicon is an effective resource, it is not a quick fix, it requires dedicated time and strategic effort to achieve high quality delivery (Nye et al., 2025). A balanced implementation of Numicon requires a critical understanding of both its advantages and challenges to meet individual needs (Towerhamlets.sch.uk, 2026). Extended use of Numicon without deliberate scaffolding can lead to over-reliance, potentially hindering a learner's ability to transition from concrete manipulatives to abstract mathematical reasoning (Douglas, 2021)). Scaffolding is an important instructional approach for teachers based on Vygotsky's Zone of Proximal Development. To ensure learners develop a genuine understanding and independence, teachers need to know when to fade scaffolded support (Maine, 2021). To make transitions seamless, teachers could encourage learners to visualise the Numicon shapes in their mind to build internal mental model (Oxford University press, Nd).

To conclude, the Numicon approach is engineered for inclusivity and equity, providing support for individual needs, over equality, giving everyone the same, ensuring all learners have the opportunity to succeed. This inclusive approach is especially beneficial for children with ALN as evidence suggests it can accelerate mathematical development, reduce maths anxiety and boost confidence. In accordance with the Numeracy framework (Welsh Government, 2020) Numicon offers the tools needed to move beyond rote memorisation and helps provide a deeper understanding paired with the ability to manipulate abstract representations and apply logical reasoning to problem solve. It assists learners move through the numeracy framework progression steps, **conceptual understanding, logical reasoning, fluency, and strategic competence** (Gov. Wales, 2021). On balance, recommendations are Numicon is to be used in conjunction with other manipulatives to cover the full spectrum of early number development. There should be appropriate teacher training as success relies on teacher understanding, so they are able to confidently adapt activities to meet the needs of all learners.

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