IMPROVING MATHEMATICS IN THE EARLY YEARS AND KEY STAGE 1

A self-assessment guide

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This Red Amber Green (RAG) self-assessment guide accompanies the Education Endowment Foundation's report, 'Early Maths: Improving Mathematics in the Early Years and Key Stage 1', which sets out five evidence-based recommendations for the effective teaching of mathematics to young children. This guide exemplifies practice in relation to each of the recommendations to help educators and leaders identify strengths and areas for development within their own settings. It can be used as part of an initial audit process to establish current practice (i.e. **point of departure**), as well as to monitor progress towards the development of more effective practice (i.e. **direction of travel**).

RECOMMENDATION 1
Develop educators' understanding of how children learn mathematics

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Educators often mistake a child's engagement as understanding—e.g. misinterpreting a reciting of the counting sequence as a full understanding of the meaning of numbers in the count sequence.	Whilst educators are aware that successful engagement is not the same as full understanding, gaps in the educators' knowledge of how children learn mathematics can lead to some incorrect assumptions—e.g. a child correctly counting a set of objects, but not understanding that the last number in the count sequence is equal to the number of objects.	Educators understand that even if a child appears to be engaging successfully in mathematical activities—e.g. reciting the count sequence—they may not have a full grasp of the underlying concepts—e.g. the meaning of numbers in the count sequence (asking 'How many altogether?' will check that the child knows that the last number counted is the total for the set).
A culture that supports children's mathematical curiosity, thinking, and problem-solving is not yet in place. Activities often are not suitably pitched to match children's level of development and do not provide appropriate cognitive challenge.	Some consideration is given to the cognitive challenge of mathematical activities, and a culture promoting curiosity and problem-solving is developing but not yet fully embedded—for example, rich tasks are used but can feel like a 'bolt on' as they are not fully embedded into practice.	There exists a culture embedded across the setting that supports children's curiosity, thinking, and problem-solving; children engage in appropriate, cognitively challenging activities well matched to their level of development—for example, tasks such as those from nRich are regularly incorporated into teaching and rich mathematical tasks with associated discussion are embedded into everyday practice.
Mathematical knowledge is seen as the only thing that is important in a child's mathematical development, and is prioritised above other areas related to successful mathematical development—working memory, language skills, motor skills, prior experiences, children's interests, enjoyment, and attitudes.	Educators are partially aware of the role that working memory, language skills, motor skills, prior experiences, and children's interests, enjoyment, and attitudes play in a child's mathematical development.	Educators are all aware through engagement with high-quality CPD that mathematical development does not rely only on specific mathematical knowledge and skills but also on working memory, language skills, motor skills, prior experiences, and children's interests, enjoyment, and attitudes towards mathematics.



Educators are not aware of typical developmental progressions, making it difficult for them to understand what children need to learn in order to progress.	Educators have some awareness of typical development progressions, but these may not be detailed enough (e.g. the many stages of learning to count) or broad enough (e.g. they may be aware of progression in number, but not in shape).	Educators are aware of typical development progressions in mathematics, and use these to inform teaching and personalise learning—for example, recognising the importance of understand the cardinality of numbers. They have a good understanding of what children need to learn to progress in all areas of mathematics, and when they need to learn it, and they attempt to close gaps in knowledge.
Progression is considered to be linear, meaning that incorrect assumptions are made about the progress that children are making and their readiness for the next stage in their learning (for example, seeing a child count correctly to 5 once may lead to an incorrect assumption that this learning is secure and cause a practitioner to move on too soon).	Educators are mostly aware of the non-linear nature of learning mathematics, but incomplete understanding of developmental progressions means that they are not always able to use this to support children's development—e.g. seeing a child count 5 objects by putting them into a line and assuming that they can count 5 images in a different arrangement.	Educators know that mathematical development rarely takes place in clearly defined linear steps—that children may develop several skills in parallel and individual children may move through skills in different orders—e.g. understanding that a child's fine motor skills may be holding back their success with counting as they are unable to count accurately with 1:1 correspondence unless they move rather than tap the object.
Educators' lack of training about progression in mathematics makes it difficult for them to assess a child's level of understanding and to plan for their next steps in learning.	Educators' incomplete understanding of progression in mathematics means that whilst they can sometimes identify gaps in children's knowledge and understanding, this is not always the case.	Due to their in-depth knowledge, staff are able to determine the developmental pre-requisites for a particular skill, assess a child's level of understanding, and build on what children already know.

RECOMMENDATION 2

Dedicate time for children to learn mathematics and integrate mathematics throughout the day

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Time is not set aside specifically for purposeful mathematical activity, or purposeful mathematics is not integrated carefully into continuous provision (e.g. there is a mathematics 'area' but mathematics is not integrated into other activities).	Whilst time is often dedicated to mathematics and there is some integration across the provision, this does not routinely happen every day.	Educators dedicate time every day for purposeful mathematical activity, support children to develop specific mathematical ideas and skills, and find ways of making appropriate spontaneous links to practice or reinforce mathematical understanding.
Mathematics is delivered through specific activities, but opportunities are missed to deliver mathematics through contexts more associated with other domains of learning such as books, puzzles, songs, rhymes, and games.	Limited opportunities are taken to explore mathematics through different contexts: for example these opportunities are only occasionally taken, or this is done more regularly but not in a variety of different ways—for example, daily counting of the children in attendance takes place but the approach is not adapted to become more challenging as the children's skills progress.	Mathematics is explored through different contexts—including books, puzzles, songs, rhymes, puppet play and games—and regularly timetabled activities are adapted to ensure they offer challenge.
Mathematical concepts are not considered when reading story books with children.	More obvious mathematical content in stories is discussed with children, but this is rarely planned in advance meaning some opportunities are missed.	Story books are used to teach mathematics through mathematical talk and questioning, and educators plan how they will use storybook resources to discuss mathematical concepts (for example, planning what specific mathematical questions will be asked).
Games are not routinely used in the teaching of mathematics.	Games are sometimes used in the teaching of mathematics, but thought is not always given to their appropriateness in supporting the development of early maths skills.	Games are integrated into mathematics teaching by providing opportunities for developing strategies such as 'counting on'. The games used feature linearly arranged, consecutively numbered, and equal-sized spaces.



Opportunities to reinforce mathematical vocabulary are often missed by Educators, and vocabulary use is not planned and used consistently.	Some opportunities to reinforce mathematical vocabulary are taken, but these usually occur during mathematical tasks rather than being embedded throughout the day without advance consideration of what vocabulary may need to be taught/learnt before children are ask to apply it.	Educators seize chances to reinforce mathematical vocabulary throughout the day, using informal then formal mathematical terms, and plan a graduated use of vocabulary which is applied consistently. They consider what key vocabulary could be the focus for teaching that week or may need to be pre-taught—for example, the book 'Rosie's Walk' requires positional language.
Educators do not routinely create opportunities for extended discussion of mathematics with individuals or small groups of children.	Children are occasionally involved in mathematical discussion with Educators, but these may not use modelling of language, open-ended questions, elaboration, recapping and clarifying.	Educators create opportunities for extended discussion of mathematical ideas with individuals or small groups of children in order to extend their thinking, possibly using an established framework for doing so.
Activities such as registration, snack time and tidying up time are not used to support mathematical development.	Occasional opportunities are taken to link everyday activities to mathematics, but this is not done routinely and is not embedded throughout the day.	Educators plan how they will take advantage of everyday activities such as registration, snack time, and tidying up time to support mathematical development, how this will progress throughout the year, and how these might be adapted to be challenging for all children.
Opportunities are not routinely taken to extend mathematical learning during play.	There are times when Educators identify 'teachable mathematical moments' during play, but this is not embedded practice across the setting. They sometimes add resources to the environment that build on mathematical moments they have observed.	Educators scaffold opportunities for extending learning during play, by providing and enhancing a variety of tools to allow children to explore all areas of mathematics. They identify 'teachable moments' in which they can join the play to model approaches, reinforce mathematical vocabulary, and encourage problem-solving through strategies such as Sustained Shared Thinking.



Manipulatives are rarely or never used to teach mathematics.	Manipulatives are often used, but without a clear rationale for how they will develop children's understanding of mathematical ideas.	Educators use manipulatives appropriately, and with a clear rationale for why the manipulative will support children to understand mathematics, considering carefully how the manipulative will be used to build on existing understanding.
Children are not encouraged to use their fingers as manipulatives, and in some cases may even be discouraged.	Children do use their fingers to support counting, but this is not always explicitly encouraged and is not extended to counting in groups.	Children are encouraged to use their fingers to support counting, and subsequently to support counting in groups.
There is little planning across year groups or phases as to how the use of manipulatives and representations might develop over time for each mathematical concept.	Whilst some planning might take across year groups or phases, this is not yet embedded practice—for example, it might take place for some mathematical concepts but not others or might be implemented inconsistently.	Planning for the use of manipulatives and representations for each mathematical concept takes place across year groups and teaching phases—for example, starting with objects (e.g. buttons and pine cones) before moving to more abstract manipulatives (e.g. Numicon), then morphing the representation of the manipulatives (moving from a Numicon hole representing 1 to representing 10).
Not enough time is given over to children becoming familiar with a manipulative through play, or too many different manipulatives are introduced quickly, meaning children are distracted from the intended learning aim.	Children are given some time to play with a manipulative before it is used with a specific learning aim in mind, but this time is often short and takes place immediately prior to the learning.	Manipulatives are used regularly, and are introduced through play to enable children to gain familiarity with them. This reduces the novelty of the manipulative, enabling a focus on the intended learning aim.



Links between the manipulative or representation and the mathematical idea they represent are not made clear by Educators.	Manipulatives are used, and some links have been made to mathematical content, but clear links between the manipulative and the mathematics have not always been thought through—for example, a child may be confident using Dienes blocks to add but be unable to connect this to a written addition.	Educators help children to understand the links between the manipulatives or representations and the mathematical ideas they represent, which have been carefully considered prior its introduction.
Children are not usually encouraged to represent problems in their own way, and Educators are overly prescriptive in the types of representations they expect children to use.	There is some freedom given to the way children represent their mathematical ideas, but Educators are too quick to steer representations in their preferred direction.	Educators encourage children to use their own pictures, symbols and more abstract diagrams to represent and communicate ideas and concepts, and are encouraged through dialogue to reflect on the success of their choices.
Whilst physical activity is encouraged and celebrated, opportunities to link physical activity to mathematics are missed.	Occasionally, children count whilst performing physical movements; however, this is not an embedded practice and is not used consistently and by all Educators in the setting.	Children are frequently encouraged to link whole-body movements to mathematics: for example, physical movement along a number line, or jumping and clapping while counting.

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Educators' knowledge of the development of mathematical thinking in incomplete or not secure. This means they have difficulty assessing children's mathematical understanding.	Educators have a growing knowledge of the development of mathematical thinking which helps in the observation and assessment of children, but their understanding is not strong enough for them to use this to inform teaching.	Educators have a secure knowledge of the development of mathematical thinking and use this to interpret and use observation of children to inform teaching.
Educators lack a varied 'toolbox' of age-appropriate assessment approaches to assess children's mathematical understanding.	Limited tools are available to educators to accurately assess children's mathematical understanding, and further training in this area would be desirable.	Educators use a variety of age-appropriate methods to assess children's mathematical understanding, including observation and discussions—for example, using puppet play to assess understanding of counting, and having resources available which allow for assessment through the observation of play.
Assessment is 'one size fits all', with all children being given the same assessment activities which are not are modified to enable teachers to fully understand pupils' mathematical knowledge—for example, children might be asked to complete a task the adults are already confident they can answer due to the assessment task not being adapted appropriately.	There is some attempt made to target assessment activities to children, but most assessment is still given to the whole cohort of children without modification.	Educators target specific assessment activities to children they have a clear rationale for focusing on, and where common assessment tasks are used these are modified to enable teachers to fully understand pupils' mathematical knowledge.
Assessment is often a 'bolt on' and is not integrated throughout the day and over time—for example, children take part in 1:1 adult initiated activities outside of the classroom for assessment purposes only.	Sometimes opportunities are taken throughout the day to assess what children know, but most assessment is still seen as being separate to the daily experiences of the children.	Educators take opportunities throughout the day to gather information about what children know.

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Settings too frequently rely on adult-led assessment activities, rather than assessment via 'in the moment' interactions where assessment and teaching happen simultaneously.	Whilst assessment via 'in the moment' interactions is used, it is often not fully embedded into a setting's or educators's assessment practice.	Settings use an appropriate mix of adult-led assessment activities, and assessment via 'in the moment' interactions where assessment and teaching happen simultaneously.
Because adult-led assessment is not planned carefully, educators are not always aware of what information they want to get out of an activity, or may find they cannot get the information that they wanted to.	There is a mixture of carefully and less-carefully planned adult-led assessment, and educators would benefit from additional training on effective methods of assessment.	Adult-led assessment activities are carefully planned to ensure that educators are aware of exactly what information they want to get out of the activity and what they will subsequently do with this information.
Information is collected for assessment and accountability purposes, but this is not routinely used to inform the next steps for teaching—for example, there are lots of observations and next steps recorded in learning journals but these are not used to inform planning and teaching.	Assessment is too frequently used for accountability and monitoring, with not enough time given to using assessment to inform the next steps in teaching.	Assessment is seen primarily as a tool to inform the next steps in teaching.



Children who are further behind are not supported to catch up with targeted support from experienced staff.	Children who are further behind are sometimes given additional support, although steps could be taken to ensure this happens more routinely.	Children who require catch up in specific areas of mathematics are supported to do so by experienced staff.
Little or no training or resources are given to Educators to support their work with children with the greatest needs in mathematics.	Whilst some training and resources are provided, Educators do not feel fully confident in using targeted activities or targeted additional support during play which are designed to support the children with the greatest needs.	Educators are well trained in using targeted activities or providing targeted additional support during play, and are provided with the support and resources they need.
Support sessions can be prolonged, or can be sporadic, taking place infrequently due to staff availability or other factors unrelated to the learning of mathematics.	Support sessions are well-planned, but lack fidelity to the programme: they can sometimes be sidelined by staffing (or other) issues and as a result are not as effective as they could have been.	Support sessions are focused: they are brief and take place at regular intervals.
Teaching Assistants are not effectively deployed, and the evidence around the use of teaching assistants is either not known or is ignored.	Teaching Assistants may sometimes be used effectively, but this is often by accident rather than by design. Planned deployment informed by evidence-informed recommendations is not in place.	Teaching Assistants are deployed effectively, where possible in line with the recommendations from the EEF's 'Making best use of teaching assistants' guidance report—such as the recommendation to ensure that they are fully prepared for their role in the classroom.



Support programmes are 'bought in' without consideration as to whether they have been shown to be effective under an external trial and evaluation and without effective implementation plans in place. This often means that leaders are unaware whether the programme is having its intended impact within the setting.

'Bought in' support programmes have some success, but implementation is variable and monitoring is inconsistent. Evidence is not always considered when making decisions about which programmes to purchase.

If 'bought-in' support programmes are used, careful thought is given over to effective implementation of these in order to give them the best chance of success (in line with the EEF 'Putting evidence to work' guidance report), and the effectiveness in the setting is monitored. Where possible, programmes which have been shown to be effective under an external trial and evaluation (including EEF's 'Promising Projects') are considered.