Research and analysis

Best start in life part 3: the 4 specific areas of learning

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Applies to England

Contents

Introduction

This report is part of our series of curriculum research reviews. Its purpose is to help early years practitioners to raise the quality of early years education. The report is the third in a 3-part review:

- part 1: setting the scene
- part 2: the 3 prime areas of learning
- part 3: the 4 specific areas of learning

Part 1 examined the factors that contribute to a high-quality education. It considered the early years context, staffing in the early years sector and early years curriculum and pedagogy. It also outlined the principles behind the research review series.

Part 2 considered the factors that help children to make progress in the 3 prime areas of learning in the early years foundation stage (EYFS).

Here in part 3, we consider the 4 specific areas of learning. The EYFS statutory framework says that 'the 3 prime areas are strengthened and applied' through the 4 specific areas. As before, we consider which principles of curriculum design and delivery ensure that all children, including disadvantaged children and those with special educational needs and/or disabilities (SEND), learn what they need to succeed in life. So, this review considers what it means to make progress in the 4 specific areas of learning in light of findings from research, and the implications of this for practitioners. We explore literature relating to early years education, drawing on a range of sources, including academic and policy literature.

This report builds on our education inspection framework (EIF) overview of research, focusing on early education. Therefore, it does not provide a comprehensive guide to research into early education and care. Instead, it highlights useful evidence that practitioners can put into practice to help ensure that every child gets the best start in life.

This part of the review considers children's learning in the areas of:

- literacy
- mathematics
- understanding the world
- expressive arts and design

The specific areas of learning give breadth and richness to the early years curriculum. Areas of learning like 'understanding the world' and 'expressive arts and design' show how early learning is connected. Children accumulate knowledge to apply in different contexts. For example, children's growing understanding of themselves as unique individuals, their family and their community gives them a pathway to learning about time and place. Learning like this is important for children while they are young. It also prepares them for their later learning in subjects such as history and geography.

Summary of findings

There is no one single way to provide high-quality early education. Parts 2 and 3 of this research review have identified some guiding principles and implications that early years practitioners can consider.

- The specific areas of learning are connected. They give the context for much learning in the prime areas. Learning in the specific areas should prioritise vocabulary and language comprehension. It should give children opportunities to develop their executive function.
- To deliver a high-quality curriculum in their settings, practitioners need to know

how children develop and learn. They need to have a clear understanding of the possible next steps in children's development and learning. They need to know how to teach young children and how to assess their learning. This requires ongoing guidance and professional development.

- All children need a fair opportunity to learn. The quality of the curriculum is especially important for children who have less help at home with their early learning.
- Early literacy development gives children lifelong benefits. Stories, rhymes and songs help with children's language and vocabulary development. They also develop children's emotional understanding. Early literacy is linked to better academic achievement, mental well-being and empathy.
- Effective early mathematical learning combines deliberate teaching with opportunities for learning through play. Understanding both number and spatial reasoning is crucial to later achievement, as is encouraging positive attitudes to maths.
- Understanding the world is a broad area that includes the foundational knowledge for many later curriculum subjects. It is not helpful to think of this area as a number of later subjects 'squashed' together under one heading. For babies and young children, learning in these areas needs to connect. Children learn new things, and the vocabulary to talk about them, in a range of interesting contexts. This helps children to develop deeper knowledge and conceptual understanding.
- Expressive arts and design (EAD) should give children opportunities to learn new skills, appreciate the arts and use this knowledge to be creative. These activities give practitioners opportunities for quality interactions with children. Talking with children about their art can help practitioners understand what children think about the arts and the world around them.

Literacy

Literacy brings a wealth of benefits for children throughout the early years and beyond. Those benefits last for a lifetime.

Our focus in this review is on children's literacy before they start Reception Year. Learning both reading and writing later in their education is underpinned by children's early communication and language. This means that before the Reception Year, literacy is more closely linked with the prime area of learning for communication and language. It may be helpful, therefore, to read this section in conjunction with the communication and language section in part 2 of this review.

As part 2 identified, practitioners embed children's understanding and use of language through high-quality interactions between adults and children and repeated stories, rhymes and songs. Babies and young children love sharing books with adults: it is an intimate and pleasurable activity that can help with their social and emotional development.[footnote 1] As they share books, babies and young children enjoy rhythms and rhymes and hear rich vocabulary and language.

For older children in the EYFS, shared reading is a powerful context for conversation. When adults use a book as the focus for conversation, it helps children to learn new vocabulary and more complex forms of language. Children in early years settings relish both traditional and new stories, rhymes and songs. They benefit in the long term from the vocabulary and language that they learn.

The help children get at home has a big impact on what they know and can do. The quality of the curriculum is especially important for children who have less help with their early literacy learning at home.[footnote 2] Shared reading at home, together with activities like visiting the library, is associated with better achievement throughout schooling, regardless of family income.[footnote 3] Book lending and gifting schemes are more effective when they are supplemented by additional advice for parents. The Education Endowment Foundation comments that: 'additional tips, support and resources can make home reading more effective. Helping parents to read in a more interactive way and prompting longer and more frequent conversations with their children are particularly important'.[footnote 4]

Links to learning and later life

A summary of research from the Book Trust concludes that children who read well are more likely to:

- overcome disadvantage caused by inequalities
- be happier and healthier and experience better mental well-being and self-esteem
- do better at school and make more progress across the curriculum
- develop empathy and creativity[footnote 5]

As we outlined in part 2 of this research review, a well-developed vocabulary in the early years is linked to many positive outcomes in school and beyond. There are many links between the prime area of communication and language, and the specific area of literacy. For example, shared reading is where individuals, pairs or small groups of children are guided by the practitioner to talk about and enjoy the book. This is a powerful technique to help children build larger vocabularies and develop their understanding of how books work.[footnote 6] The language of high-quality picture books is significantly more complex than the everyday language that adults direct to young children.[footnote 7] This suggests that 'language input via picture books may be an important driver of individual differences in early language skills because these texts contain a much higher proportion of various rare and complex sentence types'. These more complex forms of oral language contribute to later literacy.[footnote 8]

Shared book reading and group sessions focused on stories, rhymes and songs are also powerful contexts for adults to model and teach children the skills of careful listening. For example, in shared book reading, adults can model active listening to what children say. They can demonstrate thoughtful responses to

children's ideas and questions. They can remind children to wait quietly while another child finishes what they are saying. This modelling can support routines and expectations that help children learn to listen to each other.

Being able to learn both reading and writing later in their education is underpinned by children's early communication and language. Through high-quality interactions, starting in the early years, children acquire and understand patterns and structures of language, and use a rich vocabulary. This will help with their comprehension once they can read. Developing children's spoken language will also go on to help them with their writing. Older children will need to plan and rehearse what they intend to say (either aloud or in their head), before they start writing. All this underpinning knowledge starts in the early years. It depends on the quality, not just the quantity, of back-and-forth interactions.

Well-planned and sequenced curriculums for physical development and EAD can ensure that children have the skills and strength they need to develop a comfortable and efficient pencil grip. This makes it easier for them to learn handwriting and how to form letters and numbers correctly when they are older.

Early education lays the important foundations for children's later reading and writing. This includes advancing children's communication and language through high-quality interactions and inspiring their love of books, rhymes and songs.

Curriculum and pedagogy in literacy

The EYFS framework's educational programme for literacy includes the following:

- It is crucial for children to develop a life-long love of reading. Reading consists of two dimensions: language comprehension and word reading.
- Language comprehension (necessary for both reading and writing) starts from birth. It only develops when adults talk with children about the world around them and the books (stories and non-fiction) they read with them, and enjoy rhymes, poems and songs together.
- Skilled word reading, taught later, involves both the speedy working out of the pronunciation of unfamiliar printed words (decoding) and the speedy recognition of familiar printed words.
- Writing involves transcription (spelling and handwriting) and composition (articulating ideas and structuring them in speech, before writing).[footnote 9]

In this section, we consider how practitioners can help children with their early understanding of literacy. Preparing children to become fluent readers and writers later on in their education is important. This is not the same as expecting young children to attempt tasks before they have secured the knowledge and skills they need. For example, children are unlikely to benefit when practitioners encourage them to trace over letters before they understand the relationship between letters and sounds, or correct letter formation.

Developing children's communication and language is vital in preparing them for learning to read and write. Once children learn to read for themselves, those with better language development and vocabulary will have better comprehension. They will also have a richer store of knowledge to draw on for the ideas and words they need to compose their own writing. Oral storytelling, learning vocabulary across the curriculum and engaging in extended conversation are all effective ways to prepare children for literacy. In a well-sequenced early years curriculum, word reading and transcription (letter formation and spelling), taught through phonics lessons from the beginning of Reception, will follow on from the foundational learning that we outline in this review.

An illustrative example

A team of practitioners working with 2-year-olds created a small collection of books, rhymes and songs for children to encounter repeatedly.

They used guidance from the Book Trust to check the quality of the books. They intended for every book in the collection to be enjoyable for the children: books they would want to hear again and again. They also checked that the books would help the children to develop a wide range of language structures and a richer and broader vocabulary.

The practitioners thought ahead about how they would explain any unfamiliar vocabulary before they started reading. They also considered whether they might explain some unfamiliar words when they came up in the story. Some children with SEND and children at the early stages of learning English as an additional language would particularly benefit from this extra help with vocabulary.

They chose books, songs and rhymes with simpler language to share when children were new to the setting. They chose more complex books, songs and rhymes to share as the year proceeded, while ensuring that any children new to the setting would have plenty of time to share the simpler ones. They thought about linked activities, so that children could retell stories and practise vocabulary as they played. For example, they could taste and count different types of fruit after listening to 'The Very Hungry Caterpillar'.

Language comprehension

It is important to introduce children to vocabulary that goes beyond what they will hear in everyday talk. It is also important to introduce children to language that is more complicated, in grammar and sentence structure, than everyday conversation.

The researchers Beck, McKeown and Kucan propose thinking about vocabulary in 3 tiers:

- Tier 1 consists of words that most children are familiar with from everyday speech. For example, most 3-year-old children will refer to what they are wearing using terms like trousers, leggings or shorts.
- Tier 2 consists of words that are commonly used in many contexts but may not be used in everyday speech. For example, fewer 3-year-olds will refer to chinos, dungarees or culottes.
- Tier 3 consists of words that are technical or specialist. For example, a study of clothing and fashion later in school might include teaching children words like hem, pleat and seam.[footnote 10]

Introducing children to more complex forms of language is also important. This includes decontextualised language. For example, while sharing the book 'Not Now, Bernard', a practitioner might ask a child what they think about a character's decision. Should Bernard's mother have stopped to listen to him? How did Bernard feel when the monster smashed his toys? This goes beyond the 'here-and-now' discussion that might focus on the names of what children see in the illustrations, like 'toys' and 'books'. Picture books commonly include more complex sentences than is usual in conversation, as illustrated by this extract from 'Alfie Gets in First':

> " He gave the door a great big slam – BANG! – just like that. Then Mum was outside the door, holding Annie Rose, and Alfie was inside with the shopping. Mum's key was inside too.[footnote 11]"

When adults share books, rhymes and songs, they help children to understand higher-level vocabulary and forms of language, and increase their knowledge of the world. When children are older and learning to read, this will help them with comprehension – understanding what they are reading, once they are able to decode. They will use this same knowledge of language for composing a piece of writing.

Carefully planned play is another powerful opportunity for children to use and develop their language. However, without careful curriculum thinking, it can fall short. For example, if children are going to make best use of a role-play area that has been set up as a hairdresser's, they will need certain knowledge and experience. They might benefit from a well-chosen book or a group visit to give them the underpinning knowledge they need to develop their own play and narratives.

Similarly, it is important not to assume that children will understand all the vocabulary in a book, song or rhyme. Explaining key words in advance, or during the reading, will help all children to enjoy and understand the story. As an example, the researcher Sinéad Harmey suggests that: 'in planning to read "We're Going on a Bear Hunt", there are opportunities to:

- support children to retell the story in sequence
- encourage a retelling of the story in their play
- directly teach Tier 1 words (bear, stick)

- directly teach Tier 2 words (under, over)'[footnote 12]

Reading to children and fostering a love of books

Fostering a love of books is an important aim of early education. The books, stories rhymes and songs that practitioners share need to be chosen carefully. In doing this, practitioners will consider the quality of the language in books and the range of stories, poems, songs and non-fiction texts. High-quality picture books give children windows into new worlds of imagination, and into places and events beyond their immediate experiences.

It is also important that books reflect the diversity of life in modern Britain, so that all children see themselves and their families as they open the covers. However, recent research by the Centre for Literacy in Primary Education found that, although the number of books for children aged 3 to 11 that feature characters from ethnic minority backgrounds is increasing, the percentage remains low.[footnote 13]

Older children in the EYFS will benefit from group story times and the opportunity to hear the rich language of books. However, research suggests that shared book reading is even more powerful. In its study of the best available research, the American National Early Literacy Panel concluded that 'shared-reading interventions can have a significant, substantial and positive impact both on young children's oral language skills and on young children's print knowledge'.[footnote 14] When practitioners draw children's attention to print during shared reading, this can help children to learn and understand that print relates to oral language.[footnote 15] This can be particularly important for children who have not benefited from shared reading at home.

Readiness for writing

Learning to write crosses over several areas of learning. It is another example of the interconnected nature of the EYFS curriculum. As stated earlier, writing has 2 dimensions: composition (articulating ideas and structuring them in speech, before writing) and transcription (spelling and handwriting).

Composition involves thinking about what you want to write. Young children learn how to do this when speaking, particularly during conversations with adults. Children need well-developed language and communication in the early years so that they can say what they think and go on to become accomplished writers when they are older. They need to be confident to discuss their ideas, take part in conversations and retell stories. Children who can do this will have more vocabulary and ideas to draw on when they are taught spelling and letter formation in Reception, which will enable them to put their ideas in writing.[footnote 16]

The transcription element of writing involves spelling and handwriting. These are usually taught in Reception, when formal teaching of phonics begins. Expecting children to write words or sentences before this time can create unnecessary difficulties. It can be highly demotivating for the children involved. If children are choosing to write at a younger age, then it is sensible for practitioners to model and teach an appropriate pencil grip and correct letter formation. Otherwise, repeated practice of incorrect letter formation can become a habit that is hard to shift later.

Adults may want to model writing. For example, they can write down a shopping list before heading out to the supermarket with a small group of children and refer to it when they get there. That way, children see that writing has meaning.

Key messages for practitioners

Literacy is fundamental to children's enjoyment of and participation in life. It is important for the curriculum to prepare children well for their later learning in literacy.

Formal teaching of writing or phonics at ever-younger ages may limit the amount of time available to develop children's communication and language: the bedrock of children's later reading comprehension and writing composition. Research suggests that the most effective areas to focus on are:

- developing children's communication and language
- inspiring children's love of books, songs and rhymes
- storytelling
- shared book reading

These approaches are especially important for children who have less help with early literacy learning at home.

Literacy connects with all the other areas of learning in the EYFS, most notably physical development, communication and language, and EAD.

Mathematics

Mathematics is a fundamental part of a child's early education, and vital for their later success in education and in life. It is enjoyable and opens up new ways for children to experience, understand and appreciate the world.

Before they can talk, babies have an early sense of quantity and pattern in the world.[footnote 17] Babies and toddlers can compare quantities with large differences. From a very young age, children can approximate quantities, without

having to count. This early mathematical understanding is independent from language: '3-year-olds can recognise 3 things, although they may not say the word'.[footnote 18]

As they play, young children engage in mathematics. For example, as they play in a pretend shoe shop with a practitioner to support and guide their mathematical thinking, they might count, compare and order shoes by size and wonder 'how much do we have to pay?'[footnote 19] Researchers estimate that in instances like these, children 'engage in mathematical thinking at least once in almost half of each minute they are playing'.[footnote 20]

Language plays an important part in children's early understanding of number. Approaches that develop children's communication (see part 2 of this review will also contribute to their mathematical development: 'Supporting vocabulary knowledge, particularly for those children with lower numerical skills, may increase children's number knowledge.'[footnote 21]

While humans have a unique ability to think about exact quantities, this ability depends on learning a system of number. This is one of the reasons why young children need deliberate teaching as well as play to learn mathematics in their early years. As the New Zealand Education Review Office explains, 'a "hands-off" approach does not benefit children's learning.'[footnote 22] Research suggests that a high-quality environment, together with well-trained practitioners, is not sufficient alone to promote effective mathematics learning.[footnote 23]

Some children learn more mathematics at home than others. Research suggests that the amount children learn at home is strongly linked to their later attainment in mathematics.[footnote 24] This means that early education is especially important for children who learn less mathematics at home.[footnote 25]

In summary, early mathematics is essential to an effective early education. Evidence suggests that 'high-quality early numeracy education at pre-school can have long lasting effects, which may help to narrow the gap in achievement throughout life'.[footnote 26]

Links to learning and later life

Success in children's learning in mathematics is predicted by the interaction between executive function skills and early mathematical skills[footnote 27] In particular, 'early number sense predicts later mathematical achievement'.[footnote 28]

The Education Endowment Foundation (EEF) comments that it can take a considerable amount of time for young children to learn mathematics, and this learning can be taxing. The EEF adds that 'importantly, even if children appear to be engaging in mathematical activities (for example, reciting the count sequence), they may not have a full grasp of the underlying concepts (for example, understanding the meaning of the numbers in the count sequence)'.

This is one of the reasons why it is so important for practitioners to find out exactly what children know, and where they have misconceptions or gaps in their understanding. They can do this by spending time talking to and playing with children. Ensuring that all children have the secure foundations they need for their future learning is vital. It is important to address any gaps in children's early understanding of number. This needs to happen before they move on to new learning. Research suggests that primary teachers need to understand, and build with precision on, children's mathematical learning in the early years. Otherwise, early gains may fade as children move through primary school.[footnote 29] Children with a lower level of number skills in the early years go on to make slower progress in their later education. This causes gaps in achievement to widen.[footnote 30]

Research also emphasises the importance of children's spatial reasoning, as well as their understanding of number. It suggests that spatial skills at the age of 5 may 'explain a significant proportion of the variance in mathematics achievement in the early primary school years'.[footnote 31]

A secure understanding of mathematics is linked with improved prospects for employment and higher wages in adult life.[footnote 32] Unfortunately, some children have gaps in their early mathematical understanding: 'Disadvantage gaps in mathematics are large, emerge early, and are resistant to intervention.'[footnote 33] Poor mathematical skills in adulthood are also linked with difficulties in handling day-to-day finances, regardless of income.[footnote 34] Poor skills can limit adults' ability to understand risks in many areas. For example, Cancer Research UK found that nearly half of its sample got the answer wrong when asked whether a risk of 1 in 100, 1 in 10, or 1 in 1,000 resulted in more chance of their getting a disease.[footnote 35]

The rewards of successful learning in mathematics are considerable. Mathematics creates new worlds for children. As the mathematician Marcus du Sautoy says, 'mathematics has beauty and romance. It's not a boring place to be, the mathematical world. It's an extraordinary place; it's worth spending time there.'

Curriculum and pedagogy in mathematics

The EYFS framework's educational programme for mathematics includes the following:

- Developing a strong grounding in number is essential so that all children develop the necessary building blocks to excel mathematically.
- Children should be able to count confidently, develop a deep understanding of the numbers to 10, the relationships between them and the patterns within those numbers.
- In addition, it is important that the curriculum includes rich opportunities for children to develop their spatial reasoning skills across all areas of mathematics including shape, space and measures.
- It is important that children develop positive attitudes and interests in

mathematics, look for patterns and relationships, spot connections, 'have a go', talk to adults and peers about what they notice and not be afraid to make mistakes.[footnote 36]

The EYFS requirements can be summed up under 3 headings. They require that children:

- gain a strong grounding in number and counting
- develop their spatial reasoning
- learn to enjoy mathematics

Children benefit from interactions with well-qualified practitioners and from playing with well-chosen resources. But many will not learn important early mathematical concepts without a clear and coherent curriculum. The curriculum sets out the intended knowledge for them to learn. High-quality professional development is needed for practitioners to put this curriculum into action.

It is true that 'maths is everywhere'. But children will not reliably bump into mathematical ideas solely through play and physical exploration. They need adults to draw their attention to ways of thinking about the world mathematically. Free play in the home corner is unlikely to lead to learning about shapes, quantities and mathematical language. However, when adults guide play, they are clear about the intended learning goal before they set up and carry out the activity. Their focus on the intended learning is balanced with sensitivity to the child. They encourage children to choose from different options and to follow their own decisions, as appropriate.[footnote 37]

Children need practitioners to draw their attention to the potential mathematical learning in their play.[footnote 38] For example, they might discuss:

- how the smaller doll's clothing will not fit a larger doll
- making sure that everyone round the table has a plate and a cup
- why they need to move the oven shelf down to fit a casserole pot in

An effective curriculum for mathematics in the early years requires careful thinking. It needs to develop children's secure understanding of number, patterns, shape and space. Children learn mathematical knowledge at different rates and may secure that knowledge in different orders. It is important for practitioners to understand the mathematical knowledge that all children need to acquire.

However, it is not practical for practitioners to develop an individual mathematics curriculum for each child.[footnote 39] They need to be ready to adapt their responses to ensure mathematical learning for all. Settings might consider progressing through the curriculum at a slower rate for children with lower levels of mathematical understanding. Depth in learning and secure understanding for every child, rather than speedy but superficial coverage of the curriculum, should be the priorities. Practitioners might also consider allowing more time for activities, play and teaching with a focus on mathematical learning, so that no individual children, or groups, fall behind.

Books offer many opportunities for learning mathematics. This is most effective when practitioners have guidance about the mathematical language they might use and the questions they might ask.[footnote 40] Books must be selected so that the potential mathematics in their illustrations matches the text and story.[footnote 41]

For learning to count, research suggests that books with 'mixed concrete representations (1 cat, 2 dogs, 3 cows) are less beneficial than abstract or single concrete representations (1 cat, 2 cats, 3 cats)'.[footnote 42]

A summary of high-quality research by Clements and Sarama states that:

> " Children who learn mathematics with intentional activities are more likely to engage in higher-quality socio-dramatic play during free-choice play time. Those in classrooms with an emphasis on mathematics were more likely to be engaged at a high-quality level than those in classrooms without this emphasis. In this richer environment, individual children find more opportunities for meaningful engagement in free play. Thus, preventing children from experiencing intentional, structured mathematical experiences may deprive them of the joy and fascination of mathematics, as well as higher-quality play resulting from their increased mathematical knowledge.[footnote 43]"

Young children benefit from engaging teaching. Learning to sing nursery rhymes and join in with simple poems helps them to practise the counting sequence (for example, in the nursery rhyme '1, 2, 3, 4, 5, Once I caught a fish alive' and the book 'Fruits: a Caribbean Counting Poem'). It is important for practitioners to show children how to use their fingers to represent the numbers as they join in. It is also important that practitioners ensure that children learn to understand the mathematical language they are using and listen to each other.

Number rhymes, poems, storybooks and using fingers are relevant throughout the EYFS. In addition, children need structured teaching that is engaging and brief. This will help them to gain a secure grasp of some of the more abstract and sophisticated early concepts they need to succeed in mathematics. Free and guided play alongside this direct teaching remain important. Play offers children further learning opportunities and time to practise what they have learned. Play also 'provides opportunities to observe and assess children's informal mathematical activity, as well as for engaging children in mathematics'.[footnote 44]

As the report 'Researching effective pedagogy in the early years' states, the most effective settings 'combine the provision of open-framework, free play opportunities with more focused group work involving direct instruction'.[footnote 45]

Number and counting

Early learning about number includes:

- **knowing how to count:** being able to say numbers up to 10 in the correct order and being able to match each number word to a single object

- recognising numerals
- **understanding the cardinal counting principle:** that the last number you counted tells you the number of objects in the set
- **understanding ordinality:** being able to place numbers in sequence; knowing that 3 comes before 4 and after 2
- **understanding cardinality:** linking number words and symbols to quantity values
- **comparing magnitudes:** when you see a set of 5 counters, and a set of 3, knowing which set is bigger; knowing that 4 is a bigger number than 2
- **solving calculations by creating a mental model in your head:** for example, a child is shown 3 counters, which are then covered; the adult adds one more counter under the cover and asks the child how many counters are under the cover now

Using mathematical objects and actions in a carefully planned way can help with this early learning. This includes clapping and using manipulatives, pictures and symbols. For example, as they learn about the number 4, children might:

- count 4 claps
- use a card with the numeral 4 printed on it
- show 4 fingers
- find the page in a book showing 4 ducks

However, it is important to ensure that children are not overwhelmed with too many representations of ‘4’ all at the same time. This might distract them and exceed the capacity of their working memory.

Children’s typical progression in their early understanding of number is shown below:

- noticing changes in the number of objects in a group of up to 3 items
- comparing amounts, using everyday language: lots, more, the same
- showing counting-like behaviour: making sounds, pointing, saying some numbers in order and sometimes skipping numbers
- subitising: fast recognition of up to 4 items
- reciting numbers in the correct order
- one-to-one correspondence: saying one number word for each object
- knowing that that last number you reach when you count is the number of objects in the set
- recognising number symbols: numerals
- comparing quantities: using terms ‘more than’ and ‘fewer than’

Young children also need to understand simple operations with numbers. For example, they might explore different ways of making 4 with cubes. They might link 2 and 2, or 3 and 1. Practitioners might draw children’s attention to how a tower of 6 blocks can be thought of as 3 blocks on top of another 3.

Children from the age of 3 can also solve number operation problems 'in their heads', without needing apparatus. An example of this is showing a child a set of 3 counters, covering this up, and then adding an extra counter under the cover. Researchers found that young children could give an exact verbal response (they could say the number 4) to this non-verbal problem.[footnote 46]

Young children can apply their understanding of number to develop their skills in reasoning. They can explain how they came to a solution or justify their answer. For example, a group of children might be engaged in a treasure hunt for 5 items. They keep a tally of how many items of treasure they have found. When the tally reaches 3 strikes, the adult asks: 'how many more items of treasure do you need to find?' When a child answers '2', the practitioner asks them how they knew that. The child explains, using their fingers, that if you have 3, you need 2 more to make 5. As Sue Gifford explains, 'Problems are essentially things you do not know how to solve. If children know or are told the method to use, then they are not problem solving.' [footnote 47]

It is not appropriate to expect number operations to be written down as equations, or sums, in the early years. Formal recording is introduced in Year 1. However, children might choose to experiment with and talk about their own ways of recording number operations.

This general focus on language is important, but not enough, to help children learn about number. Specifically, mathematical language includes words related to:

- quantity (more, fewer, fewest, a tiny bit)
- numbers (1, 2, 3 and so on)
- equivalence (the same, equal)

Using and explaining mathematical language is important: 'both parent and teacher use of mathematical language is predictive of growth in children's numeracy skills'. However, research also states that this 'is currently scarce in early childhood settings, and greater attention is needed to promote this higher-level language content'.[footnote 48]

In conclusion, research suggests that children benefit from learning about all aspects of number from the age of 3: 'number, number relations, and number operations knowledge must be woven together right from the start of preschool instruction'. This contrasts with approaches that focus on learning number names and knowledge of the counting system first, before moving on to operations and reasoning later.

Without a focus on conceptual understanding, researchers argue, 'some children can successfully count to produce every number in their count list but fail to acquire a conceptual understanding and cannot correctly judge words occurring later in the count list as referring to larger magnitudes'.[footnote 49] In other words, they may not understand that 5 refers to a larger magnitude than 3. When children's conceptual understanding is weak, the foundations for their later learning are shaky.

Spatial reasoning

Spatial reasoning is a new term in the EYFS, introduced in the 2021 reforms. It may be unfamiliar to many practitioners. It covers:

- spatial assembly (which enables playing with blocks and other construction materials)
- size/measures (big, wide, narrow)
- the properties of shapes (bent, pointy, curved)
- the names of shapes (circle, rectangle)
- spatial relationships (next to, above, below, between, near, far)

It is important to go beyond narrow thinking about children's early learning in mathematics. Research suggests that well-developed spatial reasoning in the early years leads to better mathematical achievement in primary school, even allowing for demographic factors or language skills. The educational programme for mathematics makes it clear that spatial reasoning runs across the mathematics curriculum. It is not a separate area, distinct from number. For example, practitioners might look with the children at 4 dots in a square shape, and draw their attention to the composition of 2 and 2.

Children's spatial reasoning in the early years is malleable: it can develop quickly when children have the right teaching and opportunities to practise. A focus on spatial reasoning in early education is especially important for children who have fewer early opportunities to develop this at home. For example, observational studies show that boys may spend more time in 'spatial play' at home with construction toys than girls.

Important elements of spatial reasoning are:[footnote 50]

- knowing how to climb (up, down, over, under, through) and to squeeze yourself into different-sized spaces
- knowing how to fit different types of blocks and construction equipment together
- completing inset puzzles and jigsaws
- noticing and making patterns
- talking about the properties of shapes, using terms like sides, corners, straight, flat and round
- recognising and naming simple 2D and 3D shapes (circles, triangles, rectangles, cuboids)
- understanding position through words alone, without pointing (on, under, next to)
- combining shapes to make new ones, for example building an arch during block play, or moving and combining 2D shapes to make pictures

Play with equipment like blocks, construction toys and jigsaws is common in early years settings. Practitioners can help children to develop their spatial reasoning

during these kinds of play. They might model key vocabulary or draw children's attention to the features of shapes and their positions. For example, a practitioner might say that 'the sharp pointy block is at the top of your tower'.

Using gestures can also help with children's learning. A practitioner might spread their hands apart while using the word 'wide'. Research suggests that children should be explicitly encouraged to use gestures, 'with prompts such as, "Try using your hands," or "Can you show me with your hands?"'[footnote 51]

Enjoying mathematics

The significance of early mathematical learning can hardly be overstated. Early mathematical skills are consistently associated with later success in school and in life. One of the largest studies found that early maths is even a powerful predictor of later reading achievement.[footnote 52] Consequently, fostering positive attitudes towards and interest in mathematics from a young age is crucial for a child's development. By helping children to enjoy it, practitioners not only help them to become proficient in mathematics but also cultivate problem-solving, communication and resilience.

Research suggests that as children learn about numbers, they may develop a more positive attitude towards mathematics. In turn, this more positive attitude 'may prevent mathematics anxiety', which can adversely affect their later learning in school.[footnote 53] It is important for **all** children that adults demonstrate an attitude of confidence and enjoyment around maths. Leaders and managers in settings may need to provide additional guidance and professional development to help practitioners who lack confidence. As the Education Endowment Foundation comments, 'maths is … an area that many early years settings struggle with'.[footnote 54] Similarly, the All-Party Group for Maths and Numeracy reported that many practitioners have 'a negative outlook on maths as a result of their own school experiences'.[footnote 55]

Key messages for practitioners

To develop children's mathematical understanding, practitioners need to consider curriculum planning that includes:

- number
- operations with number
- spatial reasoning

Play is one way of learning about mathematics. But play experiences are not enough on their own. Although children may have opportunities to learn about number, there is no guarantee that all children will take advantage of them.

Teaching and activities should focus on concepts that are just ahead of children's current level of thinking. This allows them to learn newer concepts by building on previous concepts that they have securely understood.

Practitioners need to understand how children typically progress in mathematics so they can build on what children already know. Practitioners also need to check for gaps in understanding and plan further teaching to ensure that children's early learning is secure.

It is important that children develop positive attitudes and enjoy mathematics. Settings need to offer high-quality, sustained continuous professional development to ensure that staff have the necessary subject expertise. This is particularly important if some of their practitioners lack confidence.

Understanding the world

From birth, children are fascinated by the world around them. Making sense of what they see, hear and experience is a vital part of their development. The knowledge they gain enables them to develop a sense of time and place, which helps them to understand how things happen and why things change. It can help them understand the influence humans have on the world and each other. This better enables children to form a connection between themselves, others and their environments. It also enables them to learn about their place in society and form a sense of belonging.[footnote 56] This learning gives children the foundational knowledge they will draw on in their further schooling. It helps them develop their understanding of the diverse world in which they live.

There is less research into children's understanding of the world than other areas of learning. For example, there is far more information about what young children should learn and encounter in mathematics. Most research considers the separate subjects that children will go on to learn in later schooling, like history or science. However, the concept of understanding the world in the EYFS joins these different subject areas together. Young children's developing knowledge about the world beyond their home is connected; it is not helpful to create boundaries with subject areas. For example, as children explore a place, like a local park, they can learn the foundations of geographical thinking about 'place' alongside early scientific understanding about trees and other plants. Development in one area influences development in the others. Experiences like this also provide a context for children to develop the prime areas of learning: learning about plants and describing the journey to the park helps with their language development and vocabulary, for example. Research suggests that 'new information is learned better when it connects to and expands what we already know'.

Links to learning and later life

Understanding the world gives children an opportunity to develop their knowledge and understanding of a wide range of other concepts and topics. Ideas can be complex, and children will often start with a simplified understanding. They can build on this as they develop the knowledge and skills they need for later study in subjects such as history, geography and science. It is important to avoid reinforcing children's early misconceptions. For example, children might believe that heavier objects will fall faster than lighter ones, or that steam and smoke are the same substance.

From the earliest stages of life, babies develop a sense of space, place and time.[footnote 57] The relationships young children form with people and the places they visit connect them with their environment. These early geographical experiences provide the foundations for later understanding of the features of different places and the relationship between humans and the world. Some geographers write about the importance of developing a sense of place to help children with self-identity. This can play an integral role in developing children's knowledge about protecting the environment, improving quality of life and contributing to a more sustainable future.[footnote 58]

There is evidence of the importance of children gaining scientific knowledge from a young age. For example, a study carried out in the United States found a clear relationship between increasing young children's general science knowledge and their later achievement in science. This suggests that the science curriculum should start in the early years.[footnote 59] Also, if gaps in children's knowledge are not addressed early on, evidence suggests that these may continue into secondary school and beyond.[footnote 60] It would be reasonable to assume that this is also true of other aspects of understanding the world. Again, this emphasises the importance of foundational knowledge for later success.

There has been some debate among researchers about children's conception of time and the impact on teaching historical concepts in the early years. Studies have shown that young children can distinguish between 'long ago and close to now'. This is despite the fact that they may not have developed any concept of years or dates.[footnote 61] Other research also indicates that young children develop a sense of historical time and chronology even if they do not perceive it as a measurable unit.[footnote 62] Some may consider it inappropriate to teach history to young children. This research, however, suggests that early experiences develop children's concept of change over time.

A study of pre-school children across European countries indicates that they develop different associations with the past, and with varying degrees of accuracy.[footnote 63] Children need opportunities to discuss events that occurred in the past to better understand the time they happened in. This may be from a personal perspective or from being told, for example, that dinosaurs lived a very long time ago, in the Mesozoic era. Children can also learn about the past from artefacts. For example, adults can show them an old telephone or an antiquated family toy. These opportunities can help children to develop their thinking about the causes of change and its impact on people's lives.

From an early age, children recognise differences and similarities in people and the communities around them. Research indicates that babies become aware of

familiar and different faces early on.[footnote 64] To help young children feel confident and comfortable in society, they need to develop a strong sense of identity and feel like they belong. They also need to learn, in a positive and respectful way, about people's different backgrounds, cultures and faiths, and how religious belief is personal. This will help them appreciate what they have in common with others, and also accept and respect the things that make them different.

Curriculum and pedagogy in understanding the world

The EYFS educational programme for understanding the world involves 'guiding children to make sense of their physical world and their community'.[footnote 65] It highlights the importance of:

- the frequency and range of children's personal experiences to increase their knowledge and sense of the world around them
- listening to a broad selection of stories, non-fiction, rhymes and poems to help foster children's understanding of our culturally, socially, technologically and ecologically diverse world
- building important knowledge and extending familiarity with words that support understanding across domains
- enriching and widening children's vocabulary to support later reading comprehension

For the purposes of this report, the knowledge and vocabulary identified in the EYFS for understanding the world can be separated into 3 broad domains. These are:

- past and present
- people, culture and communities
- the natural world

When children reach key stage 1, these domains separate into discrete curriculum subjects. Introducing ideas and information in an age-appropriate and thoughtful way will enable children to develop their conceptual understanding and learn new words in a range of interesting contexts.[footnote 66]

Children need to encounter and think about a new concept repeatedly in order to understand and learn it. Covering a concept superficially and then moving on to new one is unlikely to be effective. This means that young children need repeated experiences. For example, when talking about something being 'old', they might look at an old church compared with a new block of houses and notice the weathering. They might see photos of their family from the past, including themselves as a baby. Or they might explore a tabletop collection of old-fashioned phones and other technical devices. Taken together, the discussion and thinking about these experiences helps them to understand a concept: in this case, the concept of 'the past'.

A well-defined curriculum helps practitioners to be clear about what they want all children to experience and learn. Without this, there is a danger that some children will not gain the knowledge they need to begin to make sense of the world around them. Children's experiences of nature, community, technology and different environments will vary greatly according to their background and home circumstances. The curriculum must consider the prior knowledge and understanding that children bring to the setting. Building on children's knowledge and experience helps them to learn new ideas in familiar contexts. Widening children's horizons, through first-hand experiences and sharing books and songs, expands children's knowledge and sense of the world around them.

It is important that all children are helped to make connections between what they already know and the knowledge they are acquiring. For example, when a toddler learns to press buttons on toys to get a response, they develop knowledge about technology (cause and effect).[footnote 67] This helps with their physical development and technological awareness. It also links to learning in other domains.

Past and present

For young children, learning about the order of events and the passage of time is a vital part of making sense of the world around them. It is also an integral part of learning history and geography.[footnote 68] The passage of time is a difficult concept to grasp. Building children's understanding from their own lives can help.[footnote 69] This could be through a visual timetable or recalling the events of a familiar journey, celebration or a story in sequence. It may also include observing and discussing the changes that occur through the day or the seasons, or looking at photographs and the way people change as they get older.[footnote 70] It could include language such as now/later, morning/afternoon and yesterday/today/tomorrow.

Young children can learn about the passage of time from a range of sources. Stories, the internet, television and the adults around them can all give children more information about past and present. Studies indicate that one of the most beneficial approaches to helping children understand the world is narrative. This works when adults are clear about the specific concepts and knowledge they want children to learn.[footnote 71] Narrative gives children a way to understand the world from the perspective of their current context. It enables children to reflect on experiences with adults, whether those experiences are real or fictional. Together, they can consider possible outcomes and talk about the consequences.

Stories can introduce the past and how people used to live. Traditional tales can present vocabulary that relates to historical learning, such as king, queen, throne, peasant, rich, poor. The simple understanding that children gain at this early stage prepares them to develop a deeper understanding as they grow older. Hearing a story about people who were rich and poor, or who had power and who did not, prepares children for later learning about political, social and economic structures.

When practitioners choose stories carefully, they help children to make connections between different aspects of their physical environment, or between other people and themselves. The vocabulary children learn through stories and discussions creates a map that allows children to navigate early concepts in scientific, geographical and historical learning. [footnote 72]

Later in their learning, children will need to understand that there are different interpretations of the past.[footnote 73] One way that practitioners can develop this understanding is to encourage children to notice and explore their own family histories and celebrations, as well as those of others. They can give children the opportunity to tell their point of view and listen to others' perspectives in a positive manner.[footnote 74] This early understanding that there are multiple perspectives on different events is a stepping stone to later understanding that there are multiple interpretations of the same event. Some research suggests one way of introducing the concept of different interpretations of the same thing is through picture books where the pictures tell a different story to the text.[footnote 75] Some examples that could work for this include 'Not Now, Bernard' and 'Time to Get out of the Bath, Shirley'.[footnote 76]

People, culture and communities

Children's cultural heritage gives them a sense of who they are and their place in the community.[footnote 77] This plays an essential role in how children make sense of their world. Young children are naturally curious about the similarities and differences they notice between people. At the age of just 3 months, babies can distinguish between faces from their own ethnic group.[footnote 78] This means that early years settings play an important role in helping children to learn about different families, communities and faiths beyond their home experience. For example, carefully chosen resources for play can promote discussions about how difference is positive and how individual characteristics make people unique. Through books and other experiences, children can learn about different faiths and religious celebrations. These experiences can also help children begin to understand and appreciate the things we share across different communities, both in modern Britain and globally.

It is important that children do not develop stereotypical views of subjects or areas of study. For example, research suggests that children's drawings often express stereotypical images of science and scientists, reflecting prevalent images in different forms of media. Providing materials that show the diversity of people in a wide range of occupations can help children to imagine that they too might take up a particular course of study or career when older.

Research suggests that this emphasis on diversity is an integral part of children's high-quality early education. It also complements the other elements in the curriculum. One study found that:

> " [early years settings that] 'put particular emphasis on literacy, maths, science/environment and children's 'diversity'… ` promoted better

> outcomes for children in their subsequent academic attainment, especially in reading and mathematics at age 6.[footnote 79]"

It is important for all children to learn about people and places in their local community. However, children's experiences of their local community will be varied. Several UK studies indicate that children are spending less time out and about in their local area.[footnote 80] This has been referred to as the 'shrinking world of childhood'. It reduces their first-hand experience of the local physical environment and contact with the wide range of people in the community. This can then limit children's opportunities to talk about where they live, local facilities and landmarks and the roles people play in the community.[footnote 81]

The natural world

Research indicates that children are best placed to learn and find out about how they are part of a living system when they are active participants in exploring the natural environment.[footnote 82] These experiences are greatly enhanced when children are helped by a knowledgeable practitioner.

Research has also shown that young children are quite capable of developing their own understanding of how the natural world works.[footnote 83] However, these ideas may not be accurate, and this is how misconceptions develop. Therefore, practitioners should be aware of what children know about different plants, animals and natural materials. They should carefully consider how children are thinking about phenomena and use the correct vocabulary to address any misconceptions. For example, when puddles begin to 'disappear' the liquid is not 'vanishing' as some may say. It is 'evaporating into a gas', called 'water vapour'. Or when watching sugar or salt dissolve in water, children may refer to it as 'melting'. A practitioner could then introduce the word 'dissolving' with a simple explanation that is appropriate for the age group. For example, they might say 'it spreads out in the water until you can't see it anymore'. If unchallenged, common misconceptions like these can last well into a young person's educational life.[footnote 84]

Babies learn to categorise objects between 7 and 24 months. From a very young age, children learn by building up their knowledge through repeated first-hand experience of the physical world. With cumulative experiences, they can begin to predict and generate rules about cause and effect. Studies suggest that the more understanding they gain about aspects of the world, the better equipped they will be to build their conceptual understanding and scientific thinking over time.[footnote 85]

Research studies set out the importance of guided play. This can intentionally engage children in scientific thought or learning about the place they live in through first-hand experiences.[footnote 86] These experiences invite children to find solutions or solve problems with a supportive adult, which helps them learn about concepts that may otherwise be too abstract to teach.

Research has explored how playing together to solve problems, learning scientific

concepts and finding out about technology helps with children's learning. Children move from generalisations to a specific and precise understanding of notions like ecosystems or the classification of living things.[footnote 87] Research on this approach to teaching science, technology, engineering and mathematics has found that using stories and imagination to harness enquiry helps children to form concepts.[footnote 88] Practitioners can create an environment where they respond to children's wonderings, such as 'what's inside the pumpkin?', and where they use discovery activities. Studies have concluded that this kind of environment can promote children's curiosity and independent scientific learning.

Children also need adults to help them engage with and understand their environment as part of their early geographical learning. All young children will begin to develop geographical awareness. For some, this will be limited to their local area. For others, it will be an awareness of where they have been in Britain and around the world.

Research indicates that features like the people in places, landmarks and routes should be included in the curriculum so that children develop a personal knowledge of them.[footnote 89] This will help the children not only to develop a sense of location but also to attach meaning to a place. A national survey indicated that just 36% of children under 16 years old had visited the countryside.[footnote 90] Practitioners should carefully consider children's previous outdoor experiences to inform their teaching about the natural world. Children who have never visited a farm may not readily understand many popular picture books, for example. Practitioners will need to think about the discussions, explanations and experiences that will support children's understanding.

The way in which young children relate to familiar places depends greatly on the vocabulary that they have to talk about, and understand, the features of these areas. This understanding and vocabulary can aid more complex awareness about environments. For example, a child may initially be able to identify that something is a 'tree'. Later, they will learn that there are different types of trees and that a group of trees is called a 'wood' or 'forest'.[footnote 91] Noticing differences and similarities is part of early science education, so this knowledge will provide some of the building blocks for later study. Learning vocabulary is also a precursor to later geography learning. For example, being taught a repertoire of 'position' words, such as under, above and next to, will help children to develop early map-reading skills.[footnote 92]

Key messages for practitioners

The EYFS does not determine the content of the curriculum for understanding the world but expects that settings will prepare children for later learning across domains. These domains, unlike the separate subjects that children go on to study, allow children to connect their learning across different topics.

Based on the research, practitioners may consider the extent to which their curriculum for understanding the world:

- emphasises the importance of children's personal experiences and the books, songs and poems they will encounter
- enables practitioners to identify the language and knowledge children need to learn to develop their concept of time, knowledge of living things and the natural world
- includes experiences that help children make sense of and learn about the diverse world in which they live
- enables children to learn how to use technology safely and purposefully

The way in which practitioners help children to understand the world is important. Practitioners might consider:

- how first-hand experiences help children to learn concepts that may otherwise be too abstract
- the range of experiences and opportunities that will enrich children's vocabulary in meaningful contexts
- the way they use narrative to help children understand the world from the perspective of their current context
- how they reinforce children's sense of identity and belonging

Expressive arts and design

Learning in EAD is an important and enjoyable part of children's early education. By participating in art and design, and appreciating their own and other people's art, children can develop cultural awareness and form lifelong interests. The arts also support learning in all other areas, as they can help children to make connections and learn about wider society.

There is a considerable amount of research that identifies the importance and benefits of the arts in young children's lives.[footnote 93] However, this research tends to focus on the individual arts, rather than EAD. Consequently, there is less information to guide the content and sequencing of curriculum planning in this area of learning, which has a broad range.

For the purposes of this review, we have considered EAD in 3 broad areas:

- the visual arts, including painting, drawing and sculpture
- music, including singing and poetry
- the performing arts, including dramatic role play and dance

Studies indicate that engaging in artistic creative activities can evoke emotional responses and help regulate emotions.[footnote 94] From an early age, children respond to different types of music. For example, babies find happy music soothing.[footnote 95]

The expressive arts give children valuable opportunities to develop problem-solving and creative thinking.[footnote 96] However, research on art and design has identified that children find it easier to problem-solve and be creative if they already have the specific skills they need.[footnote 97] Children are more likely to be creative when they know the tools, techniques and materials they need to support their art and design, musical performance or theatrical/dramatic activities. Research emphasises that practitioners should plan carefully when and how to introduce young children to new art materials and techniques, and what these will be.

These complex aspects of EAD need careful teaching to foster children's artistic and cultural awareness. Practitioners should give children opportunities to experience culturally diverse and different genres of art, music and drama. This will build their knowledge and appreciation of these over time. It will also complement their learning across the educational programmes set out in the EYFS and in the future as they go on to study the later curriculum.

Links to learning and later life

Involvement in artistic and creative activities such as dance, drama, music, painting and sculpture can impact on achievement in other areas of the curriculum.[footnote 98] Research consistently highlights the benefits of engaging in the arts on children's cooperative and social and emotional skills.[footnote 99] In this way, learning in the arts helps children with their personal, social and emotional development.

EAD give children engaging opportunities for creativity and creative learning. However, the research is clear that these ways of working are not confined purely to the expressive arts. Fostering creative thinking, imagination and freedom of expression through the arts helps children to develop perseverance, resilience and problem-solving skills. Research indicates that musical activity can enhance social inclusion and cohesion.[footnote 100] Many studies also indicate that role play benefits children's language and social interaction skills.[footnote 101] These attributes can be applied across all areas of learning and are an integral part of the characteristics of effective learning set out in the EYFS.

Curriculum and pedagogy in EAD

The EYFS framework's educational programme for EAD involves 'the development of children's artistic and cultural awareness' to support 'their imagination and creativity'. It highlights the importance of children having regular opportunities to:

- encounter and engage with the arts, enabling them to explore and play with a wide range of media and materials
- see, hear and participate in a variety of arts to develop their understanding, self-

expression, vocabulary and ability to communicate through the arts

It notes that 'the frequency, repetition and depth of their experiences are fundamental to their progress in interpreting and appreciating what they hear, respond to and observe.' Consequently, the curriculum should give children opportunities to make their own art and foster their imagination and creativity. For this to be successful, children need to:

- learn and practise skills
- be able to appreciate their own and other people's art
- have opportunities to use their skills and knowledge in creative ways, drawing on their imagination

Children use art to represent and make sense of the world around them, whether drawing a picture of their dog or pretending to be their grandad in the home corner. As well as this allowing them to learn art, it can create opportunities for discussion and to develop vocabulary. When practitioners talk to children about their art, they can elicit information about their artistic decisions and the way in which they represent concepts in the world. This can help practitioners understand what children think and understand about art and other areas of learning.[footnote 102] It also gives practitioners an opportunity to recognise and celebrate the child's creativity.

Learning and practising

There are many different forms of art and no definitive list of the types of art that children should or should not experience during their early years. It is helpful to think about the knowledge that young children need to learn and practise in terms of the visual arts, music and the performing arts.

Some research has emphasised the importance of clear thinking about the skills and specific knowledge children need to know, particularly in music, dance and poetry.[footnote 103] This suggests that practitioners need to consider carefully what skills and knowledge they want children to learn in EAD.

Babies delight in sensory experiences and love to make marks with their fingers and hands. They begin to notice the effects of their movements as they move them through materials such as sand or water thickened with cornflour. Toddlers might begin by grasping crayons and pens with their fists. They gradually refine their movements to make more controlled marks. Activities to develop fine and gross motor skills might include cutting, joining, fixing, drawing, painting and manipulating playdough. These skills can ensure that children develop stability, control, hand−eye coordination and dexterity.[footnote 104] They have strong links with children's physical development.

Songs and rhymes are an important aspect of children's musical development. Across cultures, caregivers intuitively help children with this development through

playful musical interactions or by teaching them songs. This early exploration of music should include activities that promote enjoyment of it. For example, singing and making different vocal sounds or sounds on objects through play will develop children's knowledge of pitch, rhythm and melody. Researchers note the high value of this musical interaction as an open-ended form of communication.[footnote 105] Most young children encounter the joy of music through singing and playing from their earliest years. However, this may not be the case for all children. These children may need extra help to get the most from these activities.

During musical activity and singing, children may gain an understanding of pitch or tempo as they are introduced to terms such as 'high' or 'low' and 'fast' or 'slow' so that they can connect their actions with musical learning. Practitioners can teach children how to use percussion instruments appropriately. This helps children to develop their knowledge of beat and rhythm. It also increases their understanding of music and musical vocabulary.

Opportunities for children to move or dance to music not only help with their physical development but also give them a valuable opportunity to listen to a range of different types of music. This can help children's early understanding of dance and music. They can learn to recognise mood as well as tempo, rhythm, tone and pitch.[footnote 106]

In the performing arts, listening and moving to music helps children to learn movement skills, sequences and different kinds of dances. Dance gives children a way to develop competency in fundamental movement skills. For example, they will develop locomotor skills like running and jumping, and stability skills like twisting and balancing.[footnote 107] Dance can also help children to develop their coordination, spatial awareness, core strength and balance.

Similarly, children can be helped to develop their dramatic play. A practitioner might tell children a story while they themselves are playing a role in that story. This can teach children story structure, help them to enjoy the story and explore emotions and promote decision-making. This creative drama may also naturally occur through adults interacting in children's self-chosen role play. Studies suggest that this sensitive and purposeful interaction benefits children's imagination, creativity and cognitive development. The research also suggests that children benefit from a curriculum that includes opportunities for creative drama that facilitates and guides children's imaginative storytelling and re-enactment. For example, practitioners might work with a small group to create a story that they act out, or use small-world toys to develop a story including a character, setting and evolving scenario.

Appreciating their own and other people's art

Talking to children about their own and others' art is a very valuable activity. Children's art and design gives practitioners ideal opportunities to engage children in conversation about their ideas and what they are representing. This can encourage children to develop narratives, explaining or elaborating on their

pictures.[footnote 108] It also enables children to explore different views, and develop empathy and feelings to help with their personal and social development.

Children's interest in art can be nurtured when adults talk to them about art and artists. Children and practitioners can take part in vocabulary-rich discussions about songs, illustrations and images of art and sculpture.[footnote 109] When art, music, drama, dance and stories are used to help children with learning, it better equips them to take part in cultural and artistic elements of life.[footnote 110] Children who develop a connection with art at an early age are more likely to build an interest in the arts that will last a lifetime.[footnote 111]

Art education is also a way in which children can engage with the community around them. There are many examples of community and public art projects that children could be taken to see to learn about how others have created art: street art, murals, sculptures and statues. Part of the value of this is that children learn to see art in the places that they live, created by the people around them. This can help children to see themselves as artists, and to create art that is rooted in their own experiences and values.[footnote 112]

Using knowledge and skills creatively and imaginatively

All children need opportunities to be creative and to use their imagination. Research shows that everyone can be creative, if the conditions are right. The adult's role, environment, prior knowledge and experiences are all identified as important factors when developing children's creativity. Adults also need to emphasise the importance of children's efforts and skills rather than focusing too much on the result or end product.

Young children often respond to the world through sensory experiences. This is an essential element of children's early education in the visual arts. For babies and young children, this may mean making marks or creations with materials they find around them. For example, they might create shapes in the sand tray or make marks in the spilled yoghurt on the tray of their high chair. This practical exploration is a vital part of learning for babies and very young children. As children get older, they need to learn how tools and materials can be used for creative effect. In this way, children's creative skills are enhanced when practitioners specifically teach them different art skills and techniques, and give them enough time to practise.[footnote 113]

Art and creative activities can enable freedom of expression. When children have developed a range of techniques, they can problem-solve and make informed decisions about how to combine and mix different materials and media, or sequence different moves to create a dance. These activities can also help children to make sense of the world around them and provide opportunities for expressive language and social development.

Fostering children's dramatic play needs careful thought. Research indicates that from the age of 2, children are able to recognise and enact scenarios that are

make-believe. They often imitate what they have experienced or observed adults doing.[footnote 114] At around 3 or 4 years old, children will likely begin to negotiate and create their own rules as part of the scenario. As children's knowledge of the world expands, practitioners can further enrich this by providing opportunities for children to develop an understanding of other times, countries and cultures.[footnote 115]

Dramatic play can be a useful way for children to immerse themselves in learning. Children can apply what they know about characters from familiar stories and practise using new vocabulary in an imaginary context. In this way, children can explore different scenarios and interpersonal skills, and consider consequences.[footnote 116]

Key messages for practitioners

There is no set artistic content for the EAD curriculum. But, if it is to prepare children for the future and develop their artistic and cultural awareness, it should include opportunities for visual arts, music and performance arts.

The curriculum should give children opportunities to learn and practise skills, to appreciate their own and others' art and to use what they know in creative ways.

Bearing this in mind, practitioners may want to consider whether their curriculum for EAD:

- ensures that all babies and young children have the early sensory experiences they need
- is clear about how and when new tools, materials, skills, songs, rhymes and stories will be introduced
- identifies the vocabulary that children will need to express their views and ideas about different art forms and talk about what they think and what they have done
- includes opportunities for children to practise their skills and knowledge in creative ways.

Best start in life: overall conclusions

The first 4 years of a child's life are a vital part of their education and prepare them for all later learning.

However, young children do not all get the same start in life. The reasons for this include the following:

- Early education is not compulsory for children before the Reception Year. Children have different patterns of attendance: some may attend full time, every

day, year-round; others just three mornings in term time.
- Pre-school settings are not all funded in the same way and so some have more money than others.
- Some children will experience less of the curriculum than their peers because they are registered to attend fewer sessions.
- Some children get more help at home than others.

The research is clear: early education is too important to be left to chance. With this in mind, we suggest the following points as crucial elements of an effective early education.

It is important to consider curriculum content carefully: knowing what to teach and when to teach it.

- Curriculum matters. It defines the knowledge and experiences that children will receive beyond their home environment. Practitioners need to be choosy about what they include in the curriculum. This is particularly important for children who only attend limited sessions.
- Communication is a priority; otherwise children cannot learn important knowledge and skills.
- By considering the key knowledge that they intend for all children to learn, practitioners can make the best use of the available time.

Knowledge is sticky: children learn new things by making links with things they already know.

- Children integrate new concepts into their existing store of knowledge by making connections. Their brains connect one thing to the next, a bit like a spider's web.
- Children need to encounter and think about a new concept repeatedly to remember and learn it. Their learning is often urged on by their interests. We can help young children to learn by connecting a new concept to an experience that is personally meaningful to them.
- As children think about their learning, or talk about it with another person, they deepen their understanding of new concepts. Deeper understanding prepares children for what they will be learning next. For example, once a child knows about different kinds of dinosaurs, it is easier for them to learn that the pigeons, finches, sparrows and blackbirds they notice are all types of bird.
- Creative and critical thinking requires having things to think about: it cannot exist in a vacuum.

Different areas of learning require different ways of thinking about the curriculum.

- In some areas of learning, like mathematics, there are specific concepts that children need to understand first. This ensures that they will be successful in the next step of their learning. If a child cannot count accurately to 5, it is not helpful to move on to bigger numbers.
- In other areas, different approaches to sequencing the curriculum will be valid. Children might learn about planting seeds before they experiment with magnets to learn about forces. The reverse sequence would work just as well.

Developing executive function is crucial for all children.

- Three core areas that children need to develop are:
  - focusing attention on what matters, and screening out anything that is not relevant
  - holding information in mind to work on it
  - being able to focus on a goal and work out when it is necessary to change approaches to achieve that goal.
- Executive function skills do not just develop of their own accord. Children's learning needs to become more and more challenging over time, to strengthen their executive function. This happens in the same way that adults need to increase their activity in the gym to become stronger and fitter.
- Nursery rhymes and games can help children to develop executive function skills. For example, to play 'Simon Says' or 'Musical Statues', children must listen to instructions, follow actions, and start and stop.
- Executive function is one of the best predictors of a child's later success in the crucial areas of reading and mathematics. Strong executive function skills are also linked to better emotional well-being and better behaviour in school.
- The development of these important skills cannot be left to chance: some children will need more help than others.

High-quality interactions with adults are vital.

- These include caring interactions, and interactions that promote children's thinking.
- Older children in the EYFS benefit from more complex language forms, including language that goes beyond the here and now. These interactions might include recalling past events, developing narratives, wondering and questioning, and thinking out loud together.

- The most effective settings are those that see cognitive and social development as equally important.

Interacting with children, to find out what they know and can do, is more useful than standing back and doing observations.

- Ongoing assessment can take place while practitioners are playing with children and teaching them new things.
- Children have different levels of experience and knowledge. It is important that every child is challenged as they play and learn.
- Teaching needs to be just ahead of children's current levels of knowledge and skills. This builds their understanding and supports their developing executive function through challenge.

Activities alone are not enough.

- If we want all children to learn important knowledge, then merely setting out what they might 'experience' is not adequate. This will not make the best use of the available time.
- For example, all children benefit from regular shared book reading in small groups of 2 or 3, especially those with less-developed language. Leaving this to chance might mean that only those children who choose to spend time in the book corner will benefit.

Practitioners should make it as easy as possible for children to learn.

- Play-based learning and direct instruction are both important for young children. Sometimes, play-based learning is the best approach. Other times, children need an adult to show or teach them something new.
- Research suggests that the most effective settings combine both approaches.

Practitioners should avoid making tasks too complicated.

- Children, like all of us, can only hold a few things in mind at any one time. This is why it is so difficult for children to learn to count accurately. They have to know the names and order of numbers. They have to remember to say one count word for each object. They have to remember that the

last number they say tells them how many items are in the set.
- When there is too much going on around them, children's working memories are quickly overloaded. That can happen when there are too many different things to look at, or too much adult language for them to listen to.
- When children's working memory is overwhelmed, they can suffer a calamitous loss of all the information they were trying to work with. This has a particularly negative effect on children who are struggling to learn.
- It is important to minimise distracting resources, noise and over-stimulating environments.

High-quality early education benefits all children.

It particularly benefits the most vulnerable. It is too important to be left to chance.

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Back to top

Citizenship and living in the UK

Crime, justice and the law

Disabled people

Driving and transport

Education and learning

Employing people

Environment and countryside

Housing and local services

Money and tax

Passports, travel and living abroad

Visas and immigration

Working, jobs and pensions

Policy papers and consultations

Transparency

How government works

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