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Supporting adjective learning across the curriculum by 5–7 year-olds: Insights from psychological research

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Abstract

Adjectives are a powerful tool for enriching vocabulary and developing conceptual understanding. In early elementary and primary classrooms, across core and foundation subjects, children are expected to describe, measure, classify, and compare objects and events—all processes that require a mastery of adjective meanings and use. While teachers are trained in vocabulary learning, they may be less familiar with: (i) the psychological processes by which children learn adjectives, and (ii) how a focus on adjectives can support learning in domains beyond language and literacy lessons. To address these gaps, we have collaborated as a unique interdisciplinary team with linguistic, psychological, and pedagogical expertise. We synthesise research across our disciplines to provide an accessible, practical, evidence-based primer of research findings on adjective development. We then provide guidance on how these findings can be used to enhance teaching and learning practices across subjects for children aged five to seven.

1 | INTRODUCTION

In language and literacy lessons, children are taught to use adjectives to enrich their spoken and written language—to engage their audience by, for example, pointing out not that there's something

on their shoulder, but *something wriggly, bristly*, or *alien*. Adjectives and other forms of descriptive language increase children's narrative competence by providing nuance for both referential and evaluative aspects of storytelling, and for their skills in reading comprehension (Griffin et al., 2004). Although teachers are trained in strategies for integrating new vocabulary into children's existing repertoires, they are less likely to have received specialised instruction in how children acquire adjectives, and how these findings can be used to support children in expanding their mastery of adjectives across a range of curriculum areas. For example, knowing that using comparison sets or antonyms can support children's expanding repertoire of adjectives in literacy, or understanding the links between children's talk about extent or quantity and the teaching of mathematical concepts.

Research in developmental psychology and linguistics has produced a range of findings on preschoolers' adjective development, with potential for application in the classroom. However, collaborations focussing on the implementation and evaluation of linguistic research in pedagogy are still in their infancy (though see a recent report on how cognitive science can be used in the classroom to boost learning outcomes; Perry et al., 2021). This paper, which integrates the theory and practice of adjective learning, emerges from a 2-year collaboration between a team of linguists, developmental psychologists, and teacher educators working in UK and US universities. It is underpinned by extensive consultation with a wide range of teachers and other educational practitioners working in primary schools and early years settings, most notably via the online professional development workshop Children Learning Adjectives held in 2021 (all materials available online). Following this workshop, we were recently commissioned by the Bradford Birth-to-19 SCITT (School-Centred Initial Teacher Training) programme to create a training video on adjective development. The video was an accessible version of the current paper and has reached around 25 trainee teachers so far.

Through this paper we demonstrate our approach to research-to-practice partnerships. We do this practically, by providing an accessible primer of research findings on adjective development (Section 2), with clear guidance on how these findings can be applied in classroom settings in both England and US (Section 4). The paper is intended for use by practitioners directly and as a case study for researchers to draw from in their own interdisciplinary collaborations.

1.1 | The importance of adjectives in early cross-curricular education

In the early years of primary education, children learn common adjectives, their meanings, and their usage as part of their language and literacy curricula. For example, in the English system at Key Stage (KS) 1 (years 1–2; 5–7 years old), children learn how to modify adjective meaning by adding prefixes and suffixes (Department for Education [DfE], 2014). By the end of Year 1 (age 5–6), children are expected to know that the prefix *un*-can change the meaning of an adjective to its opposite. By the end of Year 2 (age 6–7), they should know that the suffixes *-er*, *-est*, *-ful* and *-less* can be used to compare entities and refine descriptions. Likewise, in the US system, the Common Core State Standards state that kindergarteners (age 5–6) and first graders should be able to demonstrate command of adjectives by relating them to their opposites (antonyms). Children in first and second grade (6–7 years) should be able to demonstrate a command of the conventions of standard English grammar and usage when writing or speaking, which entails using frequently occurring adjectives; distinguishing between adjectives and adverbs; and recognising nuances among terms (National Governors Association Center for Best Practices [NGACBP] & Council of Chief State School Officers [CCSSO], 2010a). See Figure 1 for examples of curriculum targets for language and literacy in England and the US.

The importance of adjectives goes well beyond language and literacy instruction. For example, the national curriculum framework in England states that (English) language is both a subject in its own
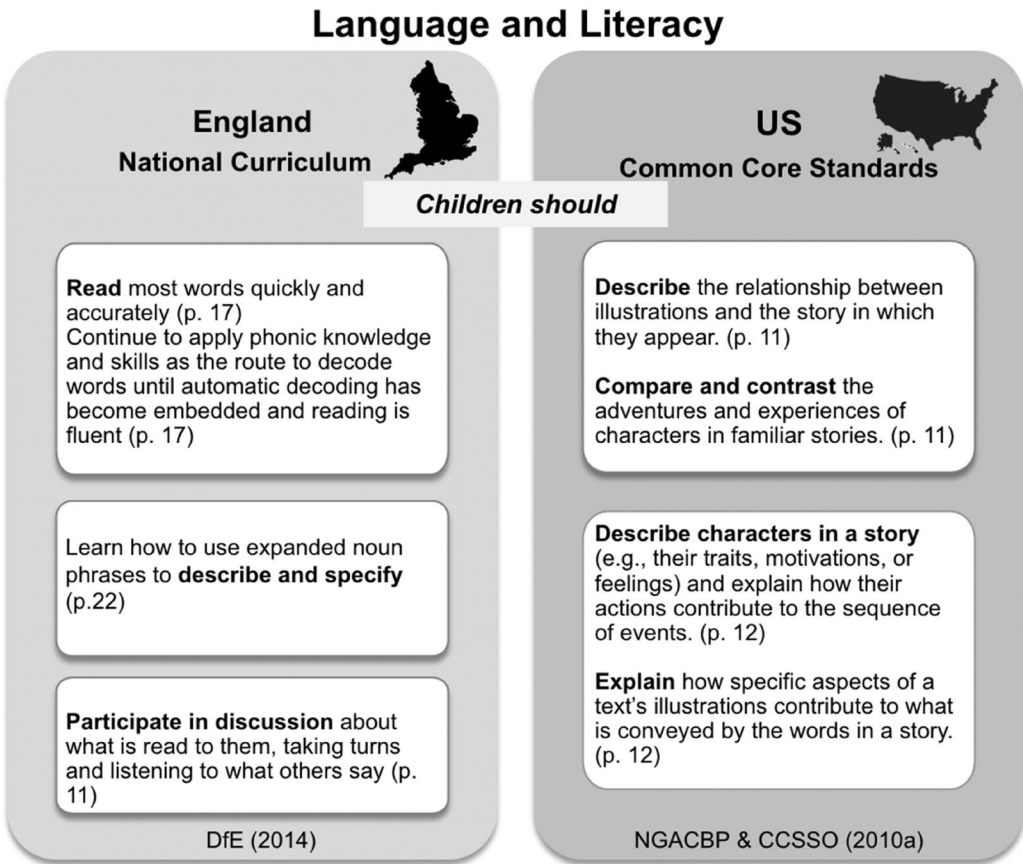
Language and Literacy

England
National Curriculum

US
Common Core Standards

Children should

Read most words quickly and accurately (p. 17)
Continue to apply phonic knowledge and skills as the route to decode words until automatic decoding has become embedded and reading is fluent (p. 17)

Learn how to use expanded noun phrases to **describe and specify** (p.22)

Participate in discussion about what is read to them, taking turns and listening to what others say (p. 11)

DfE (2014)

Describe the relationship between illustrations and the story in which they appear. (p. 11)

Compare and contrast the adventures and experiences of characters in familiar stories. (p. 11)

Describe characters in a story (e.g., their traits, motivations, or feelings) and explain how their actions contribute to the sequence of events. (p. 12)

Explain how specific aspects of a text's illustrations contribute to what is conveyed by the words in a story. (p. 12)

NGACBP & CCSSO (2010a)

FIGURE 1 Examples of Language and Literacy objectives and standards in England and the US that require adjective knowledge

right and an essential foundation for success in all subjects (DfE, 2014). Likewise, the US National Academy of Sciences Science Teaching Standards says that 'Developing communication skills in science and in language arts reinforce one another' (National Research Council [NRC], 1996). Two of the core subjects where descriptive language is crucial for academic success are mathematics and science, but it is also relevant in history, social studies, and the arts. For example, several objectives in KS1 maths require children to use language to describe, compare, and measure capacity, length or height (DfE, 2014). A core objective in science is for children to explore and describe the properties of materials (DfE, 2014; NRC, 1996). In art and music, children are required to explore different materials, colours, and melodies, and to use language to describe disciplines, practices, or techniques and to compare and categorise images and the expressive qualities of music (National Coalition for Core Arts Standards [NCCAS], 2014). In geography and history, children need to be able to describe and compare locations or historical events. Thus, for academic success across all subjects, a firm understanding of adjective meanings and their various morphosyntactic forms (i.e., their internal structure and how they can appear in sentences) is not only advantageous, but required.

The cross-curricular usefulness of adjectives means that children stand to benefit from support to develop this word class in *all* curriculum subjects. We argue for expanding the explicit teaching of adjectives beyond language and literacy classes, and explore practical methods to support adjective

learning across core and foundation subjects (Section 4). Using topics from specific curriculum areas, we propose activities through which adjectives can be taught. We build on the small amount of published research in this area (e.g., recommendations to use real objects in science classes to teach descriptive vocabulary such as *solid*, *fragile*, and *cylindrical*; Rule et al., 2004). By giving practical suggestions underpinned by their psycholinguistic rationale, we provide a guide that is both rigorous and accessible, and which should enable children to confidently use descriptive language across academic subjects and into their lives outside school.

In sum, this article supports practitioners in teaching descriptive language across the curriculum, and models to researchers wishing to engage with school communities one approach to collaboration. We provide a review of what psychological and linguistic research reveals about the acquisition of adjectives in early childhood (Section 2). As a baseline for our suggested curriculum developments, we outline current approaches to adjective learning in KS1 classrooms (Section 3). Section 4 demonstrates how research can be applied to enhance adjective learning in class across curriculum areas, together with recommended resources to support these ideas. Our work builds on foundations from Ricks and Alt (2016), who proposed to apply theoretical principles and experimental findings from research on adjective learning to support children who struggle with acquiring adjectives (see also Davies et al., in press). We expand this by harnessing the research findings to support a wider range of children starting out in formal education to reach a more sophisticated mastery of adjectives across a range of subjects.

2 | WHAT DOES RESEARCH FROM LINGUISTICS AND PSYCHOLOGY TELL US ABOUT HOW ADJECTIVES ARE ACQUIRED BY YOUNG CHILDREN?

To enable practitioners to strengthen their evidence-based classroom practice, this section presents a selection of foundational and highly-cited studies on adjective learning. They focus on its conceptual underpinnings, the role of categorisation and comparison, and the influence of concepts, context, and language itself (especially syntax and semantics) in learning adjectives. This body of research highlights the milestones in children's receptive and metalinguistic knowledge, which often exceeds their expressive skills prior to formal schooling. We illustrate some of the experimental paradigms with screenshots from our teacher training resources; these carefully designed, simple images have been very useful for translating academic research to practice.

In formal education, children are taught that adjectives modify nouns, and that they carry a specific kind of meaning that describes the properties of animate and inanimate entities (for further reading see Syrett, 2014). Prior to formal schooling, children already know a great deal about adjectives. For example, while 10-month-olds struggle to recognise that differences in properties and kind between entities distinguish them (Xu & Carey, 1996; Xu et al., 2004), 3–4-year-olds are adept not only at noticing contrasting properties of objects, but can rapidly assign meaning to new adjectives (Klibanoff & Waxman, 2000). Once children enter formal schooling, teachers help them gain a conscious understanding and dexterity with their latent adjective abilities.

What does experimental research tell us about what young children know about adjective meaning, and the conditions under which they are able to acquire it? Here we focus on three aspects: the fact that adjectives depend on context for their meaning; the role of comparison and contrast in adjective learning; and adjectives' relationship to nouns. This review establishes a foundation for our recommendations for pedagogical and curricular support focussed on adjectives (Section 4).

We begin with Figure 2, which illustrates some of the terminology used in this section. Objects can be organised into CATEGORIES according to their kind (e.g., animals; dogs). Each member of the category is an EXEMPLAR. Objects can be grouped together at different LEVELS of the category, based on conceptual similarity among exemplars.

2.1 | Some adjectives rely on context

Shape is an especially salient property to children, as opposed to colour, texture, or size (Gelman & Ebeling, 1998; Jones & Smith, 1993; Landau et al., 1988, 1998), and children are adept at using it to learn new adjectives and nouns—perhaps because it is a reliable and stable cue to object function or category membership (see Landau & Gleitman, 1985 for a comparable discussion on language learning in blind children). This does not mean children are unaware of context-dependent properties such as size or colour; it's just that these are more challenging in that they require additional contextual support. To assess whether or not something is *big* or *high*, children must refer to different types of standards. For example, to decide whether a container is *big* requires them to assess how big a typical object of that kind is relative to a comparison class, and relative to other examples of the same category co-present in the context, to the location of other objects, or its intended function (Ebeling & Gelman, 1998; Gelman & Ebeling, 1989). This line of research highlights the fact that adjectives are difficult or even impossible to understand and produce in isolation: context is key.

Children know that adjectives depend on context in different ways. Because 4-year-olds classify all objects that are bigger than the mean average of a set as *big*, we know that they understand that scalar adjectives such as *big*, *long*, or *tall* set the standard around the midpoint of a series, for example, Figure 3 (Gotowski & Syrett, 2020; Syrett et al., 2006). What's more, manipulating this context by adding more objects to one end of the series causes children to revise where they set the standard and whether they allow adjectives like *tall* to apply to a particular object. Crucially, this manipulation only has an effect if children treat these additional objects as belonging to the same object kind (Barner & Snedeker, 2008). Thus, young children use contextual cues to understand and apply adjective meaning flexibly.
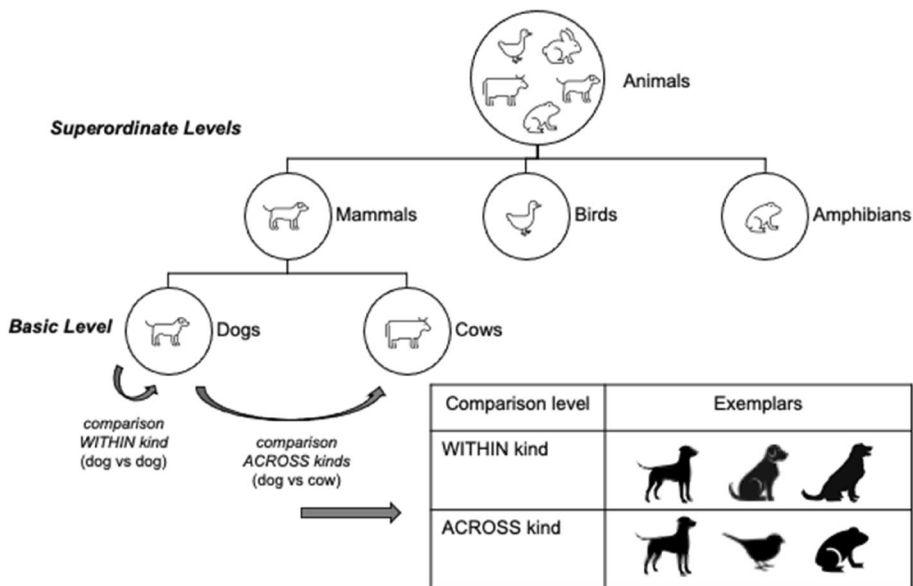

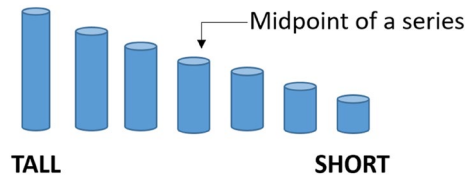**FIGURE 2** Object categories, levels, and exemplars

FIGURE 3   Series of objects in descending height, with midpoint highlighted

FIGURE 4   Example paradigm. *Source*: From Horowitz and Frank (2016, exp. 3)

2.2 | Comparison and contrast support word learning

Adjectives often imply a contrast between members of a category, for example, a big versus a small cup. Horowitz and Frank (2016, exp. 3) demonstrated that children are able to make this subtle inference before they start school, and can distinguish between adjective types. As Figure 4 illustrates, they showed children a novel object that instantiated two properties (a funny-shaped object that was both tall and dirty) and told them, 'This is a *special kind* of zib. This one is a {TALL/DIRTY} zib!' They then presented children with two new objects of the same category (one was tall and clean, and the other short and dirty), and asked what most zibs look like, forcing a choice between the two. Four-year-olds (but not 3-year-olds) selected the correct contrast object, that is, the short one when they had been shown that the special one was tall—but this worked for the size adjective only if they were told the first zib was a 'special kind'. Their choice of object indicates that they take the praenominal adjective to signal contrast relative to a default for that exemplar and its corresponding category.

The role of object category (e.g., whether something is an animal or a toy) turns out to be extremely important in adjective learning. Seeing multiple exemplars of a category while hearing an adjective highlights the commonalities between the properties of these objects, for example, the fact that they are all red or fuzzy. Importantly, preschoolers (much like infants under 12 months of age) don't notice these properties just by looking at the array; the adjective label *highlights* the similarity, inviting categorisation. When children hear an adjective describing these properties—even an entirely

novel one—they are better able to deduce its meaning and generalise it to new objects (Klibanoff & Waxman, 2000). But this 'cross-situational learning' is nuanced: it works for objects of the same basic level but not at a higher level of the taxonomy, for example, for dogs, but not for animals in general (Klibanoff & Waxman, 2000). However, if children are first allowed to extend properties to new objects of the same basic level, and *then* move across categories (e.g., duck to more ducks vs. duck to turtles), they succeed, demonstrating that the level of comparison within and among categories influences their attention to object properties (Klibanoff & Waxman, 2000).

Because children's inclination to treat words as labels for object categories is potent for both nouns and adjectives from the earliest stages of development (Waxman & Markow, 1995), there are times when children actually perform better given an across-basic-kind contrast. This appears to be the case when they are learning adjectives that describe properties that are less visual and more tactile (e.g., *lumpy*). In these cases, when children are taught that a cat toy is lumpy, they are better able to select the lumpy target when shown two turtle toys, than when they are shown a rabbit and a cat. They learn especially well when the teaching of the adjective is accompanied by gestures that highlight the tactile property (O'Neill et al., 2002).

Children are also more likely to succeed if they are initially provided with two objects to explicitly compare and contrast, before being asked to extend the adjective to new objects across categories. For example, (as Figure 5 illustrates), when children are shown objects with contrasting properties (e.g., two plates with different textures) and told 'This one is a very wuggish one but *this* one is NOT wuggish' and are then asked to find another wuggish one from a new set of objects of a different category (e.g., tubes), they are able to do so—but only if they initially compare *within* basic-level categories (e.g., multiple plates) not across (e.g., a plate vs. a sword). However, when children are told 'This one is a very wuggish one and *this* one is ALSO wuggish' and asked to find another wuggish one from a new set, they are now able to compare *across* basic-level categories, but not within (Waxman & Klibanoff, 2000). Thus, contrast *within* category and similarity *across* categories are key for adjective comprehension. Importantly, if children are asked to 'find another <u>one</u>,' they are not able to extend the adjective meaning. For size terms like *big*, children benefit from this category of explicit comparison of properties in a set to acquire novel size adjectives (Ryalls, 2000).

2.3 | Children know that adjectives modify nouns

Unifying objects with a common label—even if it's one that children have never encountered before—is a powerful cue to word meaning for both nouns and adjectives. Even at a very early age, children

FIGURE 5 Example paradigm used by Waxman and Klibanoff (2000)

understand that the morphosyntactic frame in which this novel label appears (e.g., *These are blickish* vs. *These are blickets*) has consequences for meaning (Brown, 1957; Gleitman, 1990; Landau & Gleitman, 1985; Waxman & Booth, 2001), and use this information to determine whether the word picks out a property or an object. Children seem to be aware very early on that an adjective (particularly a praenominal one) cues contrast between object *properties* (Gelman & Markman, 1985), and nouns cue contrast between object categories. Four-year-olds who are shown a novel object and told, *this is a BLUE one* are more likely to select a novel object with the same colour than if first told, *this is a BLUE* (Hall & Moore, 1997). Recent experimental work demonstrates that more complex syntactic environments can help to narrow down adjective meaning (Gotowski & Syrett, 2022), in some cases especially when combined with semantic cues such as animacy (Becker, 2015; Becker et al., 2012).

At the same time, noun labels themselves play an important role in adjective learning. When experimenters present adjective labels for properties alongside multiple objects from a category, and augment this word-exemplar pairing with a lexically rich noun label for these objects, for example, *this is a stoof horsie*, children are more successful at understanding and mapping the adjectives to the properties they denote than when they hear a vague or uninformative noun, for example, *this is a stoof {one/thing}* (Mintz & Gleitman, 2002).

Adjective position relative to the noun it modifies also matters. Children are more likely to select an object with the same property from a set when asked to find one that is *fep* if they are first shown another object and told, *this is a fep blicket* than if they are told, *this blicket is fep* (Prasada, 1992). Diesendruck et al. (2006) showed children a dog and told them either *this is a very DAXY dog* (praenominal position) or *this dog is very DAXY* (predicative position). They later introduced another dog as a comparison and said, *I want a very BLICKY dog* or *I want a dog that is very BLICKY*. Children were more likely to select the new, unlabelled dog when given the praenominal-praenominal prompts.

Children also use their knowledge of nouns and their familiarity with object properties in the world to make predictions about what a speaker is referring to. Three-year-olds rapidly look at an intended object upon hearing a praenominal adjective, even before hearing the noun. For example, when shown a red and a blue car, they successfully look at the correct car while hearing the colour adjective (Fernald et al., 2010) or a size adjective when given time to do so (Davies et al., 2021). Three-year-olds presented with images of two different objects (e.g., a pillow and a book) look to the pillow on hearing the praenominal adjective *soft*, but wait until hearing the noun when they instead hear the relatively uninformative adjective *new* (Tribushinina & Mak, 2016).

Together, the research summarised in this section shows that young children skillfully exploit aspects of adjectives and the linguistic and discourse environments in which they occur (e.g., morphosyntactic frame; presence of same-class objects) to deduce and refine the meanings of adjectives. Children dynamically adapt their expectations of what qualifies as big, high, or strong depending on prototypical patterns as well as on other items in the context. They use adjectives to hone in on object properties and extend them to new categories. They use contrasting objects to cement the meaning of new adjectives, and recruit information from the meaning and the position of nouns to further embed adjective understanding.

3 | CURRENT APPROACHES TO ADJECTIVE LEARNING IN THE CLASSROOM

Having provided an overview of some of the main findings from lab-based research on young children's adjective acquisition, we now turn to classroom-based practice. Drawing from pedagogical

research alongside the teaching expertise of our author team, here we present a baseline for our proposals on how psychological research (Section 2) can inform new approaches to the teaching of adjectives across the curriculum (Section 4). In this section we outline broad approaches to engaging children with adjectives, then provide an example of how adjectives are currently taught in language and literacy in early elementary years and at KS1. These approaches are also applicable in international literacy classrooms where English is the medium of instruction.

One of the core principles of vocabulary teaching is to enrich language input. Adjectives are excellent candidates for widening and deepening language experience. Children hear and say fewer adjectives in spoken language than nouns and verbs, particularly in early language development (Blackwell, 2005). Pedagogical research underscores this; 3- and 4-year-olds' spoken language (particularly in storytelling) contains less evaluative, descriptive language than that of 5-year-olds (Nicolopoulou et al., 2021). In addition, children's language experiences vary according to a variety of social factors, depending on the amount and type of talk at home. Thus, children start school with considerable differences in the range and number of adjectives they have encountered.

To maximise exposure and scaffold learning, teachers should provide opportunities for children to engage with new descriptive vocabulary—specifically adjectives—in a range of curriculum contexts. For young children, activities that develop spoken language are fundamental to exploring and consolidating concepts. For example, when comparing a set of moving toy vehicles on different surfaces, children can use adjectives to reason scientifically, for example, 'that car is faster because the surface is smoother'. Here, spoken language is a tool for conceptual development. Other broader approaches to supporting descriptive language development across the curriculum can be employed, for example, DIALOGIC TEACHING, in which sustained reasoning through talk is promoted in the classroom (Alexander, 2004), and EXPLORATORY TALK, in which children are encouraged to reason, question, and discuss in focussed ways (Mercer, 1995). Adjectives can straightforwardly be applied to vocabulary enrichment, conceptual development, dialogic teaching, and exploratory talk.

Explicit grammar teaching is most effective when taught in the context of real language use, rather than via decontextualised exercises (Cushing & Helks, 2021; Jones et al., 2013). 'Real' language is that which is familiar to children in their own spoken language practices, arising from their own language or from examples they are likely to encounter in everyday life, for example, in children's books. The development of a 'grammar as choice' pedagogy (Myhill, 2021) emphasises that language use should be based on purposeful, appropriate choices made by a writer (rather than to fulfil a checklist of criteria) and that children's writing should be for authentic purposes.

Teaching grammar in context, and following a discrete planning and learning sequence underpins lessons targeting specific grammatical features (Bearne & Reedy, 2017). Here we illustrate this progression within a lesson focussing on adjectives, in which children identify examples of adjectives from a selected text. The adjectives are investigated in worked models through the three explicit teaching phases suggested by Bearne and Reedy (2017), reflecting current typical practice. The first phase involves the explicit teaching of the feature; in the second, children identify the language feature in texts; and in the third, children use the language feature and include it in their own writing, for example, by experimenting for a given effect or by sharing examples with peers.

In the first phase of the lesson, the teacher introduces the children to the grammatical terminology and explains what the word class is used for, giving examples, for example, 'Today we will be learning about adjectives, which are words that help us to give more information about a noun'. In the second phase, the teacher may use a picture book (for example, *Naughty Bus* [Oke & Oke, 2005;

cited by Cremin, 2015]), to help the child to identify adjectives and to explore their role and purpose in the story. Through reading and investigation, explicit teaching, discussion, and experimentation, the teacher leads the children to choose appropriate adjectives to describe the object (here, the bus), and possibly justify their choice. The teacher may also introduce morphology by adding suffixes to root adjectives, such as *fast/faster/fastest*. The teacher also highlights the effect adjectives have on the story, such as adding detail, comparing, or making a description amusing. Children can then be encouraged to use adjectives in their own writing. This structured approach supports children in becoming confident users of language.

The teaching of specific language features such as adjectives is included in the programme of study (England) and Common Core (US) requirements for English, so is typically part of English or literacy lessons. As we have illustrated, it takes a structured form and progression. Although guidelines state the importance of developing language across the curriculum, it is only in English that statutory requirements are provided for the teaching of grammar. Adjectives are also commonly part of lessons about creative or imaginative writing. However, opportunities for developing children's knowledge, understanding and use of this important word class are often neglected in other parts of the curriculum, despite the fact that children are called upon to use and develop language in and through *all* areas of the curriculum. Thus, in the next section, we consider opportunities for promoting adjective understanding and incorporating adjectives in subject areas beyond English.

4 | APPLYING RESEARCH FINDINGS TO ENHANCE CURRENT TEACHING APPROACHES

In Section 2, we summarised research findings showing how young children develop adjectives. Here, we apply those observations to the school curriculum, focussing on classroom activities to illustrate the pedagogical potential for teaching new adjectives in areas outside of language and literacy. In doing so, we harness the major takeaways from Section 2: (a) that some adjectives are best learnt when they and the properties they describe are situated in context, (b) that word learning benefits from comparison and contrast of properties across multiple exemplars within and across kinds, and (c) that rich, informative nouns and noun frames support adjective learning.

As noted in Section 3, the direct teaching of language features has typically been positioned within the teaching of English, and the skills associated with literacy. Here, we turn our attention to curriculum areas not typically associated with the specific teaching of language (Science, Math[s], Geography, History, and Art and Design) in KS1 (England) and Kindergarten (US), but which offer a range of opportunities for teachers to support children learning adjectives and using evaluative language. In turn, we show how knowledge of adjectives can support the acquisition and expression of concepts in these very areas. For each subject area, we begin by highlighting curriculum recommendations on adjective use from both the English and US guidelines (reflecting the contexts in which we work). For the English context, we base our recommendations on guidelines from the National Curriculum for England (DfE, 2014).[1] In the US, because early childhood education guidelines are determined at state and local levels, examples are based on suggestions from several national associations and are specified when discussing each curriculum area.[2] For brevity, we have selected a subset of guidelines relating to the potential of adjectives for learning across the curriculum. The full programme of study can be found via the website of each association or institution described below. We then provide practical suggestions for practitioners, grounded in developmental research to enhance current teaching approaches and support learning. We conclude by recommending books that we have found engaging

and effective in our own practice to support adjective learning and use. We acknowledge that other English-speaking contexts both within and beyond the UK and US follow different curricula, so we have selected examples and resources applicable to a wider range of contexts.

4.1 | Science

Both the English and US curricula emphasise the importance of scientific literacy in children's education. This requires, among other things, the ability to adequately use technical terms and to describe and explain events and phenomena. The quality and variety of language that children hear and speak helps to develop their scientific vocabulary. In studying and articulating scientific processes and concepts, children encounter new vocabulary which they must integrate with existing foundational linguistic knowledge about science and scientific processes, and with concepts and ideas with which they are already familiar. Published standards emphasise the importance of oral and written discourse in promoting metalinguistic knowledge and in making further connections with scientific ideas (see Figure 6). This highlights the interactive role of communication skills and scientific ability.

In the Programme of Study for Science at KS1, children study plants and animals, properties of materials, the seasons, and weather. Terms such as *identify*, *describe* and *compare* are used to direct
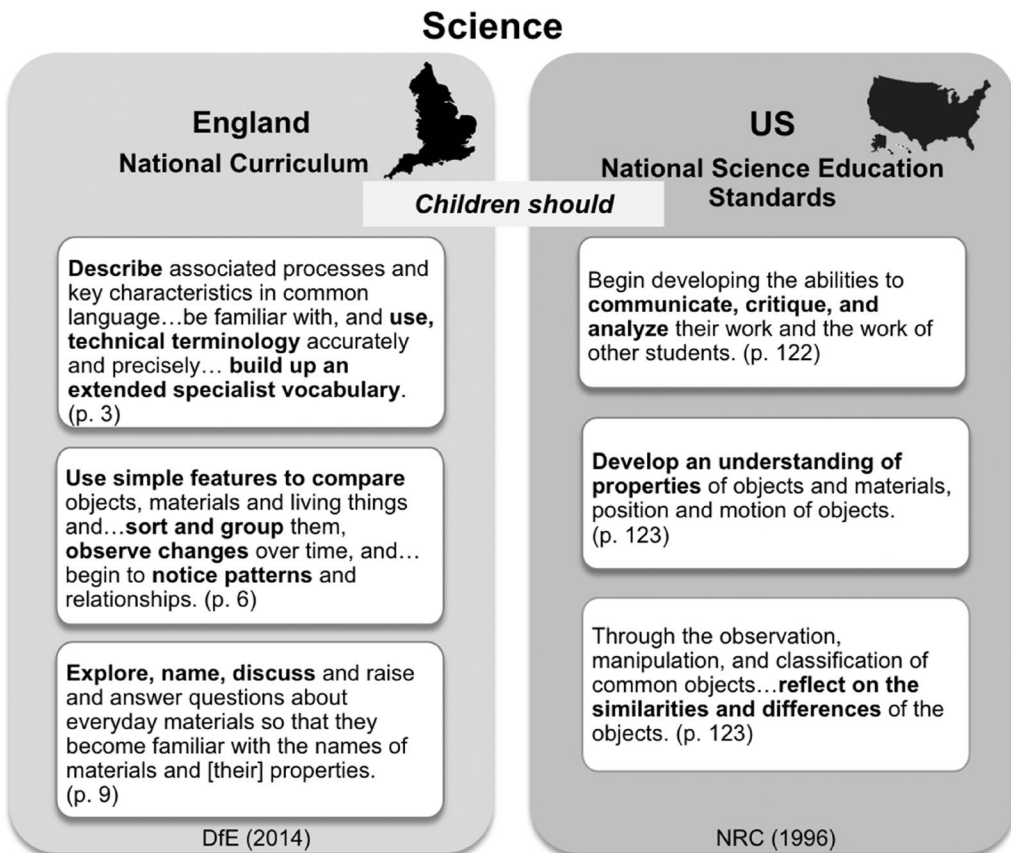

Science

England
National Curriculum

Children should

US
National Science Education Standards

Describe associated processes and key characteristics in common language…be familiar with, and **use, technical terminology** accurately and precisely… **build up an extended specialist vocabulary**. (p. 3)

Begin developing the abilities to **communicate, critique, and analyze** their work and the work of other students. (p. 122)

Use simple features to compare objects, materials and living things and…**sort and group** them, **observe changes** over time, and… begin to **notice patterns** and relationships. (p. 6)

Develop an understanding of properties of objects and materials, position and motion of objects. (p. 123)

Explore, name, discuss and raise and answer questions about everyday materials so that they become familiar with the names of materials and [their] properties. (p. 9)

Through the observation, manipulation, and classification of common objects…**reflect on the similarities and differences** of the objects. (p. 123)

DfE (2014)

NRC (1996)

FIGURE 6 Examples of Science objectives and standards in England and US that require adjective knowledge

teachers in their design of teaching and learning. Similar topics and activities can be found on the National Science Education Standards (NRC, 1996) with lessons in Science involving the study of objects, organisms, and their environment. As children engage with the material, they must carefully observe properties of individual and multiple objects and phenomena, rely heavily on the use of specific adjectives to identify similarities and differences amongst them, and form categories based on these properties—all processes that not only invoke adjectives, but support learning new ones.

As children explore, discuss, and ask and answer questions about objects they encounter every day, they are highlighting object properties and describing them using adjectives. When children build on conceptual and linguistic knowledge they already have about familiar objects and their labels, they can then make comparisons and predictions based on this knowledge. In this way, it is the adjective describing the property of a familiar object that is foregrounded, rather than a new object being described.

What can teachers do to support adjective use and learning in Science?

1. When identifying and classifying common plants, ask children to sort plants into groups based on shared characteristics (e.g., leaf shape) or contrasting features (texture of the stem, absence/presence and colour of flowers).
2. Use objects with which children are already familiar and for which they have names, and introduce new words for their properties. Recruit contrast and similarity to support learning new adjectives (e.g., '*Look at these bottles! This one is opaque, but this one is not. It's transparent. There are two more bottles. Please give me the opaque one*')
3. Use noun labels and adjective position to introduce terms and highlight contrast among properties (e.g., '*This bottle is opaque. Look, there are more bottles over there. Please get me the opaque one*').
4. Focus on one kind of object at first (e.g., bottles), then later move to a wider set of objects that may share that property, but differ in others (e.g., a plastic bottle, a pair of sunglasses, an ice cube).
5. Encourage children to give explanations for their method of sorting into categories, using adjectives to justify their choices (e.g., '*This is a smooth/shiny one and this is a spiky/dull one*', '*This has big/long leaves and this has small/round leaves*', '*All of these are rough but these are not*').
6. Guide children in making predictions about new members of a category (e.g., '*What do we know about these? So how do you think a new member of this group will probably look/feel/sound?*')
7. Use hand gestures along with the property labels to emphasise the features of the objects being described (e.g., '*These clouds are fluffy* [mimic with hands], *but these are not*', '*These legs are long and bent*' [replicate with hands]).

For shared reading that can support the acquisition of novel vocabulary for science, see Figure 11.

4.2 | Maths

As part of the national curriculum of England, pupils should strengthen their conceptual understanding of mathematical concepts, and know how to deploy them quickly and for the purpose of solving problems across disciplines and in everyday life. The importance of spoken language is underscored as an essential aspect of children's cognitive, social, and linguistic development across the curriculum. Child-directed speech and speech elicited from children in the context of maths are highlighted as supporting reasoning and critical thinking, and facilitating the acquisition of specific vocabulary

(see Figure 7). Similarly, the Common Core State Standards (NGACBP & CCSSO, 2010b) state the importance of math for the development of skills required to solve everyday life problems. In early years of schooling this can be as simple as being able to use basic mathematical concepts to describe a situation (see Figure 7).

What can teachers do to support adjective use and learning in Maths?

1. Present children with a set of numbers, objects, or events, and ask them to order them numerically or group them by mathematical properties such as evens/odds, or multiples of 3.
2. Invite children to make comparisons between different numbers or outcomes of mathematical operations and practical problems (e.g., longer/shorter, heavier than/lighter than, half, quarter). Use familiar concepts and word labels so that new vocabulary and processes can build upon an existing knowledge base (e.g., show children two familiar objects and ask '*Is this ruler longer or shorter than this stick, Can you find five objects in the classroom that are longer/shorter than this stick?*').
3. When introducing shapes, identify their properties and ask children to identify similarities and differences between them. (e.g., Give children a set of three objects, with two of them being the same shape but different colour, and ask '*Can you circle/point to the shape that is different from the others? Why is this shape different?, What are the names of these shapes?*')
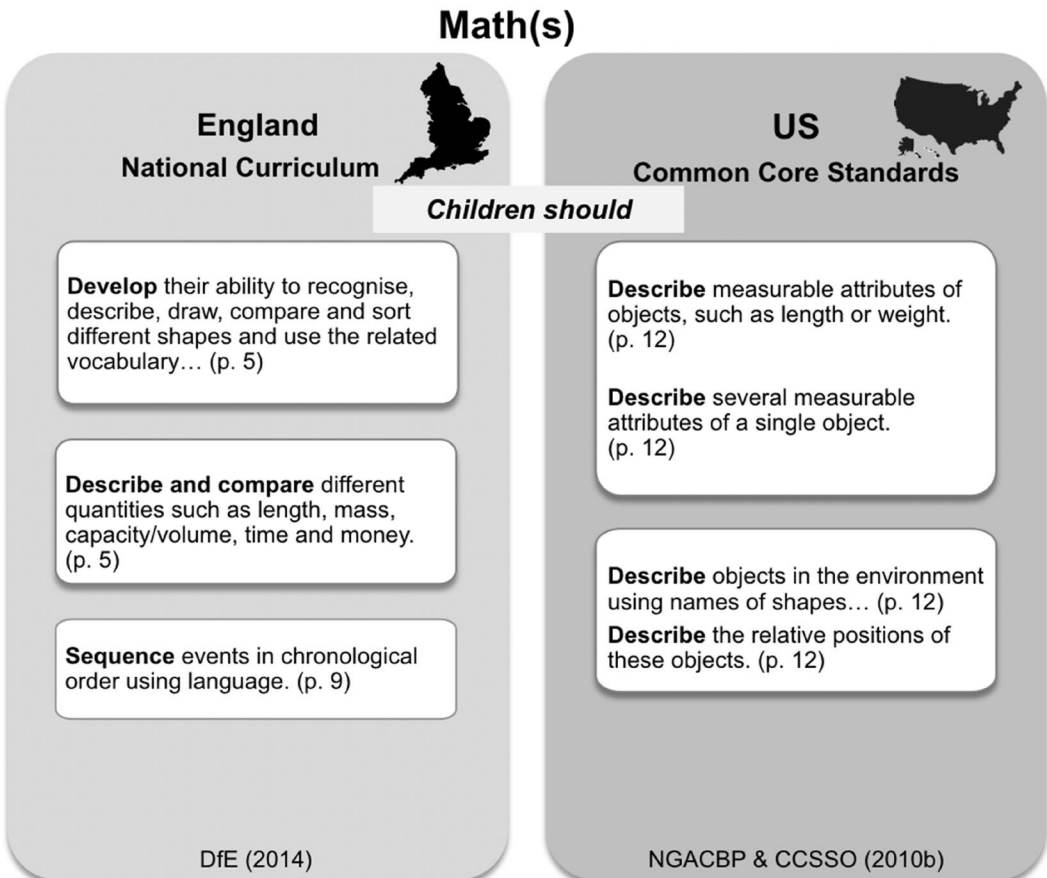

FIGURE 7 Examples of Math(s) objectives and standards in England and US that require adjective knowledge

For shared reading to support understanding and use of comparative adjectives in mathematics, see Figure 11.

4.3 | Geography

As children study the geography of their school and their immediate environment, and identify characteristics the physical environment in their community, their country, and the world, they must appeal to a variety of adjectives in contextualising locations, describing processes, comparing and contrasting human and geographical features, and outlining spatial and temporal variation. They are taught to communicate about data gathered through fieldwork, use spoken and written language to interpret and communicate geographical information, and appeal to vocabulary to describe physical features of land such as cliffs, vegetation, and weather, and human features of locations such as towns, farms, and villages. Familiar and novel adjectives are crucial when making observations and performing comparisons (see Figure 8). These include adjectives that describe dimensions of size, position/location, distance, shape, age, or time.

What can teachers do to support adjective use and learning in Geography?

Geography

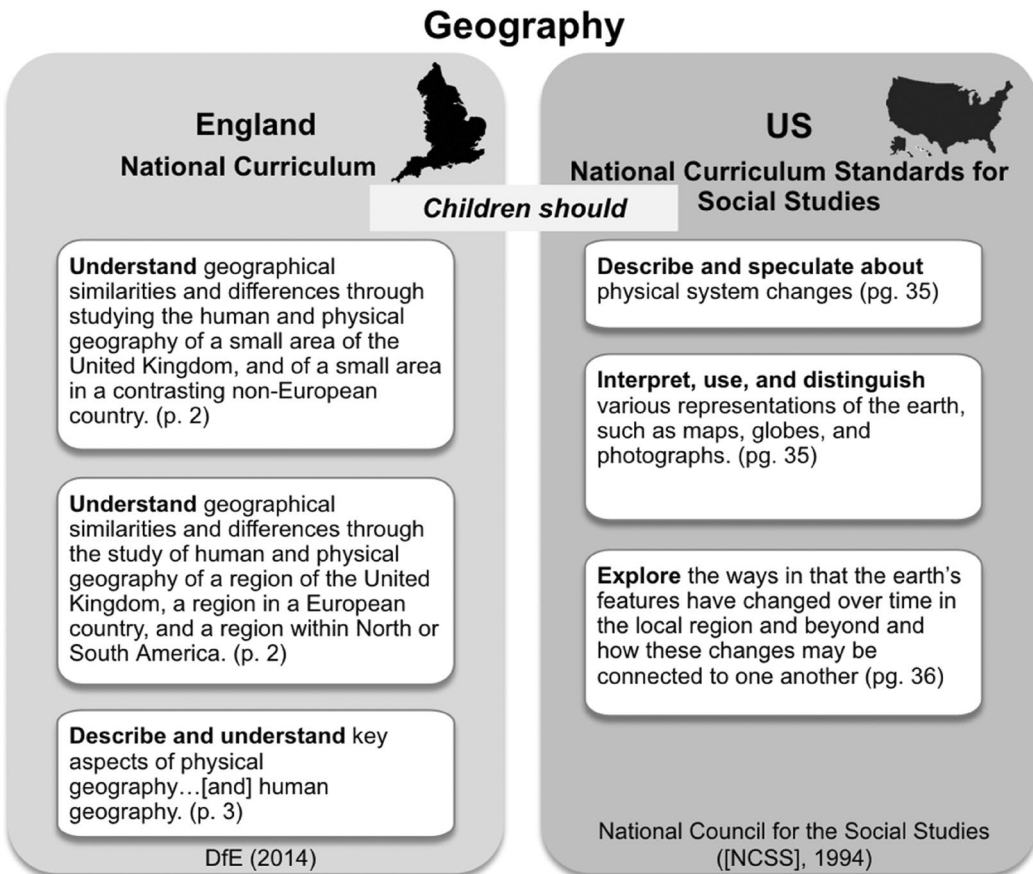| England National Curriculum	US National Curriculum Standards for Social Studies
Children should	
Understand geographical similarities and differences through studying the human and physical geography of a small area of the United Kingdom, and of a small area in a contrasting non-European country. (p. 2)	**Describe and speculate about** physical system changes (pg. 35)
Understand geographical similarities and differences through the study of human and physical geography of a region of the United Kingdom, a region in a European country, and a region within North or South America. (p. 2)	**Interpret, use, and distinguish** various representations of the earth, such as maps, globes, and photographs. (pg. 35)
Describe and understand key aspects of physical geography…[and] human geography. (p. 3)	**Explore** the ways in that the earth's features have changed over time in the local region and beyond and how these changes may be connected to one another (pg. 36)
DfE (2014)	National Council for the Social Studies ([NCSS], 1994)

FIGURE 8 Examples of Geography objectives and standards in England and US that require adjective knowledge

1. Build on children's own language using familiar nouns and adjectives in making comparisons to reinforce understanding of the concept and scaffold the use of new adjectives (e.g., mountainous; 'This region is flat, but that one is mountainous').
2. Ask children to make cross-situational comparisons of dimensions of physical space and relations between objects (e.g., '*Which building/country is higher/longer/further away?*', '*Which part of the playground is furthest away from our classroom/nearest to the school gate?*')
3. Select two countries, cities, or farms, and ask children to use adjectives to identify similarities and differences between them based on multiple dimensions.
4. Invite children to identify the country, sea, or town being described out of a set of possible candidates using adjectival terminology.

For shared reading that can support the acquisition of novel vocabulary for geography, see Figure 11.

4.4 | History and social studies

Both the English and US curricula emphasise an awareness of the past (leaders, historical events, aspects of life), the chronology of events, and historical concepts such as continuity and change, cause and consequence, and comparison. Teachers are encouraged to help children understand the methods of historical enquiry, enable them to ask questions and weigh evidence, and gain perspective by placing their knowledge in different contexts. Teachers invite children to learn about past civilisations and societies by writing or talking in descriptive ways about the similarities and differences between past and present (see Figure 9). Understanding the past and the lives of people in the past can be conceptually difficult for young children, and is most effective when linked to children's existing knowledge and experience. For this reason, aspects of everyday life, such as schooling, toys and local history, and significant national or local events are common topics at KS1. In US Social Studies, topics focus on communities, social interactions, and cultural differences, making history relevant to daily life.

What can teachers do to support adjective use and learning in History?

1. Use a particular period of time as a contextual standard against which others are situated and can be ordered relative to each other using adjectives ('*That was earlier/later/sooner*').
2. When writing or talking about aspects of the past, encourage children to identify differences among properties of objects by using adjectives of colour, size or texture, for example, describe dolls from the Victorian period as smaller than today, wooden, and with painted clothing.
3. Identify different kinds of tools from a previous period of time using familiar labels (e.g., spears, shovels), and invite children to notice and describe similarities (e.g., wooden, round, curved, metal).
4. Highlight the connection between the shape of a tool and its function and purpose for people during a chronological period (e.g., '*The sharp edge allowed them to dig deeper holes when building structures*').

For shared reading that can support understanding of life in the past as well as novel vocabulary associated with it, see Figure 11.
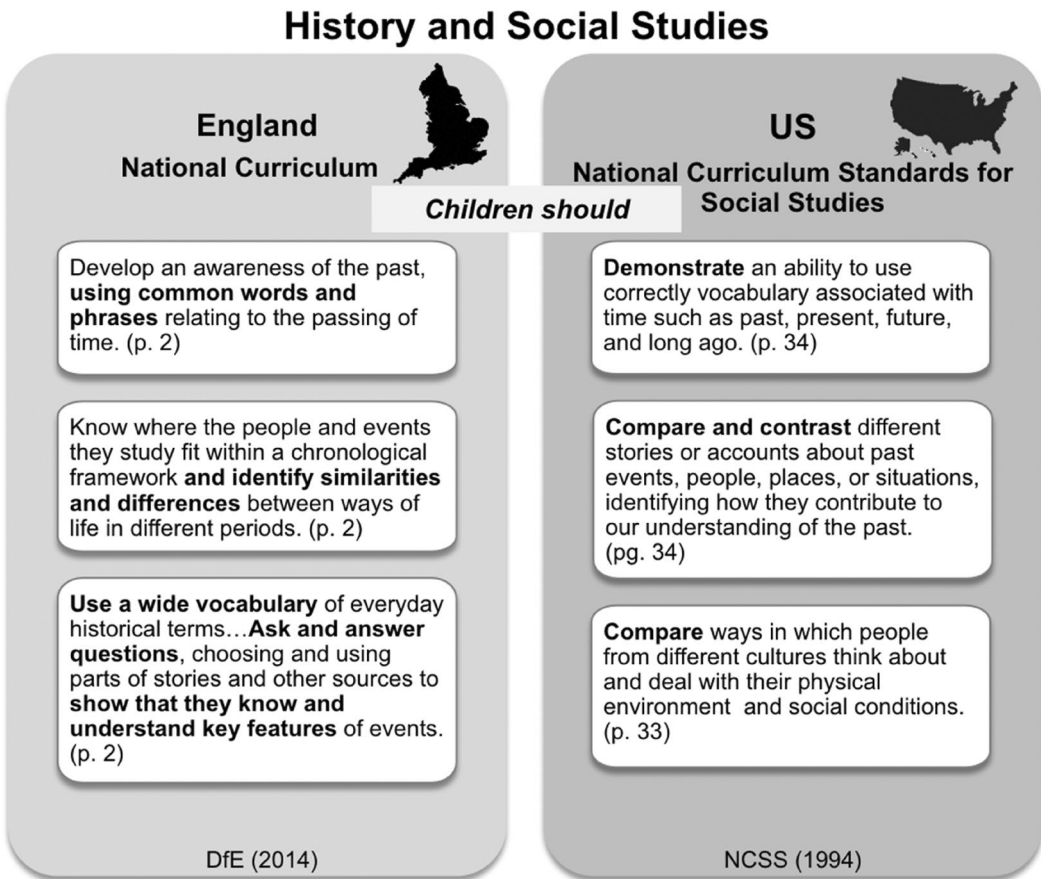
FIGURE 9 Examples of History/Social Studies objectives and standards in England and US that require adjective knowledge

4.5 | The arts

Across both the English and US curricula, children are taught to use a range of materials in visual arts to design and make products, and to draw, paint, and sculpt to develop and share their ideas. They develop various techniques using colour, pattern, texture, line, shape, form, and space. As they learn about a range of artists, craft makers, and designers, they are encouraged to describe the similarities and differences in practices and disciplines, and their own work. Children are encouraged to explore and use a variety of materials and tools and to describe artistic work using adequate language. All of these activities invite adjectival descriptions about how to successfully execute techniques, compare and contrast art forms, techniques, individuals, and styles with each other (see Figure 10). Similarly, instruction in music requires children to describe melodies, compare musical pieces, and express their own impressions and preferences—all of which involve the use of descriptive language (see Figure 10).

What can teachers do to support adjective use and learning in Art and Design?

1. Invite children to describe the specific effects of changes in lighting, line, space, or form within the context of a particular drawing or painting.
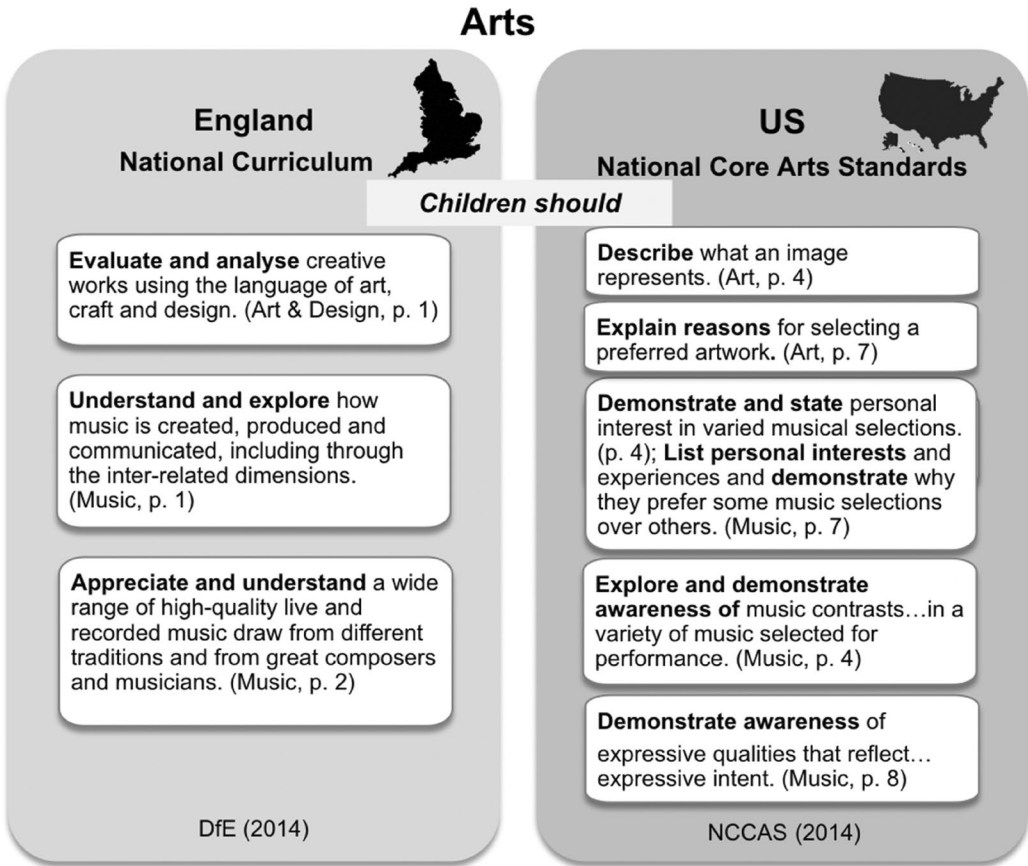
Arts

England
National Curriculum

DfE (2014)

Children should

Evaluate and analyse creative works using the language of art, craft and design. (Art & Design, p. 1)

Understand and explore how music is created, produced and communicated, including through the inter-related dimensions. (Music, p. 1)

Appreciate and understand a wide range of high-quality live and recorded music draw from different traditions and from great composers and musicians. (Music, p. 2)

US
National Core Arts Standards

NCCAS (2014)

Describe what an image represents. (Art, p. 4)

Explain reasons for selecting a preferred artwork. (Art, p. 7)

Demonstrate and state personal interest in varied musical selections. (p. 4); **List personal interests** and experiences and **demonstrate** why they prefer some music selections over others. (Music, p. 7)

Explore and demonstrate awareness of music contrasts…in a variety of music selected for performance. (Music, p. 4)

Demonstrate awareness of expressive qualities that reflect… expressive intent. (Music, p. 8)

FIGURE 10 Examples of Arts objectives and standards in England and US that require adjective knowledge

2. Identify multiple paintings from a particular artist, and invite comparisons among them using adjectives, then ask children to use these descriptions to decide whether a new work was made by the same artist.
3. Select two instances of a particular design, asking children to compare and contrast the properties, supporting the adjective labels with gestures.
4. Introduce a work of art or a craft with salient properties (e.g., shape, colour, size, pattern) by describing it with a praenominal adjective (e.g., '*This is a round/blue x*') and saying that it is a special instance of its kind, then introduce new examples of that art or craft, teasing apart the properties represented in the first one, and ask them what the art or craft typically looks like.

For shared reading to support the acquisition of novel vocabulary for arts, see Figure 11.

5 | SUMMARY AND RECOMMENDATIONS

By highlighting the importance of adjectives across the curriculum, we have made the case for expanding them beyond the language and literacy lessons and adopting a comprehensive approach across subject areas. To enable this, we have provided a primer for teachers on how young children develop
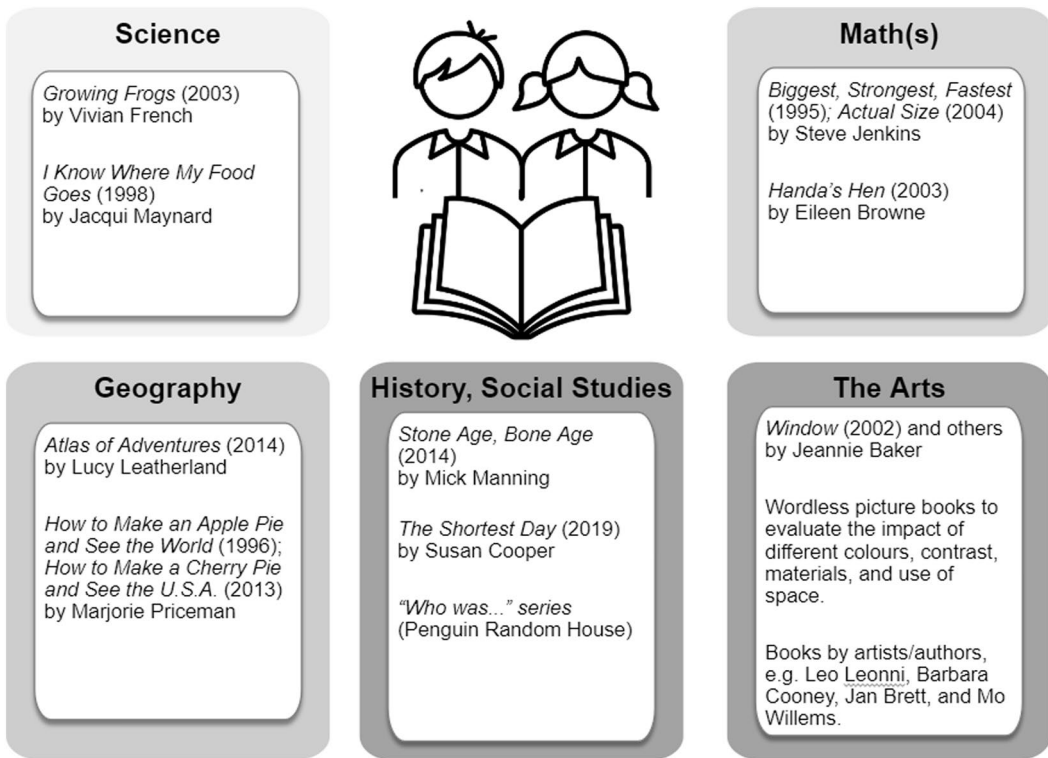
FIGURE 11 Recommended books to support adjective learning across subjects (Baker, 2002; Browne, 2003; Cooper, 2019; French, 2015; Jenkins, 1995, 2004; Leatherland, 2014; Manning, 2014; Maynard, 1998; Priceman, 1996, 2013; Who et al., 2002–2022)

adjectives, and then made a range of suggestions on how developmental psycholinguistic processes can be adopted to enhance current teaching practices across children's holistic classroom experience.

For example, a robust finding from lab-based research is that some adjectives are best learnt when they and the properties they describe are situated in context, that is, alongside a collection of objects or events that all show the relevant property. In history lessons, we propose that a specific era could be used as a contextual standard against which others are situated and can be ordered relative to each other using adjectives of time. A second core finding is that children's word learning benefits from comparison and contrast of properties across multiple exemplars within and across categories. We have provided many ideas as to how this can be mobilised, for example, in science, identifying objects that do and don't show a particular property within a taxonomy, for example, *deciduous/evergreen*.

Although we have drawn on our combined psychological and pedagogical expertise to provide these theoretically and empirically informed suggestions, many of our proposals are yet to be trialled and evaluated in a research study. Translational research will be necessary to ascertain whether our lab-inspired suggestions will be effective, feasible and acceptable in the classroom. We encourage practitioners to join us in these efforts and to share their results in open fora.

More broadly, we encourage researchers to build interdisciplinary and intersectoral collaborations with practitioners. We encountered challenges in cultivating and maintaining our partnerships, most notably the limited availability of the professional community during the pandemic and its aftermath, but found success through working with teacher trainers and offering continuous professional development with appropriate funding for teachers' cover. The rewards are long-lasting: we continue to

work with practitioners in identifying dynamic research priorities, user-testing classroom approaches, and developing the next generation of researchers to engage widely to maximise the impact of their discoveries.

AUTHOR CONTRIBUTIONS

Catherine Davies: Conceptualisation; Investigation; Writing – Original Draft (predominantly Sections 1 and 5); Writing – Review & Edit; Project administration; Funding acquisition. **Kristen Syrett**: Investigation; Writing – Original Draft (predominantly Sections 2 and 4); Writing – Review & Edit. **Lucy Taylor**: Investigation; Writing – Original Draft (predominantly Sections 3 and 4); Writing – Review & Edit. **Samantha Wilkes**: Investigation; Writing – Original Draft (predominantly Section 3); Writing – Review & Edit. **Cecilia Zuniga-Montanez**: Investigation; Writing – Original Draft (predominantly Section 1); Writing – Review & Edit; Project administration.

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CONFLICT OF INTEREST

The authors declare no conflict of interests.

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ENDNOTES

[1] The National Curriculum for England (DfE, 2014) contains programmes of study for each curriculum subject area from Key Stage 1 (age 5–7) through to Key Stage 4 (age 14–16). For each year group, it provides details of the knowledge and skills that should be taught, along with non-statutory guidance in how to do so.

[2] The curriculum for early childhood education in the US is determined at the state and local levels, but carefully shaped by standards coming from the Common Core for Math and Language Arts, the National Council for the Social Studies, the National Science Education Standards from the National Academy of Sciences, and the National Core Arts Standards, along with support from the National Association for the Education of Young Children.

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